Measurement and Evaluation Research Plan for

Load Impact Evaluation of SDG&E's Voluntary Residential Smart Pricing Program (SPP) for 2022

FOR

San Diego Gas & Electric

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1. INTRODUCTION AND KEY ISSUES

This research plan describes how Christensen Associates Energy Consulting, LLC (CA Energy Consulting) plans to conduct a load impact evaluation of San Diego Gas & Electric's (SDG&E) voluntary residential critical peak pricing (CPP) and time of use (TOU) rates for 2022. The rates, referred to collectively as residential Smart Pricing Program (SPP) rates, are TOU-DR (a traditional non-event TOU rate), TOU-DR-P (a TOU rate with an event-based CPP component), GDRTOD (a grandfathered TOU rate), and GDRTODPH (a grandfathered TOU rate with a CPP component).

The TOU time periods became effective on December 1, 2017, pursuant to D.17-080-030. The time periods address the timing of the utility's and the state's peak demand. Table 1 contains the TOU pricing periods currently in effect for non-grandfathered customers.

Customers with behind-the-meter solar who opted into a TOU tariff prior to July 31, 2017 may participate in a rate, GDRTOD or GDRTODPH, with grandfathered TOU periods. The grandfathered rate option ended on July 31, 2022. Prior to being sunset, all grandfathered customers were billed using the TOU periods shown in Table 2.

TOU time periods

The TOU periods in Summer are centered around an on-peak period of 4:00 p.m. to 9:00 p.m. on all days, which is surrounded by morning and evening off-peak periods, and an overnight super off-peak period. The off-peak and super-off-peak periods differ by day type (i.e., weekdays, weekends) as well as season (i.e., Summer, Winter), as can be seen in Table 1. The Summer season covers June 1st through October 31st, and the Winter season is from November 1st through May 31st.

Table 1: Current SPP TOU Periods

Day Type	TOU Period	Summer	Winter
Weekdays	On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
	Off-Peak	6:00 a.m. – 4:00 p.m.; 9:00 p.m. – Midnight	6:00 a.m. – 4:00 p.m. Excluding 10:00 a.m. – 2:00 p.m. in March and April; 9:00 p.m. - Midnight
	Super-Off-Peak	Midnight – 6:00 a.m.	Midnight – 6:00 a.m.; 10:00 a.m. – 2:00 p.m. in March and April
Weekends and Holidays	On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
	Off-Peak	2:00 p.m. – 4:00 p.m.; 9:00 p.m. - Midnight	2:00 p.m. – 4:00 p.m.; 9:00 p.m. - Midnight
	Super-Off-Peak	Midnight – 2:00 p.m.	Midnight – 2:00 p.m.

Table 2 presents the grandfathered TOU periods for non-holiday weekdays. All weekends and holidays are considered off-peak under the grandfathered TOU rate.

Table 2: Grandfathered TOU Periods, Non-Holiday Weekdays

TOU Period	Summer	Winter
On-Peak	11:00 a.m. – 6:00 p.m.	5:00 p.m. – 8:00 p.m.
Semi-Peak	6:00 a.m. – 11:00 a.m.; 6:00 p.m. – 10:00 p.m.	6:00 a.m. – 5:00 p.m.; 8:00 p.m. – 10:00 p.m.
Off-Peak	10:00 p.m. – 6:00 a.m.	10:00 p.m. – 6:00 a.m.

The CPP rate may be called during the 4:00 p.m. to 9:00 p.m. period on any day (including weekends) throughout the year.

1.1 Project Goals

The primary goals for this evaluation are the following:

1. Estimate hourly ex-post load impacts for the residential voluntary TOU and CPP rates for 2022, including:
    - Event-day hourly load impacts for CPP
    - Non-event day load impacts for both TOU and CPP[1]
2. Produce ex-ante load impact forecasts for both TOU and CPP through 2033.

The evaluations shall conform to the Load Impact Protocols adopted by the California Public Utilities Commission (CPUC) in April 2008 (D.08-04-050), including both event-based and non-event based protocols.

1.2 Roadmap

Section 2 discusses technical issues and our approach for conducting the study. Section 3 lists the data sources. Section 4 contains detailed work plan by task for meeting the study objectives, including a task list with the associated schedule and deliverables. Section 5 describes our quality control mechanisms and processes.

2. STUDY METHOD

This section discusses technical issues to be addressed in this study, and our planned approach to resolving those issues. We begin by describing the planned ex-post load impact estimation methods and then turn to development of the ex-ante forecasts.

2.1 2022 CPP program activity

Five CPP events have been called as of September 08, 2022, from September 3rd through 7th.

[1] For non-event-based rates, the Load Impact Protocols call for estimating average weekday load impacts by month, and by monthly peak days.

2.2 Evaluation Design

The ex-post impacts will be estimated using difference-in-differences evaluation approaches that compare treatment and quasi-experimental matched control group customer usage on relevant days or time periods, adjusted by their usage differences on pre-treatment or non-event days. The control groups will be selected by matching each treatment customer to one of an initial sample of eligible non-treatment customers in relevant population segments (e.g., climate zone and CARE status), based on the closest match of load profiles. The initial samples of eligible control group customers will be developed by segment from the eligible population of SDG&E residential customers. Ideally, the control group will draw from an existing pool of non-TOU customers who have not yet been defaulted onto TOU rates. However, if this pool does not contain a sufficient number of non-TOU customers, the control group will consist of customers on a TOU rate over the entire study period or customers who have opted-out of TOU rates.

When estimating TOU impacts using a non-TOU control group (for both TOU-only and CPP/TOU customers, relative to a non-TOU counterfactual rate), the treatment customers will be matched by comparing loads in the pre-treatment period (i.e., before the customer enrolled in the TOU rate). The TOU customers will be matched separately by season, based on two pairs of hourly loads for each season – one for all weekdays, and one for a subset of the hottest (or coldest) weekdays. Matching for the *non-summer* season will use data for the November through May preceding TOU enrollment, while matching for the *summer* season will use data for the June through October preceding TOU enrollment.[2] If the non-TOU control group is not viable, the match will occur during the treatment period when both treatment and control customers are on a TOU rate. Otherwise, it will follow the same methodology described above.

TOU load impacts for grandfathered customers will be estimated by combining 2016 load data with 2022 load data and current indicators of grandfathered customers. The 2016 load data will serve as a pre-treatment year while 2022 load data will be used as the post-treatment year in a difference-in-difference analysis. This is a similar approach to the PY2018 – PY2021 analyses. TOU load impacts for grandfathered customers will only be conducted up until the sunset date July 31, 2022.

Table 3 summarizes the ex-post load impact analyses described above, including the treatment customers, the load impact to be estimated, whether a control group will be used, and the day types for which load impacts will be estimated.

[2] The Summer matching period for non-grandfathered customers is October 2019 and June through September 2020.

Table 3: Summary of Ex-post Load Impact Analyses

Treatment Customers	Load Impact Represents…	Control Group?	Day Types
TOU-DR enrolled on or after 10/1/2021	Current TOU periods vs. non-TOU rate	Yes; non-TOU customers	Monthly peak days, typical event day
TOU-DR-P enrolled on or after 10/1/2021	Current TOU periods vs. non-TOU rate	Yes; non-TOU customers	Monthly peak days, typical event day
TOU-DR-P enrolled at any time during PY2022	CPP event days vs. non-event days	Yes; non-TOU customers	Each event called during PY2022
GDRTOD or GDRTODPDH enrolled during PY2022	Current TOU periods vs. non-TOU rate	Yes; non-TOU customers	Monthly peak days, typical event day

Matching will be based on Euclidean distance minimization between treatment and potential control group customer loads. This approach minimizes the difference between a standardized usage metric of the treatment and potential control group customers. The standardized metric, for example, combines the 48 hourly load difference statistics for the two average weekday load profiles for the TOU customers into a single value equal to the square root of the sum of squared differences between the load statistics. That is, each enrolled customer is compared to each potential control group customer, using the distance measure. The eligible control-group customer with the minimum distance statistic is selected as the match for the corresponding TOU customer. Potential control group customers will be allowed to be matched to multiple enrolled customers.

We will conduct matches for NEM customers with the additional restrictions: (1) must be NEM for the entire analysis period, (2) matched on solar PV size (and other solar PV characteristics, if available), and (3) must not have large changes in net profiles between years.[3] A separate difference-in-difference analysis will be conducted for these customers, and like the analysis for PY2021, protocol tables will include a selection to review NEM-only load impacts.

Once matched control group customer accounts have been selected for each TOU and TOU/CPP participant, we set up difference-in-differences fixed-effects panel regression models for each relevant group (e.g., separate groups for TOU and CPP, by Coastal and Inland climate zones, grandfathered, NEM). The models include hourly load data for the relevant period for each participant in the group, along with their matched control group customer, as well as data for the pre-treatment period. The models are described in detail in Section 2.3.

[3] Large changes in net profiles are more likely attributable to changes in solar PV characteristics rather than a response to a TOU rate. Removing these instances from the analysis mitigates confounding load impact estimates.

2.3 Ex-post Load Impact Evaluation

The primary objectives of the ex-post impact evaluation were described in Section 1.1. This section describes the data and specific methods that we plan to use, including a discussion of the estimation of uncertainty-adjusted load impacts and distributions of load impacts. The methods described here focus on the control-group methods, as those will be the basis for the impacts reported under the Protocols.

2.3.1 Data

Analysis that addresses each of the load impact objectives listed in Section 1.1 requires the following types of data:

- *Customer* information for the residential TOU and CPP enrollees and potential control group customers (e.g., location indicator for matching to climate zone, and a summary indicator of their usage level);
- Billing-based *interval load data* (i.e., hourly loads for each TOU and CPP enrollee, and potential control group customers);
- *Weather data* (i.e., hourly temperatures and other variables for the relevant time period, for both climate zones—coastal and inland);
- *Program event data* (i.e., dates and hours of CPP events with notification status, and event triggers).

2.3.2 Analysis Methods

This section describes the process that we plan to follow in estimating program load impacts. Estimating load impacts using data for both participants and matched control group customers involves three steps. First, we request hourly load data for the TOU and CPP enrollees, and potential control group customers, for the current year and pre-enrollment year. Second, we select matched control group customers for the TOU and CPP enrollees, as described above. Third, we estimate fixed-effects panel regression models, representing difference-in-differences estimates of event load impacts (for CPP), and average TOU period load impacts (for both TOU and for CPP non-event days).

Fixed-effects panel regression models

The formal ex-post load impact estimates will be based on *fixed-effects* panel regression models. These models are appropriate in situations like the current study, in which observed data are available for both multiple individual customers (cross-section) and multiple days, or time periods (time-series). The advantages of estimating such models include: 1) accounting for the effect of relevant factors on the variation in usage across customers and days, 2) accounting for the effects of weather conditions on usage, and 3) calculation of standard errors around the estimated load impact coefficients, thus allowing construction of *confidence intervals*.

Estimating hourly ex-post load impacts by subgroup

We typically plan to estimate two versions of fixed-effects models. The first version is used to estimate CPP event-day hourly load impacts for TOU-DR-P customers. The second version is used to estimate the TOU load impacts, estimated separately for the TOU-DR and TOU-DR-P customers. Each model will be estimated separately for NEM and grandfathered customers. The results for grandfathered customers will be reported separately, as will the results for NEM customers. In the first model, which addresses the objective of estimating hourly ex-post load impacts at the program level, we will estimate a set of twenty-four separate fixed-effects models, one for each hour of the day.

The estimation model for CPP load impacts accounts for customer-specific and date-specific fixed effects (which include weather and day-type factors) and estimates the CPP load impact as the difference between CPP and control-group customer loads on event days, controlling for the fixed effects. This can be described as a difference-in-differences estimate (the difference between treatment and control group usage on event days and non-event days). The primary customer-level fixed-effects regression model used in the analysis is shown below, where the equation is estimated separately for each of the 24 hours, and for each applicable sub-group of customers. This model produces load impact estimates for each hour of every event:

$$kW_{c,d} = \beta_0 + \Sigma_{Evts(i)} (\beta_{1,i} \times CPP_{c,d} \times Evt_{i,d}) + \beta_2 \times CPP_{c,d} + C_c$$
$$+ D_d + \beta_3 \times ACSDO\_Evt_{c,d} + \beta_4 \times ACSDA\_Evt_{c,d} + \beta_5 \times ELRP\_Evt_{c,d} + \beta_6 \times Notify_{c,d} + \varepsilon_{c,d}$$

The variables and coefficients in the equation are described in the following table:

Symbol	Description
$kW_{c,d}$	Load in a particular hour for customer *c* on day *d*
$CPP_{c,d}$	Variable indicating whether customer *c* is a CPP (1) or Control (0) customer on day *d*
$Evt_{i,d}$	Variable indicating that day *d* is the i^{th} event day (1=i^{th} event, 0 if not)
$ACSDA\_Evt_{c,d}$	Variable indicating that day *d* is an *AC Saver Day-Ahead* event day (1= event, 0 if not) for customer *c*
$ACSDO\_Evt_{c,d}$	Variable indicating that day *d* is an *AC Saver Day-Of* event day (1=event, 0 if not) for customer *c*
$ELRP\_Evt_{c,d}$	Variable indicating that day *d* is an *Emergency Load Reduction Program* event day (1 = event, 0 if not) for customer *c*
$Notify_{c,d}$	Variable indicating that a notification was sent to customer *c* on an event day (1=event, 0 if not)
β_0	Estimated constant coefficient
$\beta_{1,i}$	Estimated load impact for event *d*
β_2	Estimated non-event day response
β_3 and β_4	Estimated average *SS* and *ACSDA* event event-day load impacts
C_c	Customer fixed effects
D_d	Date fixed effects
$\varepsilon_{c,d}$	Error term

We can produce estimates of load impacts for the average event by customer type (e.g., Climate Zone) by estimating separate models that include only one event coefficient that applies to all event days.

For the TOU load impacts (for both the CPP and TOU-only customers), we estimate a distinct model for each required result. For example, we estimate a model including only August non-holiday weekdays to get the average TOU load impacts on that day type. In this case, we simplify the model to include customer and date fixed effects, plus a variable to estimate the load impact (i.e., the coefficient β_1). Separate models are estimated by hour, month, day-type (i.e., average weekday versus peak month day), applicable customer groups (e.g., climate zone), where the customer-level fixed-effects models are of the following form:[4]

$$kW_{c,d} = \beta_0 + \beta_1 \times TOU_{c,d} + C_c + D_d$$
$$+ \beta_2 \times Evt_{c,d} + \beta_3 \times ACSDO\_Evt_{c,d} + \beta_4 \times ACSDA\_Evt_{c,d} + \beta_5 \times ELRP\_Evt_{c,d} + \varepsilon_{c,d}$$

The variables and coefficients in the equation are described in the following table:

Symbol	Description
$kW_{c,d}$	Load in a particular hour for customer *c* on day *d*
$TOU_{c,d}$	Variable indicating whether customer *c* is a TOU or CPP (1) or Control (0) customer on day *d*
$Evt_{c,d}$	Variable indicating whether day *d* is an event day for customer *c*[5]
$ACSDA\_Evt_{c,d}$	Variable indicating that day *d* is an *AC Saver Day-Ahead* event day (1= event, 0 if not) for customer *c*
$ACSDO\_Evt_{c,d}$	Variable indicating that day *d* is an *AC Saver Day-Of* event day (1=event, 0 if not) for customer *c*
$ELRP\_Evt_{c,d}$	Variable indicating that day *d* is an *Emergency Load Reduction Program* event day (1 = event, 0 if not) for customer *c*
β_0	Estimated constant coefficient
β_1	Estimate of TOU load impact
β_2	Estimate of average event-day load impact
$\beta_{3 \text{ and }} \beta_4$	Estimated average *SS* and *ACSDA* event-day load impacts
C_c	Customer fixed effects
D_d	Date fixed effects
$\varepsilon_{c,d}$	Error term

Estimating distributions of load impacts for different customer segments

We will produce distributions of load impacts by percentiles of usage from the statistical comparison of event-day treatment and control groups separated by categories of average hourly peak-period usage. That is, the models described above can be

[4] Note that the customer and date fixed effects remove the need for us to include stand-alone TOU_c and $Post_d$ variables. The former is perfectly collinear with the customer's fixed effect and the latter is perfectly collinear with a combination of date fixed effects.

[5] For CPP customers, the *Evt* variable indicates that a day is a CPP event day.

estimated on different sub-sets of customers, allowing us to estimate, for example, load impacts by climate zone.

Calculating uncertainty-adjusted load impacts

The Load Impact Protocols require the estimation of uncertainty-adjusted load impacts. In the case of ex-post load impacts, the coefficients that represent the estimated load impacts in the fixed-effects regressions are not estimated with certainty, but with a range of uncertainty indicated by the variance of the estimates. Therefore, we will base the uncertainty-adjusted load impacts on the variances associated with the estimated load impact coefficients (e.g., the event-day or treatment-period coefficients in the twenty-four hourly regressions).

The uncertainty-adjusted scenarios will then be simulated under the assumption that each hour's load impact is normally distributed with the mean equal to the sum of the estimated load impacts and the standard deviation equal to the square root of the sum of the variances of the errors around the estimates of the load impacts. Results for the 10th, 30th, 70th, and 90th percentile scenarios will be generated from these distributions.

In order to develop the uncertainty-adjusted load impacts associated with the *average* event hour or by TOU pricing period (i.e., the bottom rows in the tables produced by the ex-post table generator), we will estimate additional sets of regression models in which the load impact variable is constrained to be the same across the applicable hours (e.g., we directly estimate an average event-hour CPP load impact). The associated standard errors will then be used to develop the uncertainty-adjusted load impacts in the same manner described above.

We will also develop an average event hour load impact using the 5:00pm – 10:00pm RA window period for all measurements after March 2023. This value will be displayed alongside the 4:00pm-9:00pm RA window in the protocol tables.

Validity assessment

Because we are employing a control-group approach, our validity assessment will focus on comparisons of treatment and control-group loads for selected non-event or pre-treatment days. To the extent that the two groups differ systematically, we will assess the ability of our models to properly implement the difference-in-differences approach. This will be implemented by comparing simulated loads to observed loads on event-like non-event or pre-treatment days. The performance of the models will be evaluated in terms of accuracy and potential bias (e.g., do the equations systematically understate load on hot days?). We will also report statistics like relative root mean square error and median percent error, which provide formal estimates of the percent differences between observed and simulated loads.

2.4 Developing Ex-Ante Load Impacts

Estimating ex-ante load impacts for future years for a particular DR rate or program requires three key pieces of information:

- An *enrollment forecast* for relevant elements of the program;
- *Reference loads* by customer type;
- A forecast of *load impacts per customer*, again by relevant customer type, where the load impact forecast also varies with weather conditions, as determined in the ex-post evaluation.

SDG&E will provide the first of the three required items, the *enrollment forecast*. The second and third items (per-customer *reference loads* and *load impacts*) will be simulated using a modified version of the regression model presented in Section 2.3. Specifically, we will add an interaction between the load impact variable and weather to the "descriptive" model (with weather variables, etc. in place of daily fixed effects). This will allow us to simulate both the reference loads (using predicted loads with the load impact variables "turned off") and the load impacts (using only the load impact variables, including the estimated effect of weather on the load impact). If the estimated load impact does not vary with weather (or if the relationship can't be estimated due to a low number of events), then we propose applying the ex-post load impact percentage to simulated reference loads to calculate the ex-ante load impact.

Reference loads and load impacts are simulated using the appropriate weather scenario data (i.e., the 1-in-2,1-in-10 weather-year, and worst-case conditions to be provided by SDG&E) and event-day characteristics. If SDG&E determines that future participants will be systematically different from current participants, we will explore the availability of interval data for more representative customers that can be used to develop the ex-ante reference loads and load impacts. We then apply the per-customer reference loads and load impacts to SDG&E's enrollment forecast to generate ex-ante forecasts.

Uncertainty-adjusted load impacts will be generated from variations in the ex-post percent load impacts across events for CPP, or the ex-post estimation precision by day type/hour for TOU. Scenario-specific percent load impacts will be developed from 10^{th}, 30^{th}, 50^{th}, 70^{th}, and 90^{th} percentile load changes estimated for the relevant program year.

3. DATA SOURCES

SDG&E will provide the required data, including customer characteristics; interval load data; weather data; program participation and event data; and ex-ante scenario data (i.e., the weather conditions associated with each required scenario).

4. DETAILED PLAN OF WORK

This section describes our work plan for conducting the project, which consists of seven tasks.

Task 1: Conduct Project Initiation Meeting

A project initiation (PI) meeting was held on September 8, 2022 by Microsoft Teams call. We provided a meeting agenda prior to the meeting along with a meeting summary memorandum the next day.

Deliverables:

• PI Meeting agenda	September 7, 2022
• PI Meeting	September 8, 2022
• PI Meeting memorandum	September 9, 2022

Task 2: Develop Measurement and Evaluation Plan

CA Energy Consulting will draft a measurement and evaluation (M&E) plan (this document), which builds on our proposal document and takes into account discussions at the PI meeting. The plan is organized around the following outline:

- *Introduction and Key Issues*.
- *Study Method* (e.g., show specifics on how the data collection and research plan will address all of the research objectives outlined in the introduction).
- *Data Sources*. This section specifies data sources needed to successfully complete the evaluation, including customer information for any planned samples, program implementation information, and smart meter interval load and billing data.
- *Detailed Plan and Work*. This section describes planned tasks and sub-tasks for completing the evaluation, including task definitions and deliverables.
- *Deliverables Schedule and Due Dates*. This section summarizes deliverables and due dates, and provides a timeline for the project.
- *Quality Control Mechanisms and Processes*. This section outlines our plans to ensure the tables, figures, data files, and table generators have been checked for accuracy and are error-free.

Deliverables:

• Draft M&E plan	September 30, 2022
• Final M&E plan	5 days after receipt of comments

Task 3: Impact Evaluation

This task involves assembling data and conducting the ex-post and ex-ante evaluations.

Task 3.1: Data Collection and Validation

CA Energy Consulting will prepare a data request memorandum for SDG&E specifying the information required to conduct the analysis. The requested data will include:

- Customer IDs
  - Account number
  - Premise ID
  - Service point ID
  - Channel ID
- Location variables
  - ZIP code

    - Climate zone
    - Weather station
    - Busbar ID
    - Circuit ID
- Date enrolled and de-enrolled (where applicable) in TOU or CPP
- Dates called for CPP events (where applicable)
    - Notification status by customer and event
- Date enrolled and de-enrolled (where applicable) in other DR programs
    - AC Saver Day-Ahead
    - AC Saver Day-Of
    - Emergency Load Reduction Program
- Dates called for other DR program events (e.g., AC Saver Day-Ahead, AC Saver Day-Of, ELRP)
- Date enrolled in NEM (where applicable) and solar PV characteristics
    - Solar PV Size
    - Tilt
    - Azimuth
    - For customers that change their solar PV size, if available, please provide a history of solar PV sizes and dates of change.

As described in Section 2.2, for purposes of selecting the matched control groups, we will also need customer characteristics (e.g., climate zone) and interval load data for the set of potential control-group customers. We will work with SDG&E staff to determine an appropriate number of customers to include in the set of potential matched control group customers and a method for drawing them.

We will examine the data as it arrives to ensure that the customer information can be matched to hourly load data; and to ensure that the hourly load data appear to be accurate. CA Energy Consulting will then create the databases required to conduct the analyses.

Deliverables:

- Initial data request — September 9, 2022
- Final data request — October/November 2022

Task 3.2: Ex-post Load Impact Analysis

We will estimate average TOU load impacts, and hourly load impacts and reference loads for each CPP event, at the program and average customer level, using methods as described in Section 2.3, and as agreed upon with the SDG&E project manager. Uncertainty-adjusted load impacts and distributions of load impacts by customer subgroups will be developed as described in Section 2.3.

Task 3.3: Ex-ante Impact Analysis

Forecasted load impacts and reference loads for 2022 through 2033 will be produced for 1-in-2, 1-in-10, and "worst-case" weather year conditions, for both SPP rates, on a per-customer and aggregate basis. Results shall be provided for:

- The typical event day (for CPP).
- For TOU and the non-event portion of CPP, forecasts shall be provided for the monthly system peak day and average weekday and weekend, for each month that the rates will be available, under both 1-in-2 and 1-in-10 weather year conditions, for both CAISO and SDG&E monthly peak days.
- Forecasts for the average day by month in both 1-in-2 and 1-in-10 weather year conditions.
- Uncertainty-adjusted load impacts shall be estimated on an aggregate and per-customer basis.

Task 4: Prepare Reports

CA Energy Consulting will prepare draft, high-level summary, and final reports that summarize the load impacts estimated in Tasks 3.2 and 3.3, in the schedule provided below. The report will contain a non-technical abstract and executive summary; an introduction summarizing objectives and an overview of the program and project; a section describing the data used and analysis techniques employed; a results section presenting ex-post load impacts; a validity assessment of the findings discussing any threats to the reliability of the results; and a conclusion section summarizing findings and recommendations. In conjunction with the final report, we will deliver spreadsheet-based Protocol table generators, which will provide the user with explanations for why some data may not be reported in the table (e.g., no customers in the cells, or restrictions to maintain customer confidentiality). The report will include an abstract of less than 3,000 characters that is suitable for posting on the CALMAC website.

In addition, we will provide a Quality Control (QC) report that will demonstrate that load impacts add up correctly, demonstrate that the number of customers in the program agrees with the datasets provided, compare ex-post and ex-ante load impacts, and ensure that MW levels are consistent with the enrollment forecasts.

Deliverables:

- Draft ex-post LI estimates (report/table generators) Late December 2022.
- Final ex-post LI estimates (report/table generators) Early January 2023.
- Draft ex-ante LI estimates (report/table generators) February 15, 2023.
- Final ex-ante LI estimates (report/table generators) March 1, 2023.
- Final hourly and monthly ex-post and ex-ante datasets March 1, 2023.
- Executive Summary write-up for April 1st reports March 15, 2023.
- Non-technical abstract for CALMAC website April 10, 2023.

Task 5: Presentation of Results

CA Energy Consulting will attend the DRMEC load impact workshop that traditionally follows the submittal of the utilities' impact evaluation reports and will present results of TOU and CPP load impacts.

Task 6: Project Management and Progress Reporting

The CA Energy Consulting project manager (Dr. Mike Clark) shall manage all day-to-day details of the project. He will work closely with the SDG&E project manager to ensure smooth operation of the project.

We shall participate in conference calls as requested and shall provide monthly written status reports by the 10th day of each month.

Deliverables:

- Monthly or bi-weekly conference calls. TBD.
- Monthly status reports showing: 1) summary of accomplishments in previous month; 2) current month's planned activities; and 3) any variances in schedule and budget, with explanations as needed.

Task 7: Database Documentation

Upon Program Manager's request, CA Energy Consulting shall provide an integrated project database consisting of all the data collected and developed in the project and produce detailed documentation of all variables used in the database.

Deliverables:

- Integrated project database April 15, 2023.
- Database specifications and documentation April 15, 2023.

5. QUALITY CONTROL MECHANISMS AND PROCESSES

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

- *Database review*. We will evaluate the interval data to ensure consistency and regularity, checking it against billing data if necessary.
- *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.
- *Reporting checklist*. We have developed a checklist that the project team will apply to each results table generator and to the evaluation report. This 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.