

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee the
Resource Adequacy Program, Consider
Program Reforms and Refinements, and
Establish Forward Resource Adequacy
Procurement Obligations.

Rulemaking 23-10-011
(Filed October 12, 2023)

**PG&E'S SUBMISSION OF THE
LOAD IMPACT PROTOCOLS SIMPLIFICATION WORKING GROUP REPORT
ON BEHALF OF THE LIP SIMPLIFICATION WORKING GROUP**

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PACIFIC GAS AND ELECTRIC COMPANY

Dated: January 19, 2024

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In Decision (D.) 23-06-029 in R.21-10-002, the California Public Utilities Commission (CPUC) authorized the Energy Division to conduct a stakeholder process to pursue simplification of the current Load Impact Protocols (LIP). Pursuant to that decision and as co-lead of the resulting LIP Simplification Working Group, PG&E submits the attached *Load Impact Protocols Simplification Working Group Report* on behalf of the working group.

Respectfully submitted,

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By: /s/ Majorie R. Kennedy
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ATTACHMENT

Load Impact Protocols Simplification Working Group Report

January 19, 2024

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CHAPTER 1: Introduction

This report provides the findings and recommendations from the Load Impact Protocols Simplification Working Group as originally requested by the California Public Utilities Commission (CPUC) in Decision (D.) 23-06-029 in R.21-10-002 Conclusion of Law 17, “Energy Division should be authorized to pursue simplification of the current Load Impact Protocols (LIP) requirements using a stakeholder process.” Energy Division (ED) launched an out-of-proceeding workshop to discuss ED and stakeholder ideas on how the load impact protocols process and requirements might be simplified while the ED-led Working Group refines an incentive-based supply-side demand response qualifying capacity methodology.

The bullet points below compile the decisions related to the LIPs between 2008 and 2023:

- [D.08-04-050](#): established the annual LIP process
 - [Attachment A](#): All 27 protocols themselves
- [D.10-04-006](#) Ordering Paragraphs (OP) 1-2: established Investor-Owned Utility (IOU) Executive Summary Requirement in Appendix 1
- [D.10-06-036](#) OP 10: established 5-hr window “measurement hours” from LIP ex ante to determine monthly Qualifying Capacity (QC) of Demand Response (DR) resource according to protocols 17, 21, 22, 23.
 - Also made numerous line-item changes to protocols, including removing uncertainty adjustments from table generators, which type of ex post days are required, eliminating 1-in-10 weather year, when an evaluation plan is needed, and other clarifications.
- [D.16-06-045](#) OP 5a exempted third-party DR resources from LIPs and allowed the use of contracted capacity to be resource adequacy (RA) QC
- [D.19-06-026](#) OP 17: acknowledged expiration of exemption authorized in D.16-06-045
- [D.20-06-031](#)
 - OP 13-14: established 3rd-party Demand Response Provider (DRP) quarterly testing requirements
 - OP 15a clarified 3rd-party DRP ex post and ex ante must be estimated at Sub-LAP
 - OP 15b permitted mid-year QC updates if QC values vary by >20% of 10 MW, whichever is greater
 - OP 16 directed ED to coordinate with supply-side working group on mid-year QC process/requirements and how to enhance LIPs
 - OP 17 requires LIP results from 3rd party DRPs to be public to the maximum extent allowable, while protecting customer privacy and market sensitive information
- [D.22-06-050](#)
 - OP 12: modified quarterly testing requirements for third-party DRPs for RA-year 2023. Established RA-year 2024 as test year.
 - [Appendix A](#) established “worst day” criterion instead of “peak day” for RA QC and 24-hour slice-of-day framework
- [D.22-08-039](#): LIPs were reasonable to use for slice-of-day test year.
- [D.23-04-010](#) OP 11-12: established slice-of-day requirements, including snapback effect requirements in ex ante
- [D.23-06-029](#)
 - OP 27: removed transmission loss factor and planning reserve margin adders starting in 2024.
 - OP 30 required quarterly testing reports to be factored into RA QC award considerations

CHAPTER 2: Current DR Load Impact Protocols

The table below provides a summary of the current DR Load Impact Protocols

Group	Protocol	Summary	Protocol description
Evaluation Plan	1	Evaluation plan is required	Prior to conducting a load impact evaluation for a demand response (DR) resource option, an evaluation plan must be produced. The plan must meet the requirements delineated in Protocols 2 and 3. The plan must also include a budget estimate and timeline
	2	Requirements beyond resource planning and additional to protocol 4-27, i.e., resource adequacy	<p>Protocols 4 through 27 establish the minimum requirements for load impact estimation for long term resource planning. There are other potential applications for load impact estimates that may have additional requirements. These include, but are not necessarily limited to:</p> <ul style="list-style-type: none"> • Forecasting DR resource impacts for resource adequacy; • Forecasting DR resource impacts for operational dispatch by the CAISO; • Ex post estimation of DR resource impacts for use in customer settlement; <p>and</p> <ul style="list-style-type: none"> • Monthly reporting of progress towards DR resource goals. <p>The evaluation plan required by Protocol 1 must delineate whether the proposed DR resource impact methods and estimates are intended to also meet the requirements associated with the above applications or others that might arise and, if so, delineate what those requirements are.</p>
	3	Questions/issues that must be addressed by the evaluation plan	<p>The evaluation plan must delineate whether the following issues are to be addressed during the impact estimation process and, if not, why not:</p> <ul style="list-style-type: none"> • The target level of confidence and precision in the impact estimates that is being sought from the evaluation effort; • Whether the evaluation activity is focused exclusively on producing ex post impact estimates or will also be used to produce ex ante estimates; • If ex ante estimates are needed, whether changes are anticipated to occur over the forecast horizon in the characteristics of the DR offer or in the magnitude or characteristics of the participant population; • 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.); • Whether a specified monitoring and verification (M&V) activity is needed to address the above issues, particularly if full evaluations are expected to occur only periodically (e.g., every two or three years); • Whether it is the intent to develop impact estimates for geographic subregions and, if so, what those regions are; • Whether it is the intent to develop impact estimates for sub-hourly intervals and, if so, what those intervals are; • Whether it is the intent to develop impact estimates for specific subsegments of the participant population and, if so, what those sub-segments are; • 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; • 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; • Whether free riders and/or structural beneficiaries 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 beneficiaries or free riders; • 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; and • 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.
	4	Hour-of-day and daily impact estimate	The mean change in energy use per hour (kWh/hr) for each hour of the day shall be estimated for each day type and level of aggregation defined in the following Protocol 8. The protocol also calls for the mean change in energy use for the day must also be reported for each day type.

Group	Protocol	Summary	Protocol description																																																								
Ex post for event-based DR	5	Average and total impact	The mean change in energy use per year shall be reported for the average across all participants and for the sum of all participants on a DR resource option for each year over which the evaluation is conducted.																																																								
	6	Percentile-based uncertainties	Protocol 6 is designed to recognize the inherent uncertainty in impact estimates resulting both from the uncertainty in the estimation methods as well as uncertainty in underlying driving variables when ex ante estimation is required. Estimates shall be provided for the 10th, 30th, 50th, 70th and 90th percentiles of the change in energy use in each hour, day and year, as described in Protocols 4 and 5, for each day-type and level of aggregation described in Protocol 8.																																																								
	7	Tabular output format	Impact estimates shall be reported in the format depicted in Table 4-1 for all required day types and levels of aggregation, as delineated in Protocol 8. Table 4-1. Reporting Template for Ex Post Impact Estimates (Separate Tables Shall Be Provided for Each Required Day Type)																																																								
				<table border="1"> <thead> <tr> <th rowspan="2">Hour Ending</th> <th rowspan="2">Estimated Reference Load (kWh/hr)</th> <th rowspan="2">Observed Load (kWh/hr)</th> <th rowspan="2">Estimated Load Impact (kWh/hr)</th> <th rowspan="2">Temp (F)</th> <th colspan="5">Uncertainty Adjusted Impact - Percentiles</th> </tr> <tr> <th>10th</th> <th>30th</th> <th>50th</th> <th>70th</th> <th>90th</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Hour Ending	Estimated Reference Load (kWh/hr)	Observed Load (kWh/hr)	Estimated Load Impact (kWh/hr)	Temp (F)	Uncertainty Adjusted Impact - Percentiles					10th	30th	50th	70th	90th	1										2										3										4									
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	8	Reporting requirements	<p>The information shown in Table 4-1 shall be provided for each of the following day types and levels of aggregation:</p> <ul style="list-style-type: none"> • Each day on which an event was called; • The average event day over the evaluation period; • For the average across all participants notified on each day on which an event was called; • For the total of all participants notified on each day on which an event was called; and • For the average across all participants notified on the average event day over the evaluation period. <p>An average event day is calculated as a day-weighted average of all event days. The number of event days that apply to each hour may vary for resource options that have variable length event periods.³⁰ As such, for the average event day, the following information must be provided:</p> <ul style="list-style-type: none"> • The number of actual event days included in the calculation for each hour of the average day; • Average number of customers enrolled in the resource option over the year³¹; and • Average number of customers notified across all event days in the year. <p>In addition to the information contained in Table 4-1, the following information must be provided for each event day:</p> <ul style="list-style-type: none"> • Event start and stop time; • Notification lead time; • The number of customers who were enrolled in the resource option on the event day; • The number of customers who were notified on the event day; and • Any other factors that vary across event days that are considered by the evaluator to be important for understanding and interpreting the impacts and why they vary across events. 																																																								
	9	Error metrics for day matching results	<p>This statistical measures protocol is specific to Day-matching methods. A different protocol (e.g., protocol 10) is appropriate for regression methods.</p> <p>These calculations should be based on a suitable and sufficiently large number of proxy days. From this process, the following statistics should be calculated and reported for day-matching reference value methods:</p> <ul style="list-style-type: none"> • The number of proxy days used in the calculations below and an explanation of how the proxy days were selected. • Average error across customers and proxy days for each hour for the entire day. This is calculated as follows: $\bar{\epsilon}_{ip} = \frac{\sum_{i=1}^{N_{cust}} \sum_{j=1}^{N_{days}} (L_{ip} - \hat{L}_{ip})}{N_{cust} \times N_{days}} \quad (4-1)$ <p>where:</p> <ul style="list-style-type: none"> i = the cross-sectional unit or customer j = the event-like day t = the hour of the day L_{ip} = the actual load for the customer on the proxy day of interest for the hour of interest \hat{L}_{ip} = the predicted load for the customer on the proxy day of interest for the hour of interest N_{cust} = the total number of customers in the observation group N_{days} = the total number of days in the observation group 																																																								

Group	Protocol	Summary	Protocol description
			<ul style="list-style-type: none"> • Median error across customers and proxy days for each hour for the entire day. The median error is the error corresponding to the exact center of the distribution of errors when all the errors under consideration are arranged in order of magnitude. It is calculated as follows: <ol style="list-style-type: none"> Calculate the error for each customer and proxy day for the hour of interest: Sort the resulting distribution of $n_{cust} \times n_{days}$ errors by magnitude for each hour of interest. If the number of errors is odd, the median is the error associated with the $\frac{(n_{cust} \times n_{days}) + 1}{2}$ observation. If the number of errors is even, the median is the average of the errors associated with observations $\frac{(n_{cust} \times n_{days})}{2}$ and $\frac{(n_{cust} \times n_{days})}{2} + 1$. • The relative average error for each hour. This is calculated as the ratio of the average error to the average actual load that occurred in the hour: $REL\ e_p = \frac{\bar{e}_p}{\sum_{i=1}^{n_{cust}} \sum_{j=1}^{n_{days}} L_{ip}} \quad (4-2)$ <p>where:</p> <ul style="list-style-type: none"> \bar{e}_p = the average error across customers and proxy days for the hour of interest • The relative median error for each hour. This is calculated as follows: $REL\ e_p^M = \frac{e_p^M}{L_p^M} \quad (4-3)$ <p>where:</p> <ul style="list-style-type: none"> e_p^M = the median error across customers and proxy days for each hour for the entire day, as calculated above L_p^M = the median load for the customer on the proxy day of interest • The Coefficient of Alienation², which describes the percentage of the variation in actual load for each hour that is not explained by variation in the predicted load. This is calculated as follows: $\sum_{i=1}^{n_{cust}} \sum_{j=1}^{n_{days}} \sum_{k=1}^{n_{hours}} \frac{(L_{ijk} - \hat{L}_{ijk})^2}{(L_{ijk} - \bar{L}_{ij})^2} \quad (4-4)$ <p>where:</p> <ul style="list-style-type: none"> i = the cross-sectional unit or customer j = the event-like day k = the hour of the day L_{ijk} = the actual load for the customer on the proxy day of interest for the hour of interest \hat{L}_{ijk} = the predicted load for the customer on the proxy day of interest for the hour of interest \bar{L}_{ij} = the average load on the proxy day of interest for the hour of interest n_{hours} = the total number of hours being observed on the proxy day • Theil's U, calculated as follows: $\frac{\left[\frac{1}{n_{hours}} \sum_{k=1}^{n_{hours}} (L_k - \hat{L}_k)^2 \right]^{1/2}}{\left[\frac{1}{n_{hours}} \sum_{k=1}^{n_{hours}} (L_k)^2 \right]^{1/2} + \left[\frac{1}{n_{hours}} \sum_{k=1}^{n_{hours}} (\hat{L}_k)^2 \right]^{1/2}}$ <p>where:</p> <ul style="list-style-type: none"> n_{hours} = the number of periods k = the period of interest L_k = the actual observed load for the period of interest \hat{L}_k = the predicted load for the period of interest
10	Error metrics for regression method results		<p>For regression-based methods, the following statistics and information shall be reported:</p> <ul style="list-style-type: none"> • Adjusted R-squared or, if R-squared is not provided for the estimation procedure, the log-likelihood of the model; • Total observations, number of cross-sectional units and number of time periods; • Coefficients for each of the parameters of the model; • Standard errors for each of the parameter estimates; • The variance-covariance matrix for the parameters;³⁵ • The tests conducted and the specific corrections conducted, if any, to ensure robust standard errors; and • How the evaluation assessed the accuracy and stability of the coefficient(s) that represent the load impact.

Group	Protocol	Summary	Protocol description																																												
Ex post for non-event-based DR	11	Hour-of-day and daily impact estimates	The mean change in energy use per hour (kWh/hr) for each hour of the day shall be estimated for each day type and level of aggregation defined in Protocol 15. The mean change in energy use for the day shall also be reported for each day type.																																												
	12	Average and total impact	The mean change in energy use per month and per year shall be reported for the average across all participants and for the sum of all participants in a DR resource option in each year over which the evaluation is conducted.																																												
	13	Percentile-based uncertainties	Estimates of the 10th,30th, 50th, 70th, and 90th percentiles of the change in energy use in each hour, day and year, as described in Protocols 11 and 12, for each day-type and level of aggregation described in Protocol 15, shall be provided.																																												
	14	Tabular output format	Impact estimates shall be reported in the format depicted in Table 4-1 for all required day types, as delineated in Protocol 15.																																												
	15	Reporting requirement	The information shown in Table 4-1 shall be provided for each of the following day types for the average across all participants sum of all participants: <ul style="list-style-type: none"> • For the average weekday for each month in which the DR resource is in effect. • For the monthly system peak day for each month in which the DR resource is in effect. Day type definitions and additional reporting requirements for each day type are summarized below: <p>Average Week Day for Each Month: The average across all weekdays in each month during which the DR resource is in effect. In addition to the information contained in Table 4-1, the following information shall be provided:</p> <ul style="list-style-type: none"> • Average temperature⁵⁴ for each hour for a typical week day for each month. • Average degree hours for the typical week day for each month. • Average number of customers participating in the DR resource option each month <p>Monthly System Peak Day for Each Month: The day with the highest system load in each month. In addition to reporting all of the information shown in Table 4-1, the following information shall be provided:</p> <ul style="list-style-type: none"> • Temperature for each hour on the system peak day for each month • Average degree hours on the system peak day for each month. • Average number of customers participating in the DR resource option on the system peak day for each month. 																																												
	16	Error metrics for regression method results	For regression-based methods, the following statistics and information shall be reported: <ul style="list-style-type: none"> • Adjusted R-squared or, if R-squared is not provided for the estimation procedure, the log-likelihood of the model • Total observations, number of cross-sectional units and number of time periods • Coefficients for each of the parameters of the model • Standard errors for each of the parameter estimates • The variance-covariance matrix for the parameters • The tests conducted and the specific corrections conducted, if any, to ensure robust standard errors • How the evaluation assessed the accuracy and stability of the coefficient(s) that represent the load impact. 																																												
Ex ante	17	Ex ante based on ex post results	Whenever possible, ex ante estimates of DR impacts should be informed by ex post empirical evidence from existing or prior DR resource options. Evidence from resource options and customer segments most relevant to the ex ante conditions being modeled should be used, regardless of whether they come from the host utility or some other utility. If ex post estimates or models are not used as the basis for ex ante estimation, an explanation as to why this is the case shall be provided.																																												
	18	Hour-of-day impacts for all day types	The mean change in energy use per hour (kWh/hr) for each hour of the day shall be estimated for each day type and level of aggregation defined in Protocol 22. The mean change in energy use for the day shall also be estimated for each day type.																																												
	19	Change in monthly/annual energy us	The mean change in energy use per month shall be estimated for non-event based resources and the mean change in energy use per year shall be estimated for both event and non-event based resources for the average across all participants and for the sum of all participants on a DR resource option for each year over the forecast horizon.																																												
	20	Uncertainty-adjusted impacts by percentile.	Estimates of the 10th, 30th, 50th, 70th and 90th percentiles of the change in energy use in each hour, day and year, as described in Protocols 17 and 18, and for each day-type described in Protocol 22, shall be provided.																																												
	21	Tabular reporting format	Impact estimates shall be reported in the format depicted in Table 6-1 for all required day types and levels of aggregation, as delineated in Protocol 22. <p>Table 6-1. Reporting Template for Ex Ante Impact Estimates</p> <table border="1"> <thead> <tr> <th rowspan="2">Hour Ending</th> <th rowspan="2">Estimated Reference Load (kWh/hr)</th> <th rowspan="2">Estimated Event Day Load (kWh/hr)</th> <th rowspan="2">Estimated Load Impact (kWh/hr)</th> <th rowspan="2">Temp (F)</th> <th colspan="5">Uncertainty Adjusted Impact - Percentiles</th> </tr> <tr> <th>10h</th> <th>30h</th> <th>50h</th> <th>70h</th> <th>90h</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Hour Ending	Estimated Reference Load (kWh/hr)	Estimated Event Day Load (kWh/hr)	Estimated Load Impact (kWh/hr)	Temp (F)	Uncertainty Adjusted Impact - Percentiles					10h	30h	50h	70h	90h	1										2										3								
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Group	Protocol	Summary	Protocol description
	22	Estimates for typical event, average, and system peak day types (1-in-2 and 1-in-10)	<p>The information shown in Table 6-1 shall be provided for each of the following day types using 1-in-2 and 1-in-10 weather conditions for the average across participants and for the sum of all participants for each forecast year:</p> <ul style="list-style-type: none"> • For a typical event day for a 1-in-2 and for a 1-in-10 weather year for event-based resource options. • For the average weekday for each month in which the resource option is in effect for a 1-in-2 and for a 1-in-10 weather year for non-event based resource options. • For the monthly system peak day for each month in which the resource option is in effect, for a 1-in-2 and for a 1-in-10 weather year for event based and non-event based resources. <p>Day type definitions and additional reporting requirements for each day type are summarized below:</p> <p>Typical Event Day for a 1-in-2 and 1-in-10 Weather Year: This day type requirement applies primarily to event-based resources. It is meant to capture both the exogenous factors such as weather and the event characteristics for a day on which an event is likely to be called. The relevant characteristics can be defined by the evaluator. At a minimum, the following information shall be provided:</p> <ul style="list-style-type: none"> • An explanation of how the weather and any other relevant day-type characteristics were chosen • Detailed information on the timing and duration of the event or any other factors (e.g., notification lead time) that were explicitly factored into the impact estimates (e.g., factors that, if different than those reported, would change the estimated impacts) • The number of notified consumers included in the aggregate impact estimate • Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resource options and population characteristics (e.g., air conditioning saturation, business type, etc.). <p>Average Week Day for Each Month In A 1-in-2 and for a 1-in-10 Weather Year: This day type applies primarily to non-event based resources. It is meant to capture the weather conditions and other relevant factors for an average weekday. In addition to the information contained in Table 6-1, the following information must be provided:</p> <ul style="list-style-type: none"> • An explanation of how the weather and any other relevant day-type characteristics were chosen for the typical weekday in each month • The number of enrolled customers included in the aggregate impact estimate. • Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resource options and population characteristics (e.g., air conditioning saturation, business type, etc.). <p>Monthly System Peak Day for Each Month In a 1-in-2 and for a 1-in-10 Weather Year: This day type applies to event- based and non-event based resources. It is meant to capture impacts for the day with the highest system load in each month. In addition to reporting all of the information shown in Table 6-1, the following information must be provided:</p> <ul style="list-style-type: none"> • An explanation of how the weather and any other relevant day-type characteristics were chosen for the typical monthly system peak day • The number of enrolled customers included in the aggregate impact estimate • Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resources and population characteristics (e.g., air conditioning saturation, business type, etc.).
	23	Statistical tests and methods (same as 10,16 regression statistics)	All ex ante estimates based on regression methodologies shall report the same statistical measures as delineated in Protocols 10 and 16.
Misc. technical	24	Portfolio adjustment	The evaluation of a DR resource should identify correlations, synergies and overlaps across the set of DR resource options offered in a region or being proposed for a region. A judgmental determination of the impact of the magnitude of adjustment in program impacts should be made for all programs. In some cases, a zero adjustment may be recommended. In other cases, identified correlations, synergies and overlaps may result in a recommended adjustment to the ex ante estimate of program impacts.
	25	Sampling requirements	<p>If sampling is required, evaluators shall use the following procedures to ensure that sampling bias is minimized and that its existence is detected and documented.</p> <ol style="list-style-type: none"> 1. The population(s) under study must be clearly identified and described – this must be done for both participants and control groups to the extent that these are used; 2. The sample frame(s) (i.e., the list(s) from which samples are drawn) used to identify the population(s) under study must be carefully and accurately described and if the sample frame(s) do not perfectly overlap with the population(s) under study, the evaluator must describe the measures they have taken to adjust the results for the sample frame so that it reflects the characteristics in the population of interest – this would include the use of weighting, matching or regression analysis;

Group	Protocol	Summary	Protocol description
			<ol style="list-style-type: none"> 3. The sample design used in the study must be described in detail including the distributions of population and sample points across sampling strata (if any); 4. A digital snapshot of the population and initial sample from the sample frame must be preserved – this involves making a digital copy of the sample frame at the time at which the sample was drawn as well as a clean digital copy of the sample that was drawn including any descriptors needed to determine the sampling cells into which the sampled observations fall; 5. The “fate” of all sampled observations must be tracked and documented throughout the data collection process (from initial recruitment to study conclusion) so that it is possible to describe the extent to which the distribution of the sample(s) may depart from the distribution of the population(s) of interest throughout the course of the study; 6. If significant sample attrition is found to exist at any stage of the research process (i.e., recruitment, installation, operation), a study of its impact must be undertaken. This study should focus on discovering and describing any sampling bias that may have occurred as a result of selection. This should be done by comparing the known characteristics of the observed sample with the known characteristics of the population. Known characteristics would include such variables as historical energy use, time in residence, geographical location, reason for attrition from sample, and any other information that may be available for the population and sample. 7. If selection bias is suspected, the evaluator must describe it as well as any efforts made to control for it.
Evaluation report	26	Evaluation report requirements	<p>Evaluation reports shall include, at a minimum, the following sections:</p> <ol style="list-style-type: none"> 1. Cover 2. Title Page 3. Table of Contents 4. Executive Summary - this section should very briefly present an overview of the evaluation findings and the study’s recommendations for changes to the DR resource 5. Introduction and Purpose of the Study - this section should briefly summarize the resource or resources being evaluated and provide an overview of the evaluation objectives and plan, including the research issues that are addressed. It should also provide a summary of the report organization. 6. Description of Resources Covered in the Study - this section should provide a detailed description of the resource option being evaluated in enough detail that readers can understand the DR resource that delivered the estimated impacts. The description should include a history of the DR program or tariff, a summary of resource goals (both in terms of enrollment and demand impacts), tables showing reported progress toward goals, projections of future goals and known changes and other information deemed necessary for the reader to obtain a thorough understanding of how the resource has evolved over time and what changes lie ahead. 7. Study Methodology - this section should describe the evaluation approach in enough detail to allow a repetition of the study in a way that would produce identical or similar findings. (See additional content requirements below.) 8. Validity Assessment of the Study Findings – this section should include a discussion of the threats to validity and sources of bias and the approaches used to reduce threats, reduce bias and increase the reliability of the findings, and a discussion of confidence levels. (See additional content requirements below.) 9. Detailed Study Findings - this section presents the study findings in detail. (See additional content requirements below.) 10. Recommendations - this section should contain a detailed discussion of any recommended changes to the resource as well as recommendations for future evaluation efforts.
		Study methodology	<p>The Study Methodology section shall include the following:</p> <ol style="list-style-type: none"> 1. Overview of the evaluation plan study methodology; 2. Questions addressed in the evaluation; 3. Description of the study methodology, including not just the methodology used and the functional specification that produced the impact estimates, but also methodologies considered and rejected and interim analytical results that led to the final model specification. The intent of this section is to provide sufficient detail so that a trained reviewer will be able to assess the quality of the analysis and thoroughly understand the logic behind the methodology and final models that were used to produce the impact estimates; and the statistics required to be reported in Protocols 9, 10, 16 and 23; 4. How the study meets or exceeds the minimum requirements of these protocols or, if any protocols were not able to be met, an explanation of why and recommendations for what it will take to meet these protocols in future evaluations;

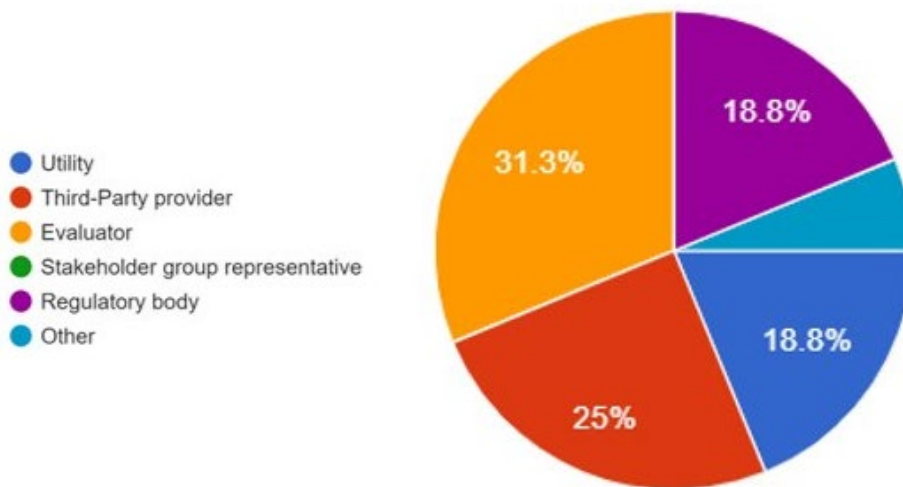
Group	Protocol	Summary	Protocol description
		Validity assessment	<p>5. How the study addresses the technical issues presented in these Protocols; and 6. Sampling methodology and sample descriptions (including all frequency distributions for population characteristics from any surveys done in conjunction with the analysis).</p> <p>The Validity Assessment section of the report shall focus on the targeted and achieved confidence levels for the key findings presented, the sources of uncertainty in the approaches used and in the key findings presented, and a discussion of how the evaluation was structured and managed to reduce or control for the sources of uncertainty. All potential threats to validity given the methodology used must be assessed and discussed.</p> <p>This section should also discuss the evaluator’s opinion of how the types and levels of uncertainty affect the study findings. Findings also must include information for estimation of required sample sizes for future evaluations and recommendations on evaluation method improvements to increase reliability, reduce or test for potential bias and increase cost efficiency in the evaluation study(ies). The data and statistics outlined in Protocol 24 should be reported in this section.</p>
		Detailed study findings	<p>The Detailed Study Findings section shall include the following:</p> <ol style="list-style-type: none"> 1. A thorough discussion of key findings, including insights obtained regarding why the results are what they are. 2. All output requirements and accompanying information shown in protocols 4 through 10 for ex post evaluation of event based resources, protocols 11 through 16 for non-event based resources, and protocols 17 through 23 for ex ante estimation. If the number of data tables is large, the main body of the report should include some exemplary tables and explanatory text with the remaining required tables provided in appendices. Detailed data tables should also be provided in electronic format. 3. For ex post evaluations of event-based resources, a table summarizing the relevant characteristics associated with each event and the date of each event over the historical evaluation period. At a minimum, the table should include for each event: date, weather conditions (for weather sensitive loads), event trigger (e.g., emergency, temperature, etc), start and stop times for the event, event duration in hours, notification lead time, number of customers notified, and number of customers enrolled. 4. For ex ante forecasts, detailed descriptions of the event and day type assumptions underlying the estimates. 5. For ex ante forecasts, assumptions and projections for all exogenous variables that underlie the estimates for each forecast year, including but not necessarily limited to, the number of customers enrolled and notified (for event based resources), participant characteristics, weather conditions (if relevant), prices and price elasticities (if relevant), other changes in demand response over time due to persistence related issues and the reasons underlying the changes for the average customer. Information describing the probability distributions for these exogenous variables should be provided whenever such uncertainty is included in the ex ante impact estimates. <p>A comparison of impact estimates derived from the analysis and those previously obtained in other studies and those previously used for reporting of impacts toward resource goals, and a detailed explanation of any significant differences in the new impacts and those previously found or used.</p>
Process and public review	27	Process and public review	<p>A comparison of impact estimates derived from the analysis and those previously obtained in other studies and those previously used for reporting of impacts toward resource goals, and a detailed explanation of any significant differences in the new impacts and those previously found or used.</p>

CHAPTER 3: DR LI Protocols Survey Results

The working group co-leads put together a survey of each of the protocols and a few other items pertinent to the LIPs to gauge which protocols the working group's suggested simplifications would have the most positive impact on all participants in the process. From October 18-20, 2023, there were 16 responses across all participants in the LIP process. The survey was made up of 27 questions for the 27 protocols with response options of "keep," "keep, but modify," and "Eliminate;" 6 "yes or no" questions; and 7 questions ranking how valuable certain aspects of the protocols are.

How would you describe your entity?

16 responses



The following is a list of respondents:

- Demand Side Analytics
- California Public Utilities Commission, Energy Division
- Pacific Gas & Electric Company
- Applied Energy Group
- CPUC, Cal Advocates
- Voltus
- Resource Innovations
- California Energy Commission
- Christensen Associates Energy Consulting
- OhmConnect
- Verdant Associates
- SDG&E
- Southern California Edison
- CPower
- CEDMC
- Leap

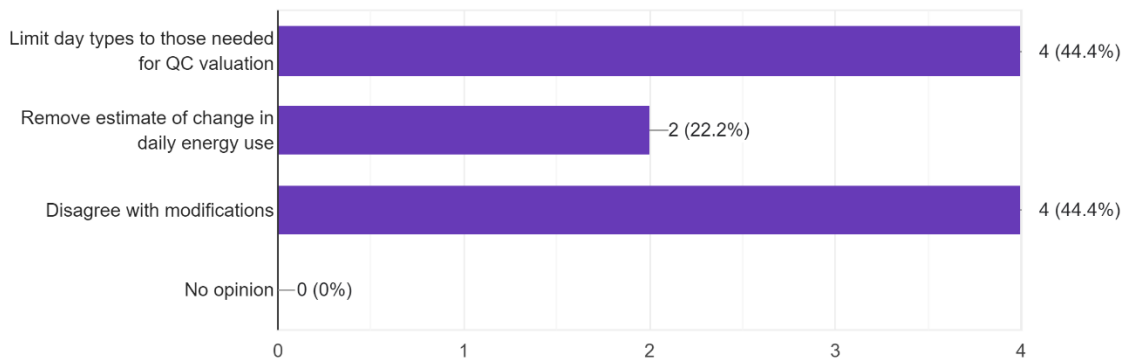
A follow-up survey was conducted by the co-leads from November 13-27, 2023, to help determine consensus of how to simplify the protocols that were identified as needed to be modified by the first survey. This survey consisted of 18 questions, the results of which can be found below.

The following are the respondents to the second survey:

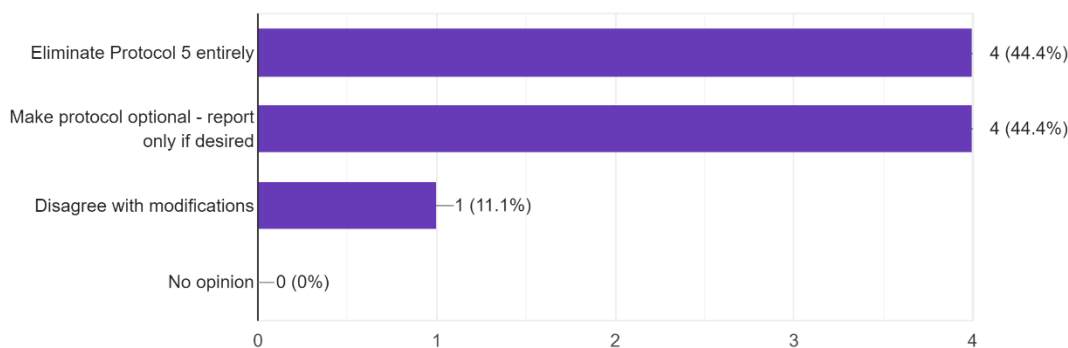
- OhmConnect
- PG&E
- Christensen Associates Energy Consulting
- ED, CPUC
- Demand Side Analytics
- Leap
- CPower
- SDG&E
- Southern California Edison

The directions for stakeholders to fill out the responses below are as follows: Checkmark as many modifications as you agree with. Check "disagree with modifications" if you disagree with all. Check "no opinion" if you neither agree nor disagree with all. If you would like to comment to clarify your views, use the comment question available below each protocol question.

Protocol 4 (Ex-Post for Event-Based Resources): Requires estimating the change in hourly demand for each day type and aggregation level (defined in ...requires estimating the change in daily energy use.
9 responses

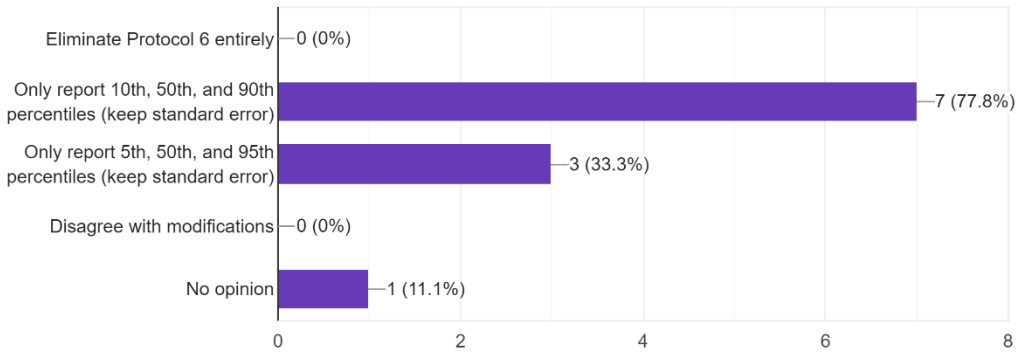


Protocol 5 (Ex-Post for Event-Based Resources): Requires reporting the change in energy use per year for average participant and in total.
9 responses



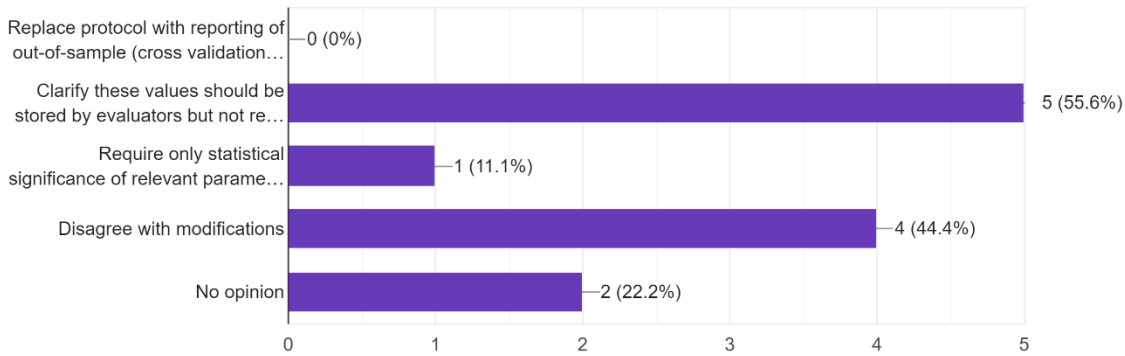
Protocol 6 (Ex-Post for Event-Based Resources): Requires uncertainty estimates for ex-post evaluation, including the 10th, 30th, 50th, 70th and 90th percentiles.

9 responses



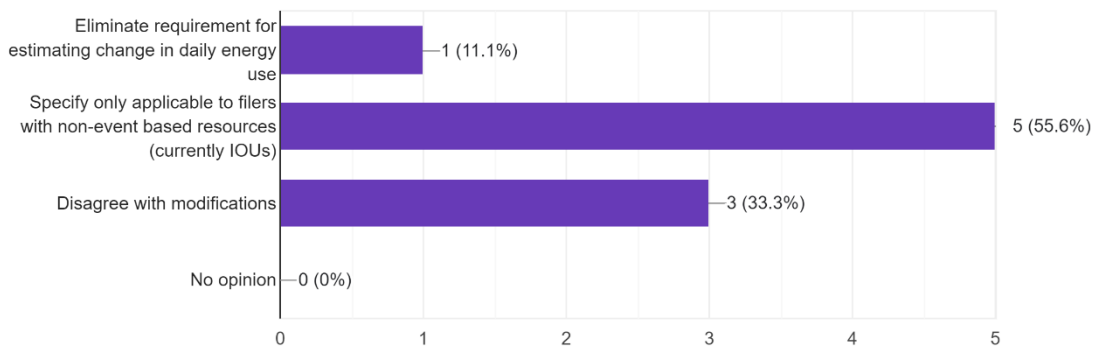
Protocol 10 (Ex-Post Evaluations for Event-Based Resources): List the statistics that must be reported for regressions, including: a. Adjusted R-s... accuracy and stability of load impact coefficients

9 responses



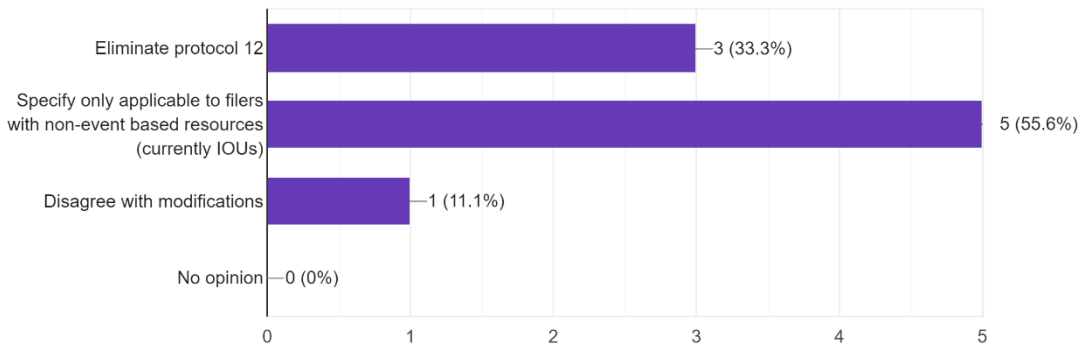
Protocol 11 (Ex-Post for Non-Event-Based Resources): Requires estimating the change in hourly demand for each day type and aggregation le...quires estimating the change in daily energy use.

9 responses



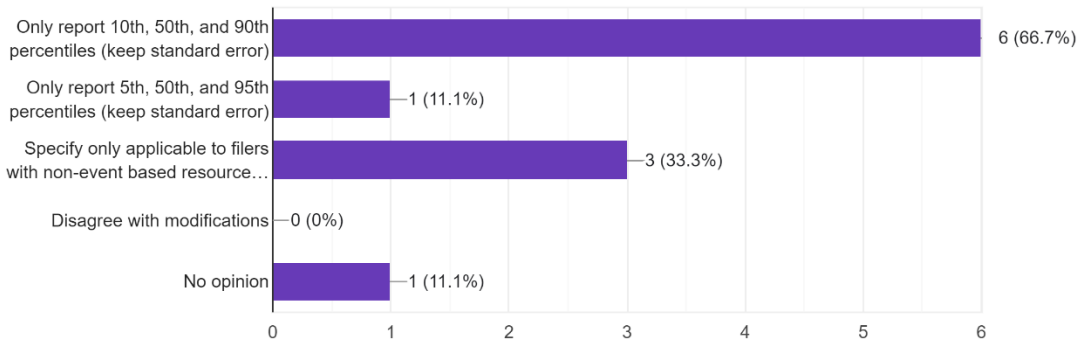
Protocol 12 (Ex-Post Evaluations for Non-Event-Based Resources): Requires reporting the change in energy use per month and per year for average participant and in total.

9 responses



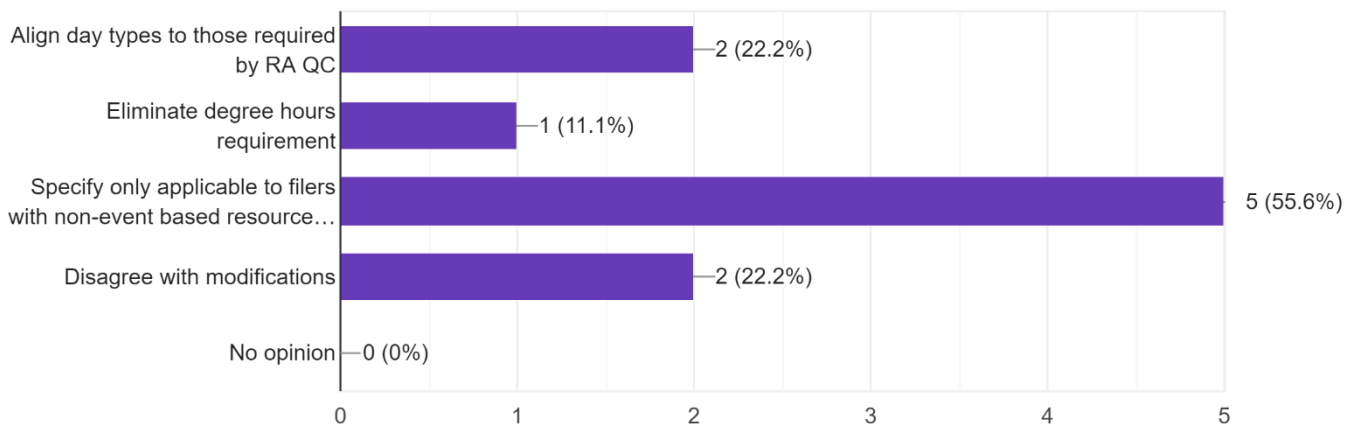
Protocol 13 (Ex-Post Evaluations for Non-Event-Based Resources): Requires uncertainty estimates for ex-post evaluation, including the 10th, 30th, 50th, 70th and 90th percentiles.

9 responses



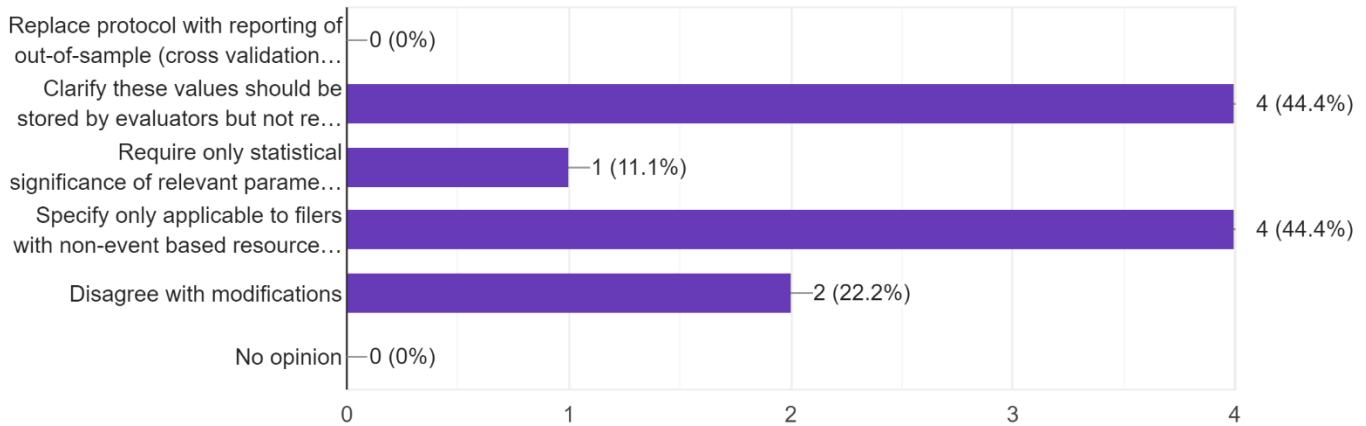
Protocol 15 (Ex-Post for Non-Event-Based Resources): Requires hourly load impacts for the average weekday of each month and the monthly system peak temperature conditions and number of participants.

9 responses



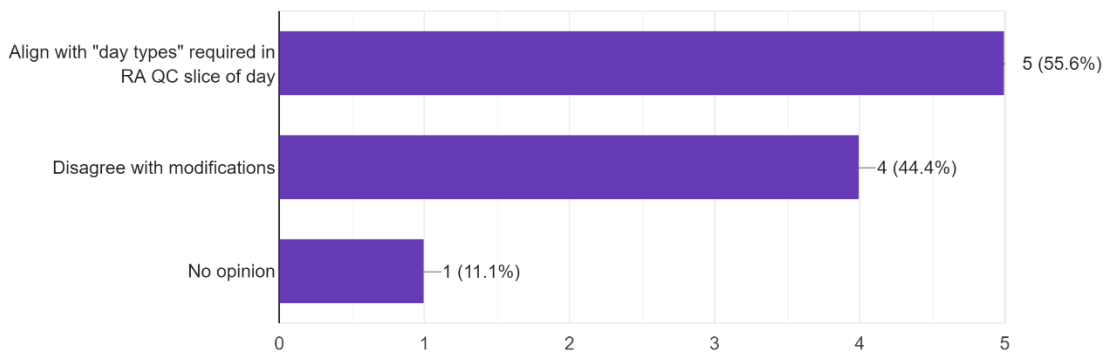
Protocol 16 (Ex-Post Evaluations for Non-Event-Based Resources): List the statistics that must be reported for regression-based methods, including: a...accuracy and stability of load impact coefficients

9 responses



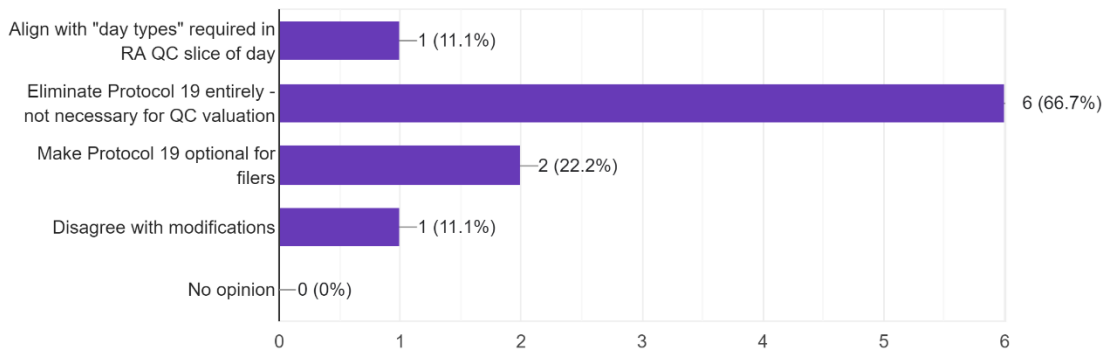
Protocol 18 (Ex-Ante Estimation Protocols): Requires that hourly changes (24 hours) in demand estimates must be estimated for each of the day types identified in Protocol 22.

9 responses



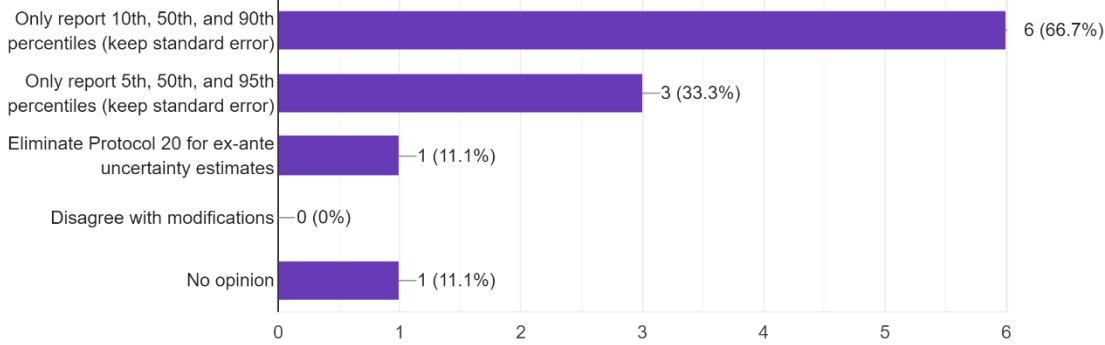
Protocol 19 (Ex-Ante Estimation Protocols): Requires estimating the change in energy use for each month and for the year.

9 responses



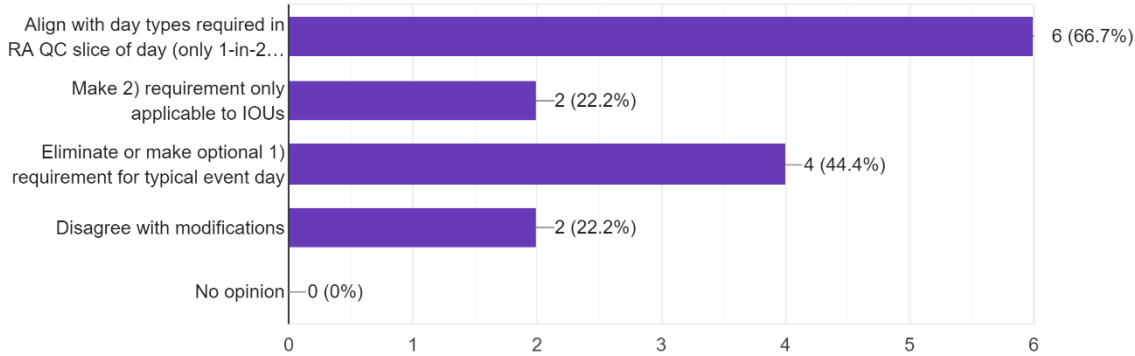
Protocol 20 (Ex-Ante Estimation Protocols): Requires uncertainty estimates for ex-ante impacts, including the 10th, 30th, 50th, 70th and 90th percentiles.

9 responses



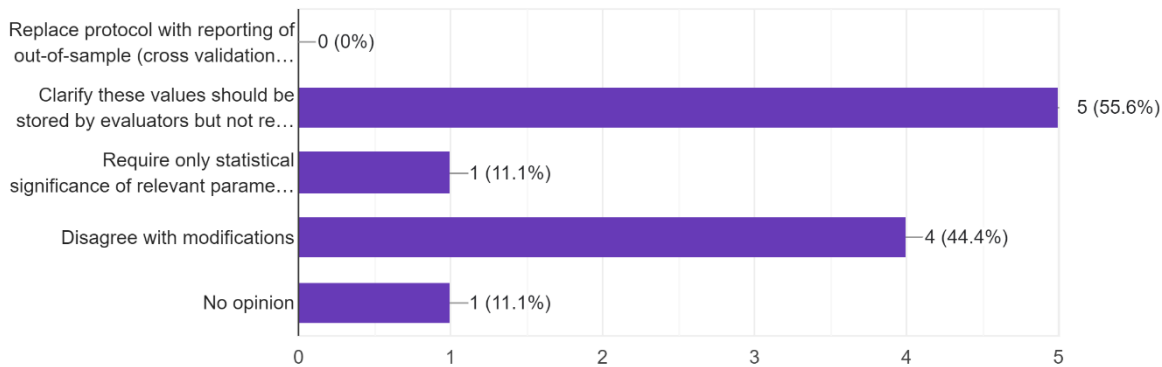
Protocol 22 (Ex-Ante Estimation Protocols): Defines day types required for ex-ante: 1) Typical event day for 1-in-2 and 1-in-2 weather year for event-bas...each month for 1-in-2 and 1-in-10 for all resources

9 responses

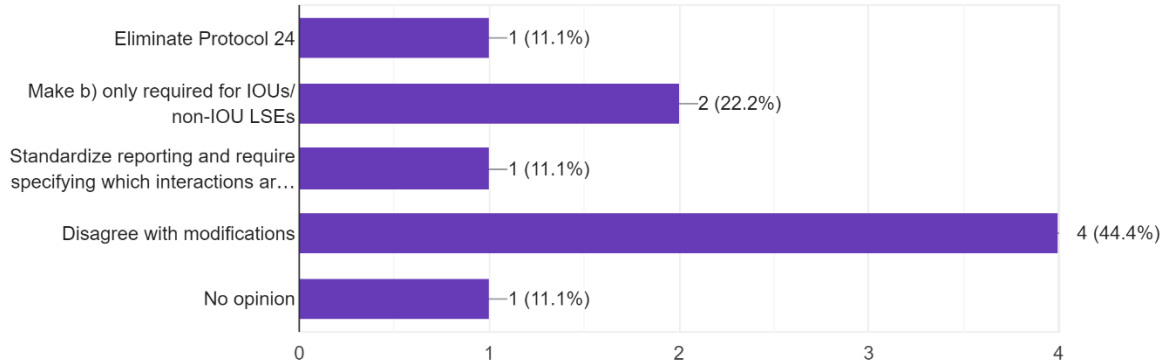


Protocol 23 (Ex-Ante Estimation Protocols): Requires reporting the following for ex-ante regressions: a. Adjusted R-squared b. Total observa...accuracy and stability of load impact coefficients

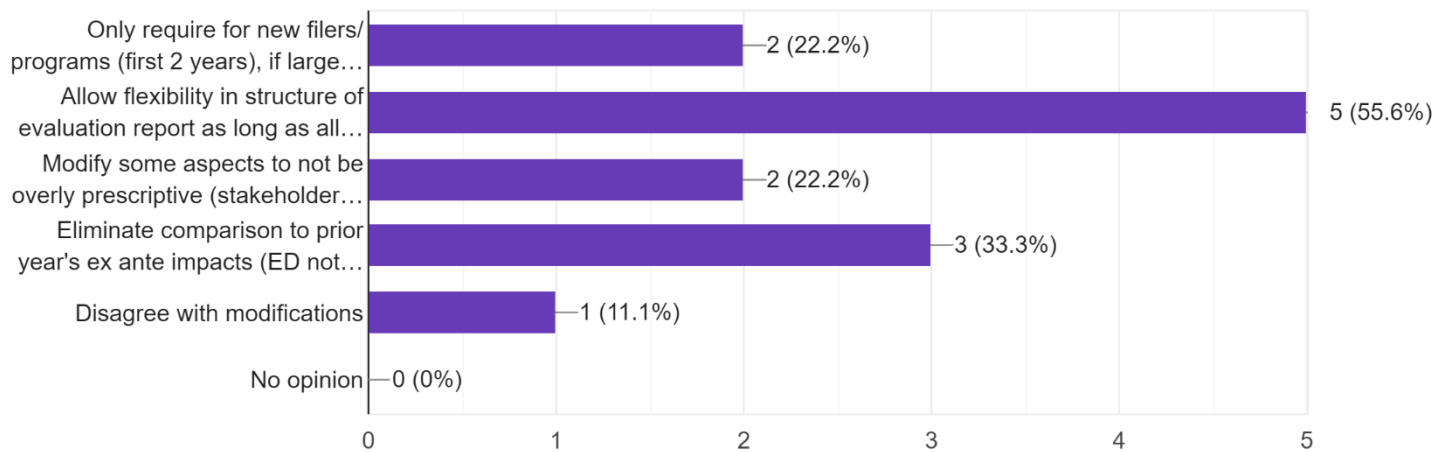
9 responses



Protocol 24 (Estimating Impacts for Demand Response Portfolios): Requires considering overlaps and making adjustments to load impacts, if warranted (dual enrollment) c) Adjust for partial dispatch
 9 responses



Protocol 26 (Reporting Protocols): Evaluation Reports minimum requirements. - Cover, - Title page -
 Table of Contents - Executive Summary - Introducti...ngs - Detailed Study Findings - Recommendations.
 9 responses



CHAPTER 4: Proposed Modifications to D.08-04-050

The following chapter proposes specific decision language changes to D.08-04-050 and Attachment A. Additions to the text are in red and underlined and deletions from the text are red and struck through. Some alterations have explanations as to why they are being proposed. These explanations follow “*explanation*” written in italics.

Conclusions of Law

D.08-04-050, at 34:

“6. The DR Load Impact Estimation Protocols in Attachment A should be adopted for use by third party demand response providers, SCE, SDG&E, and PG&E.”

Ordering Paragraphs

D.08-04-050, at 35:

“1. The Demand Response (DR) Load Impact Estimation Protocols in Attachment A (Adopted Protocols) are adopted for use by Third-Party Demand Response Providers, Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E), and Pacific Gas and Electric Company (PG&E).”

Protocols 1 & 3

The working group has started a template that could be used to replace the arduous and long-winded evaluation plan; however, the template created thus far is incomplete and will need further refinement before it can fully replace the evaluation plan. The final template could be a web drop-down menu, a standardized word format, or a combination of the two. The working group recommends the Commission start another working group, direct Energy Division, or hire a third party to complete the template replacing the evaluation plan.

Protocol 5

D.08-04-050, Attachment A, at 37:

“The mean change in energy use per year may optionally shall be reported for the average across all participants and for the sum of all participants on a DR resource option for each year over which the evaluation is conducted.”

Explanation: the mean change in energy use per year is an energy efficiency value, showing the total change (sum) in energy use per year and per participant. While this may be useful for some load-modifying DR programs, it is not useful for RA QC. How much energy is used is secondary to *when* in the day that energy is used, especially in the context of RA.

Protocol 6

D.08-04-050, Attachment A, at 38:

“Estimates shall be provided for the 5th 10th, 30th, 50th, ~~70th and 90th~~ and 95th percentiles of the change in energy use in each hour, day and year, as described in Protocols 4 and 5, for each day-type and level of aggregation described in Protocol 8.”

Explanation: a 90-percentile uncertainty window (i.e., 5th and 95th) is standard convention in statistical regression analysis.

Protocol 7

D.08-04-050, Attachment A, at 39

“Impact estimates shall be reported in the format depicted in Table 4-1 for all required day types and levels of aggregation, as delineated in Protocol 8.

Table 4-1. Reporting Template for Ex Post Impact Estimates (Separate Tables Shall Be Provided for Each Required Day Type)

Hour-Ending	Estimated Reference Load (kWh/hour)	Observed Event Day Load (kWh/hour)	Estimated Load Impact (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
					5th%ile	50th%ile	95th%ile	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
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24								
By Period:	Estimated Reference Energy Use (kWh/hour)	Observed Event Day Energy Use (kWh/hour)	Estimated Change in Energy Use (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
					5th%ile	50th%ile	95th%ile	
Average Event Hour								

Blue rows indicate the event window hours. kWh/hour is used for average customers, whereas MWh/hour is used for aggregate customers.

Explanation: Despite D.10-06-036, Appendix B, at 19 altering Protocol 7: “Protocol 7 requires impact estimates be reported in a table format. Uncertainty adjustments are not needed in the table,” the LIP Simplification WG

suggests uncertainty estimates of 5th and 95th percentiles be presented in the table, since those values are required to be calculated by Protocol 6.

“The back-end data informing the table generator in Table 4-1 must be structured in the format defined in Table 4-1-1 and 4-1-2 below:

Table 4-1-1. Back-End Data Informing Table 4-1 (Daily-level)

Data Item	Standard ized Input	Notes
Obs ID	No	Indicator for Table 4-1-2 merge; unique ID in this table
Utility	Yes	PG&E, SCE, SDG&E
Program	Yes	Predetermined by Utility
Sub-program	Yes	Predetermined by Utility; examples: res v. non-res; CBP products; DA v. DO notification; ELRP subprogram
Segment Type	Yes	Optional; Predetermined by Utility; examples: Sublap, LCA, Size Group, etc.
Segment	Yes	Optional; Predetermined by Utility
Day Type	Yes	(Event-based) Event Day, Test Event; (Non-event Based) Average Monthly Weekday, Monthly System Worst Day
Event Date	No	For event days only
Event Start Time	Yes	Hour-ending; integer value 1 to 24
Event End Time	Yes	Hour-ending; integer value 1 to 24
Notification Lead Time	No	Integer value; # of hours
Confidential Flag	Yes	1=Confidential; 0=Public
Number of Accounts	No	Customer count included
Reference Load	No	MWh/hour unit; Aggregate Impact (Event-based) Average Event Hour (Non-event Based) As applicable to the program: example: on-peak window, etc.
Observed Load	No	MWh/hour unit; Aggregate Impact (Event-based) Average Event Hour (Non-event Based) As applicable to the program: example: on-peak window, etc.
Load Impact	No	MWh/hour unit; Aggregate Impact; Equal to Percentile 50 (Event-based) Average Event Hour (Non-event Based) As applicable to the program: example: on-peak window, etc.
Percentile XX	No	MWh/hour unit; Aggregate Impact; Percentile 5, 50, 95 (Event-based) Average Event Hour (Non-event Based) As applicable to the program: example: on-peak window, etc.

Standard Error of LI	No	MWh/hour unit; Aggregate Impact (Event-based) Average Event Hour (Non-event Based) As applicable to the program: example: on-peak window, etc.
CDH	No	Cooling degree hours; base 75 (Event-based) Average Event Hour (Non-event Based) As applicable to the program: example: on-peak window, etc.

Table 4-1-2. Back-End Data Informing Table 4-1 (Hourly-level)

Data Item	Standardized Input	Notes
Obs ID	No	Indicator for Table 4-1-1 merge; multiple obs in this table (24 obs)
Hour-ending	Yes	Integer value 1 to 24
Event Hour ID	Yes	0=Non-event hour; 1=Event hour
Reference Load	No	MWh/hour unit; Aggregate Impact
Observed Load	No	MWh/hour unit; Aggregate Impact
Load Impact	No	MWh/hour unit; Aggregate Impact; Equal to Percentile 50
Percentile XX	No	MWh/hour unit; Aggregate Impact; Percentile 5, 50, 95
Standard Error of LI	No	MWh/hour unit; Aggregate Impact
Temperature	No	deg F unit

Explanation: Standardizing the back-end data structure of the table generators will allow Joint Staff to stack data for ease of analysis and verification. This should substantially lower review time by Joint Staff.

The above example is the WG’s first attempt at creating a standardized back-end data structure. The WG recommends the CPUC open another working group to finalize this.

Protocol 8

D.08-04-050, Attachment A, at 42-43:

“The information shown in Table 4-1 shall be provided for each of the following day types and levels of aggregation:

- ***Required:*** Each day on which an event was called;
- ***Optional:*** The average event day over the evaluation period;
- ***Required:*** For the average across all participants notified on each day on which an event was called;
- ***Required:*** For the total of all participants notified on each day on which an event was called; and
- ***Optional:*** For the average across all participants notified on the average event day over the evaluation period.

Optional: An average event day is calculated as a day-weighted average of all event days. The number of event days that apply to each hour may vary for resource options that have variable length event periods. As such, for the average event day, the following information must be provided:

- The number of actual event days included in the calculation for each hour of the average day;
- Average number of customers enrolled in the resource option over the year; and
- Average number of customers notified across all event days in the year.

In addition to the information contained in Table 4-1, the following information must be provided for each event day:

- *Event start and stop time;*
- *Notification lead time;*
- *The number of customers who were enrolled in the resource option on the event day;*
- *The number of customers who were notified on the event day; and*
- *Any other factors that vary across event days that are considered by the evaluator to be important for understanding and interpreting the impacts and why they vary across events.”*

Explanation: Despite D.10-06-036 Appendix B, at 19 stating the following:

“Protocol 8 requires reporting for the average across all participants notified on an average event day over the evaluation period. Only the hourly load drop across participants notified on an average event day is required; no need to provide the following details:

- Each day on which an event was called;
- The average event day over the evaluation period
- For the average across all participants notified on each day on which an event was called;
- For the total of all participants notified on each day on which an event was called.”

The LIP Simplification WG recommends keeping each day, average across all participants on each day, and total of all participants on each day on which an event was called, as these are essential data sources for the Joint Staff (both ED And CEC) to review the filings of the IOUs and DRPs. Without these data points, Joint Staff would not be able to check the relationship between ex post and ex ante results.

However, the WG does agree to keep average event day optional as stated in D.10-06-036 and also to make the average across participants on average event day optional. The average event day is only a useful metric for programs that are consistently called with the same number of non-temperature sensitive customers within the same dispatch window. Modern DR programs and providers do not act in this way. However, these values are useful for some IOU data reporting and analysis; therefore, we recommend they remain optional.

Protocol 10

D.08-04-050, Attachment A, at 47-48:

“For regression-based methods, the following statistics and information shall be calculated and stored by the evaluator for a period of one year after filing date of April 1 reported:

- Adjusted R-squared or, if R-squared is not provided for the estimation procedure, the log-likelihood of the model;
- Total observations, number of cross-sectional units and number of time periods;
- Coefficients for each of the parameters of the model;
- Standard errors for each of the parameter estimates;
- Optional: The variance-covariance matrix for the parameters;
- The tests conducted and the specific corrections conducted, if any, to ensure robust standard errors; and
- ~~How the evaluation assessed the accuracy and stability of the coefficient(s) that represent the load impact.”~~

Explanation: The variance-covariance matrix is not required unless it was used to calculate the uncertainty adjusted impact percentiles. If it was not used, it is not required to be stored for the period of one year.

The last bullet point required in Protocol 10 is duplicative of validation requirements in Protocol 26. Therefore, we recommend removing it from Protocol 10.

The LIP Simplification WG does not recommend requiring the statistics within Protocol 10 to be reported as part of the LIP filing, as modern regression modeling for demand response often creates individual customer regressions instead of portfolio-level regressions. This means that a DRP with 5,000 customers would have 5,000 regressions building their ex-post and ex-ante evaluations. The amount of data is so large, it would not be useful to be required to report to the Commission for Joint Staff review unless Joint Staff want to investigate. Storing these values for a period of 1 year following the filing (from April 1 of the filing year to April 1 of the compliance year) allows sufficient time for Joint Staff to reach out to the evaluator for these values if determined necessary.

Ex Post Evaluation for Non-Event Based Resources

D.08-04-050, Attachment A, at 78:

“This section contains protocols and guidelines for ex post evaluation of non-event based, DR resource options. As delineated in Section 2, non-event based resources fall into three broad categories:

- **Non-event based pricing**—This resource category includes TOU, RTP and related pricing variants that are not based on a called event—that is, they are in place for a season or a year.
- **Scheduled DR**—There are some loads that can be scheduled to be reduced at a regular time period. For example, a group of irrigation customers could be divided into five segments, with each segment agreeing to not irrigate/pump on a different selected weekday.
- **Permanent load reductions and load shifting**—Permanent load reductions are often associated with energy efficiency activities, but there are some technologies such as demand controllers that can result in permanent load reductions or load shifting. Examples of load shifting technologies include ice storage air conditioning, timers and energy management systems.

All protocols within this section (protocols 11-16) are only applicable to filers that have non-event based resources. Filers without those resources are exempt.”

Protocol 12

D.08-04-050, Attachment A, at 82:

“The mean change in energy use per year may optionally shall be reported for the average across all participants and for the sum of all participants on a DR resource option for each year over which the evaluation is conducted.”

Protocol 13

D.08-04-050, Attachment A, at 79:

“Estimates of the ~~10th, 30th, 50th, 70th, and 90th~~ 5th, 50th, and 95th percentiles of the change in energy use in each hour, day and year, as described in Protocols 11 and 12, for each day-type and level of aggregation described in Protocol 15, shall ~~to~~ be provided.”

Protocol 14

D.08-04-050, Attachment A, at 82:

“Impact estimates shall be reported in the format depicted in Table 4-1 for all required day types, as delineated

in Protocol 15. In lieu of an average event hour, provide an average hour as applicable to resource. For example, provide the average on-peak window for a non-event based pricing resource like a Time-of-Use (TOU) rate.”

Explanation: Despite D.10-06-036, Appendix B, at 19 altering Protocol 14: “Protocol 14 requires impact estimates be reported in a table format. Uncertainty adjustments are not needed in the table,” the LIP Simplification WG suggests uncertainty estimates of 5th and 95th percentiles be presented in the table, since those values are required to be calculated by Protocol 13.

Protocol 15

D.08-04-050, Attachment A, at 82-83:

“The information shown in Table 4-1 shall be provided for each of the following day types for the average across all participants sum of all participants:

- For the average weekday for each month in which the DR resource is in effect
- For the monthly system worst peak day for each month in which the DR resource is in effect.

Day type definitions and additional reporting requirements for each day type are summarized below:

Average Week Day for Each Month: The average across all weekdays in each month during which the DR resource is in effect. In addition to the information contained in Table 4-1, the following information shall be provided:

- Average temperature for each hour for a typical week day for each month.
- Average degree hours for the typical week day for each month.
- Average number of customers participating in the DR resource option each month

Monthly System Worst Peak Day for Each Month: The day with the highest system load in each month. In addition to reporting all of the information shown in Table 4-1, the following information shall be provided:

- Temperature for each hour on the system peak day for each month
- Average degree hours on the system peak day for each month.
- Average number of customers participating in the DR resource option on the system peak day for each month”

Protocol 16

D.08-04-050, Attachment A, at 83-84:

“For regression-based methods, the following statistics and information shall be calculated and stored by the evaluator for a period of one year after filing date of April 1 reported:

- Adjusted R-squared or, if R-squared is not provided for the estimation procedure, the log-likelihood of the model;
- Total observations, number of cross-sectional units and number of time periods;
- Coefficients for each of the parameters of the model;
- Standard errors for each of the parameter estimates;
- Optional: The variance-covariance matrix for the parameters. Must be stored only if used to calculate the uncertainty adjusted impact percentiles; and
- The tests conducted and the specific corrections conducted, if any, to ensure robust standard errors; ~~and~~
- ~~How the evaluation assessed the accuracy and stability of the coefficient(s) that represent the load impact.”~~

Explanation: The LIP Simplification WG notes the last bullet point required in Protocol 16 is duplicative of validation requirements in Protocol 26.

Protocol 19

D.08-04-050, Attachment A, at 95:

“The mean change in energy use per month may optionally shall be estimated for non-event based resources and the mean change in energy use per year shall be estimated for both event and non-event based resources for the average across all participants and for the sum of all participants on a DR resource option for each year over the forecast horizon.”

Protocol 20

D.08-04-050, Attachment A, at 95:

“Estimates of the ~~10th, 30th, 50th, 70th, and 90th~~ 5th, 50th, and 95th percentiles of the change in energy use in each hour, day and year, as described in Protocols 17 and 18, for each day-type and level of aggregation described in Protocol 22, shall be provided.”

Protocol 21

D.08-04-050, Attachment A, at 95

“Impact estimates shall be reported in the format depicted in Table 6-1 for all required day types and levels of aggregation, as delineated in Protocol 22.

Table 6-1. Reporting Template for Ex Ante Impact Estimates (Separate Tables Shall Be Provided for Each Required Day Type)

Hour-Ending	Estimated Reference Load (kWh/hour)	Estimated Event Day Load (kWh/hour)	Estimated Load Impact (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
					5th%ile	50th%ile	95th%ile	
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21								
22								
23								
24								
By Period:	Estimated Reference Energy Use (kWh/hour)	Estimated Event Day Energy Use (kWh/hour)	Estimated Change in Energy Use (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
	5th%ile	50th%ile	95th%ile					
Average RA Hour								

* Blue rows indicate the RA window hours. kWh/hour is used for average customers, whereas MWh/hour is used for aggregate customers.*

Explanation: Despite D.10-06-036, Appendix B, at 20 & 21 altering Protocol 21: “Protocol 21 requires impact estimates be reported in a table format. Uncertainty adjustments are not needed in the table,” the LIP Simplification WG suggests uncertainty estimates of 5th and 95th percentiles be presented in the table, since those values are required to be calculated by Protocol 20.

“The back-end data informing the table generator in Table 6-1 must be structured in the format defined in Table 6-1-1 and Table 6-1-2 below:

Table 6-1-1. Back-End Data Informing Table 6-1 (Daily-level)

Data Item	Standard ized Input	Notes
Obs ID	No	Indicator for Table 6-1-2 merge; unique ID in this table
Utility	Yes	PG&E, SCE, SDG&E
Program	Yes	Predetermined by Utility
Sub-program	Yes	Predetermined by Utility; examples: res v. non-res; CBP products; DA v. DO notification; ELRP subprogram
Segment Type	Yes	Optional; Predetermined by Utility; examples: Sub-LAP, LCA, Size Group, etc.
Segment	Yes	Optional; Predetermined by Utility
Weather Year	Yes	1-in-2 IOU, 1-in-2 CAISO
Day Type	Yes	Monthly System Worst Day, Typical Event Day, Average Monthly Weekday
Month	Yes	Integer value 1 to 12
Confidential Flag	Yes	1=Confidential; 0=Public
Number of Accounts	No	Customer count included
Reference Load	No	MWh/hour unit; Aggregate Impact Average RA Hour

Estimated Load	No	MWh/hour unit; Aggregate Impact Average RA Hour
Load Impact	No	MWh/hour unit; Aggregate Impact; Equal to Percentile 50 Average RA Hour
Percentile XX	No	MWh/hour unit; Aggregate Impact; Percentile 5, 50, 95 Average RA Hour
Standard Error of LI	No	MWh/hour unit; Aggregate Impact Average RA Hour
CDH	No	Cooling degree hours; base 75 Average RA Hour

Table 6-1-2. Back-End Data Informing Table 6-1 (Hourly-level)

Data Item	Standard-ized Input	Notes
Obs ID	No	Indicator for Table 6-1-1 merge; multiple obs in this table (24 obs)
Hour-ending	Yes	Integer value 1 to 24
RA Hour ID	Yes	0=Non-RA hour; 1=RA hour
Reference Load	No	MWh/hour unit; Aggregate Impact
Estimated Load	No	MWh/hour unit; Aggregate Impact
Load Impact	No	MWh/hour unit; Aggregate Impact; Also Percentile 50
Percentile XX	No	MWh/hour unit; Aggregate Impact; Percentile 5, 50, 95
Standard Error of LI	No	MWh/hour unit; Aggregate Impact
Temperature	No	deg F unit

Explanation: Standardizing the back-end data structure of the table generators will allow Joint Staff to stack data for ease of analysis and verification. This should substantially lower review time by Joint Staff.

The above example is the WG’s first attempt at creating a standardized back-end data structure. The WG recommends the CPUC open another working group to finalize this.

Protocol 22

D.08-04-050, Attachment A, at 96-98:

“The information shown in Table 6-1 shall be provided for each of the following day types using 1-in-2 ~~and 1-in-10~~ weather conditions for the average across participants and for the sum of all participants for each forecast year:

- **Optional:** For a typical event day for a 1-in-2 ~~and for a 1-in-10~~ weather year for event-based resource options.
- **Optional:** For the average weekday for each month in which the resource option is in effect for a 1-in-2 ~~and for a 1-in-10~~ weather year for non-event based resource options
- For the monthly system **worst peak** day for each month in which the resource option is in effect, for a 1-in-2 ~~and for a 1-in-10~~ weather year for event-based and non-event based resources.

Day type definitions and additional reporting requirements for each day type are summarized below:

Typical Event Day for a 1-in-2 ~~and 1-in-10~~ Weather Year may optionally be reported: This day type requirement applies primarily to event-based resources. It is meant to capture both the exogenous factors such as weather and the event characteristics for a day on which an event is likely to be called. The relevant characteristics can be defined by the evaluator. At a minimum, the following information shall be provided:

- An explanation of how the weather and any other relevant day-type characteristics were chosen
- Detailed information on the timing and duration of the event or any other factors (e.g., notification lead time) that were explicitly factored into the impact estimates (e.g., factors that, if different than those reported, would change the estimated impacts)
- The number of notified consumers included in the aggregate impact estimate
- Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resource options and population characteristics (e.g., air conditioning saturation, business type, etc.).

Average Week Day for Each Month In A 1-in-2 ~~and for a 1-in-10~~ Weather Year may optionally be reported: This day type applies primarily to non-event based resources. It is meant to capture the weather conditions and other relevant factors for an average weekday. In addition to the information contained in Table 6-1, the following information must be provided:

- An explanation of how the weather and any other relevant day-type characteristics were chosen for the typical weekday in each month
- The number of enrolled customers included in the aggregate impact estimate
- Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resource options and population characteristics (e.g., air conditioning saturation, business type, etc.).

Monthly System Worst Peak Day for Each Month In a 1-in-2 ~~and for a 1-in-10~~ Weather Year: This day type applies to event- based and non-event based resources. It is meant to capture impacts for the day with the highest system load in each month. In addition to reporting all of the information shown in Table 6-1, the following information must be provided:

- An explanation of how the weather and any other relevant day-type characteristics were chosen for the typical monthly system worst peak day
- The number of enrolled customers included in the aggregate impact estimate
- Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resources and population characteristics (e.g., air conditioning saturation, business type, etc.).”

Explanation: D.10-06-036, Appendix B, at 20 & 21 already makes the following changes to this protocol: “[For] Protocol 22... The 1-in-10 weather year, typical event day, or an average weekday for each month are not needed for QC calculation.” This WG proposal is just reaffirming these already-existing changes.

1-in-10 weather conditions may be required for non-RA QC purposes. If so, this requirement is already covered in Protocol 2.

Protocol 23

D.08-04-050, Attachment A, at 98:

“All ex ante estimates based on regression methodologies shall calculate and store report the same statistical measures as delineated in Protocols 10 and 16 for a period of one year from filing date of April 1.”

Protocol 26

D.08-04-050, Attachment A, at 142:

Table 9-1. Reporting Template for Ex Post Impact Estimates*

Hour-Ending	Estimated Reference Load (kWh/hour)	Observed Event Day Load (kWh/hour)	Estimated Load Impact (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
					5th%ile	50th%ile	95th%ile	
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By Period:	Estimated Reference Energy Use (kWh/hour)	Observed Event Day Energy Use (kWh/hour)	Estimated Change in Energy Use (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			90% CI
					5th%ile	50th%ile	95th%ile	Significant?
Average Event Hour								

*This table is the same as Table 4-1 of the report. kWh/hour is used for average customers, whereas MWh/hour is used for aggregate customers.

D.08-04-050, Attachment A, at 143:

Table 9-1. Output Template for Ex Ante Impact Estimates*

Hour-Ending	Estimated Reference Load (kWh/hour)	Estimated Event Day Load (kWh/hour)	Estimated Load Impact (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
					5th%ile	50th%ile	95th%ile	
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By Period: Average Event Hour	Estimated Reference Energy Use (kWh/hour)	Observed Event Day Energy Use (kWh/hour)	Estimated Change in Energy Use (kWh/hour)	Average Temperature (deg F)	Uncertainty Adjusted Impact (kWh/hr)- Percentiles			Standard Error
					5th%ile	50th%ile	95th%ile	

*This table is the same as Table 6-1 of the report. kWh/hour is used for average customers, whereas MWh/hour is used for aggregate customers.

D.08-04-050, Attachment A, at 144:

Table 9-3. Day Types to be Reported for Each DR Type*

Day Types	Event Based Resources			Non-Event Based Resources		
	Event Driven Pricing	Direct Load Control	Callable DR	Non-event Driven Pricing	Schedule d DR	Permanent Load Reductions
Ex Post Day Types						

Each Event Day	X	X	X			
Average Event Day	<u>O</u> X	<u>O</u> X	<u>O</u> X			
Average Weekday Each Month				X	X	X
Monthly System <u>WorstPeak</u> Day				X	X	X
Ex Ante Day Types						
Typical Event Day (1-in-2 Weather Year)	<u>O</u> X	<u>O</u> X	<u>O</u> X			
Average Weekday Each Month (1-in-2 and 1-in-10 Weather Year)	<u>O</u> X	<u>O</u> X	<u>O</u> X	<u>O</u> X	<u>O</u> X	<u>O</u> X
Monthly System <u>WorstPeak</u> Day (1-in-2 and 1-in-10 Weather Year)	X	X	X	X	X	X

*This table is the same as Table 1-2. X=Required; O=Optional.

Protocol 27

D.08-04-050, Attachment A, at 147-148:

“The protocols include a process protocol that would provide for public review and comment. This will occur at three stages in the evaluation effort.

Protocol 27:

A review and comment process will be used at three stages in the implementation of the Load Impact estimation effort. These stages are:

- 1. The evaluation plan used to develop the research questions to be answered and the corresponding methods to be used to answer them;*
- 2. The interim and draft final reports for all load impact studies conducted for demand response resources; and*
- 3. **Public** Review of Final Reports to determine how ~~Commission staff~~ comments were addressed.*

This process protocol is meant to ensure that the products of each of the two stages in the estimation effort benefits from a **public** review by ~~stakeholders, Joint Staff and the DRMEC, and the CAISO (California Independent System Operating).~~ The Demand Response Measurement Evaluation Committee (DRMEC) would be used to initiate evaluation planning, review the final evaluation plan, and review draft load impact reports.

Two processes are set out below for comments – one for review and comment on the Evaluation Planning effort and a second for the review of interim and draft impact reports.

10.1. Evaluation Planning—Review and Comment Process

~~The DRMEC Commission staff~~ will be responsible for working with the utilities (or another identified lead entity) in developing evaluation plans for all statewide or local DR programs that are to have load impacts estimated. ~~The DRMEC will develop a process to determine which demand response programs/activities or tariffs should be evaluated and how frequently meetings should be held. The DRMC is responsible for finalizing the process of deciding which DR programs or tariffs should have impact evaluations within 90 days of this order.~~ The DRMEC will also be responsible for ensuring the issues identified in the evaluation planning

sections of the load impact protocols are covered during this planning process. The following actions will be undertaken:

1. DRMEC members will identify utility or state staff leads that will be responsible for developing draft evaluation plans for selected projects. The DRMEC will also review draft and final research plans for local utility programs.
2. The DRMEC is to oversee the drafting of the IOU evaluation plans. ~~These drafts should be sent to CPUC staff and DRMEC for comment. interested utility program managers and/or evaluators and to the service list (preferably the list established for the review and authorization of DR programs in the last round) or for those who want to participate on the DRMEC for comment.~~
3. The ~~Utility or DRMEC~~ member responsible for drafting the evaluation plan is responsible for ensuring that comments are solicited from ~~DRMEC and Joint Staff~~ key stakeholders and publishing a small summary of comments received and how or if they were incorporated into the final evaluation plan for each load impact study. The comment period, including responses to them, will be set by ~~the DRMEC Commission staff~~, taking into account the complexity and length of the documents. Absent good reason, the period for comments on evaluation plans will be 15 business days.
4. The final evaluation plan will be made available to Joint Staff and DRMEC members ~~and parties to previous DR proceedings~~ upon request.
5. Responses to the evaluation plan comments are required by filing parties that have received comments from DRMEC, Energy Division, Public Advocates Office, California Energy Commission, or other reviewing party. Updated methods sections specifically addressing the comments made by reviewers are due by the second week of March or as determined by Energy Division.

~~10.2. Review of Interim and Draft Load Impact Reports~~

~~The utility or contract manager is responsible for facilitating the production of a readable first draft of the load impact report. There may also be interim reports specified in the evaluation plan that will also be subject to a review and comment process. Interim reports may be useful to the impact estimation effort by ensuring interim work products are to be consistent with the protocols. The review and comment process will consist of:~~

- ~~1. The interim or draft load impact report will be sent to both the members of the DRMEC and the service list and Joint Staff with a request for comments in at least 5 business days or more, within the time limit determined by Commission staff the DRMEC. The DRMEC can, at its discretion, choose to meet to discuss any the study or conduct the study review by e-mail.~~

10.2.3. Review of Final Load Impact Reports

The utility or research manager is responsible for reviewing the comments received and identifying which comments have been incorporated or responded to in the final report.

Copies of the final load impact report should be filed on the CALMAC website and a notice of its availability should be sent out to the service list for the previous demand response rulemaking.”

CHAPTER 5: Proposed Modifications to D.10-04-006

Appendix 1

D.10-04-006, Appendix 1, at 1:

“Southern California Edison Company, San Diego Gas & Electric Company, and Pacific Gas and Electric Company (collectively, the Utilities) ~~may optionally shall~~ prepare the following executive summary ~~and are required to prepare the~~ summary tables described below as a part of their annual load impact reports, and shall file this summary information in R.07-01-041 or its successor proceeding, as long as such a proceeding is open. ~~While the executive summary is not required to be in its own, separate filing, the information required herein is still required in either the individual DR program filings or the executive summary.~~

~~The executive summary (if filed separately from individual DR program filings) and the summary table are due three weeks after the individual DR program filings are due. If individual filings are due April 1, the executive summary and summary tables are due April 22.~~

Optional Executive Summary Requirement

Consistent with D.08-04-050, Attachment A, Protocol 26 under item 4, the utilities shall prepare Executive Summaries of their load impact reports. These executive summaries shall include an overview of the evaluation findings and the study’s recommendation for changes to the demand response resource. In addition, it should also describe briefly the methodology, the enrollment forecast and the inputs and assumptions used for calculating the ex post and the ex ante load impact estimates. The utilities should also report the regression model specification for each demand response program.

The Executive Summary shall also contain an explanation of how the Monthly System ~~Worst Peak Load~~ Day under the “1-in-2 Weather Conditions” ~~and the “1-in-10 Weather Conditions”~~ were derived and disclose the temperature or Weather Year used for those conditions. It shall also disclose the assumption used for ex ante “portfolio basis” load impacts.

Summary Table Requirement

The Summary Tables to be filed along with the Executive Summary of each utility’s load impact reports shall include the aggregate average ex ante load impacts for each Monthly System ~~Worst Peak Load~~ Day under a 1-in-2 Weather Condition ~~and a 1-in-10 Weather Condition~~ for the next 10 years. The average impact shall be based on the hours ~~from 2 p.m. to 6 p.m. or other peak hours~~ consistent with the average hours used in calculations in the current Resource Adequacy proceeding, R.23-10-01109-10-032, or a successor Resource Adequacy proceeding. Each utility’s summary tables shall include two sets of ex ante load impact estimated tables for each Demand Response resource program: “program-specific” load impact estimates that would occur if events are called only under that program; and “portfolio basis” load impact estimates that would be attributed to that program if simultaneous events were called under all programs. All utility demand response programs must appear in the Summary Table, and shall be divided into five categories: Emergency Programs, Price Responsive Programs, Demand Response Aggregator Managed Programs, Demand Response Enabled Programs, and Non-Event Based Resource(s). The list in the Summary Table need not be identical to those contained in the utility’s demand response monthly reports.”

Explanation: Some IOUs’ executive summaries are entirely duplicative of information found in their LIP reports, whereas others have made the executive summaries unique and supplemental to the content in their LIP reports. Ensuring that information is captured either in the executive summaries or the LIP reports is most important.

CHAPTER 6: Proposed Modifications to D.10-06-036

Appendix B

D.10-06-036, Appendix B, at 22:

“In order for DR programs to receive local capacity credit for RA, the load impact must be broken down by local areas. ~~However, this breakdown is not required for all months—it is only required for August. If a filer is not requesting any local RA, breakdown at the Sub-LAP level in ex ante are not required.~~”

Explanation: If a filer is requesting local RA under Slice-of-Day methodology, the breakdown at the Sub-LAP level for every hour of the RA-window is required for all months of the year, since the fatigue profile may be vastly different in winter months vis-à-vis summer months. If a filer is not requesting local RA for a given compliance year, Sub-LAP ex-ante is not required.

**All other proposed modifications to D.10-06-036 are specific to protocols themselves and are included in Chapter 5 of this WG proposal.

CHAPTER 7: Public vs. Confidential information in DRP Filings

What information should be publicly available vs. kept confidential as part of “market sensitive” information has been interpreted very differently among the third-party demand response providers that file with the LIPs each year. Information like enrollment projections is publicly available in some filings but not others. This disparate interpretation of confidentiality creates an uneven playing field between third parties, and the WG recommends the Commission or ED staff to make a statement on what is expected in the filings.

Previous Commission decisions have not been explicit about what is expected to be filed, only stating in D.20-06-031 OP 17 that, “The Load Impact Protocol (LIP) reports and qualifying capacity values from a demand response provider’s LIP results shall be posted publicly to the maximum extent allowable, while protecting customer privacy and market sensitive information of demand response providers by adhering to the Commission’s existing confidentiality policies.”

The WG contends that ED staff has its own authority to decide what the “maximum extent possible” should be. Because this is not covered in the original LIPs themselves and subsequent decisions have used vague language, clarifications on expectations should not need a new CPUC decision. ED could offer this clarification in the LIP Filing Guide v4.0 to create standards/expectations or by holding a workshop to get consensus and release a report.

As a starting suggestion, the WG believes ED should create a template showing what information should be made public, possibly in the newest LIP Filing Guide.

The WG believes the following information should be kept confidential:

1. Customer forecast scenarios
2. Customer forecast rationale
3. Anything that violates existing Commission confidentiality policies (e.g., 15/15 rule)

APPENDIX 1: New Protocols Incorporating WG Proposals

The table below provides a summary of the proposed new DR Load Impact Protocols

Group	Protocol	Summary	Protocol description
Evaluation Plan	1	Evaluation plan is required	Prior to conducting a load impact evaluation for a demand response (DR) resource option, an evaluation plan must be produced. Filers have the option to either submit the traditional evaluation plan, or to fill out the standardized form (if and when adopted by ED staff) with a short explanation attached; it is not required to complete both the evaluation plan and the standardized form. The plan must meet the requirements delineated in Protocols 2 and 3. The plan must also include a budget estimate (which may remain redacted in public filing) and timeline.
	2	Requirements beyond resource planning and additional to protocol 4-27, i.e., resource adequacy	<p>Protocols 4 through 27 establish the minimum requirements for load impact estimation for long term resource planning. There are other potential applications for load impact estimates that may have additional requirements. These include, but are not necessarily limited to:</p> <ul style="list-style-type: none"> • Forecasting DR resource impacts for resource adequacy; • Forecasting DR resource impacts for operational dispatch by the CAISO; • Ex post estimation of DR resource impacts for use in customer settlement; <p>and</p> <ul style="list-style-type: none"> • Monthly reporting of progress towards DR resource goals. <p>The evaluation plan required by Protocol 1 must delineate whether the proposed DR resource impact methods and estimates are intended to also meet the requirements associated with the above applications or others that might arise and, if so, delineate what those requirements are.</p>
	3	Questions/issues that must be addressed by the evaluation plan	<p>The evaluation plan must delineate whether the following issues are to be addressed during the impact estimation process and, if not, why not:</p> <ul style="list-style-type: none"> • The target level of confidence and precision in the impact estimates that is being sought from the evaluation effort; • Whether the evaluation activity is focused exclusively on producing ex post impact estimates or will also be used to produce ex ante estimates; • If ex ante estimates are needed, whether changes are anticipated to occur over the forecast horizon in the characteristics of the DR offer or in the magnitude or characteristics of the participant population; • 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.); • Whether a specified monitoring and verification (M&V) activity is needed to address the above issues, particularly if full evaluations are expected to occur only periodically (e.g., every two or three years); • Whether it is the intent to develop impact estimates for geographic subregions and, if so, what those regions are; • Whether it is the intent to develop impact estimates for sub-hourly intervals and, if so, what those intervals are; • Whether it is the intent to develop impact estimates for specific subsegments of the participant population and, if so, what those sub-segments are; • 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; • 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; • Whether free riders and/or structural beneficiaries 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 beneficiaries or free riders; • 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; and • 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.
	4	Hour-of-day and daily impact estimate	The mean change in energy use per hour (kWh/hr) for each hour of the day shall be estimated for each day type and level of aggregation defined in the following Protocol 8. The protocol also calls for the mean change in energy use for the day must also be reported for each day type.

Ex post for event-based DR	5	Average and total impact	The mean change in energy use per year may optionally be reported for the average across all participants and for the sum of all participants on a DR resource option for each year over which the evaluation is conducted.																																																																																																					
	6	Percentile-based uncertainties	Protocol 6 is designed to recognize the inherent uncertainty in impact estimates resulting both from the uncertainty in the estimation methods as well as uncertainty in underlying driving variables when ex ante estimation is required. Estimates shall be provided for the 5 th , 50 th , 95 th percentiles of the change in energy use in each hour, day and year, as described in Protocols 4 and 5, for each day-type and level of aggregation described in Protocol 8.																																																																																																					
	7	Tabular output format	Impact estimates shall be reported in the format depicted in Table 4-1 for all required day types and levels of aggregation, as delineated in Protocol 8. Table 4-1. 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8	Reporting requirements		<p>The information shown in Table 4-1 shall be provided for each of the following day types and levels of aggregation:</p> <ul style="list-style-type: none"> • Required: Each day on which an event was called; • Optional: The average event day over the evaluation period; • Required: For the average across all participants notified on each day on which an event was called; • Required: For the total of all participants notified on each day on which an event was called; and • Optional: For the average across all participants notified on the average event day over the evaluation period. <p>Optional: An average event day is calculated as a day-weighted average of all event days. The number of event days that apply to each hour may vary for resource options that have variable length event periods.³⁰ As such, for the average event day, the following information must be provided:</p> <ul style="list-style-type: none"> • The number of actual event days included in the calculation for each hour of the average day; • Average number of customers enrolled in the resource option over the year³¹; and • Average number of customers notified across all event days in the year. <p>In addition to the information contained in Table 4-1, the following information must be provided for each event day:</p> <ul style="list-style-type: none"> • Event start and stop time; • Notification lead time; • The number of customers who were enrolled in the resource option on the event day; • The number of customers who were notified on the event day; and • Any other factors that vary across event days that are considered by the evaluator to be important for understanding and interpreting the impacts and why they vary across events. 																														
9	Error metrics for day matching results		<p>This statistical measures protocol is specific to Day-matching methods. A different protocol (e.g., protocol 10) is appropriate for regression methods.</p> <p>These calculations should be based on a suitable and sufficiently large number of proxy days. From this process, the following statistics should be calculated and reported for day-matching reference value methods:</p> <ul style="list-style-type: none"> • The number of proxy days used in the calculations below and an explanation of how the proxy days were selected. • Average error across customers and proxy days for each hour for the entire day. This is calculated as follows: 																														

$$\bar{e}_{ij} = \frac{\sum_{j=1}^{n_{\text{days}}} \sum_{i=1}^{n_{\text{cust}}} (L_{ij} - \hat{L}_{ij})}{n_{\text{cust}} \times n_{\text{days}}} \quad (4-1)$$

where:

i = the cross-sectional unit or customer

j = the event-like day

\bullet = the hour of the day

L_{ij} = the actual load for the customer on the proxy day of interest for the hour of interest

\hat{L}_{ij} = the predicted load for the customer on the proxy day of interest for the hour of interest

n_{cust} = the total number of customers in the observation group

n_{days} = the total number of days in the observation group

• Median error across customers and proxy days for each hour for the entire day. The median error is the error corresponding to the exact center of the distribution of errors when all the errors under consideration are arranged in order of magnitude. It is calculated as follows:

a. Calculate the error for each customer and proxy day for the hour of interest:

b. Sort the resulting distribution of $n_{\text{cust}} \times n_{\text{days}}$ errors by magnitude for each hour of interest.

c. If the number of errors is odd, the median is the error associated with the $\frac{((n_{\text{cust}} \times n_{\text{days}}) + 1)}{2}$ observation.

d. If the number of errors is even, the median is the average of the errors associated with observations $\frac{(n_{\text{cust}} \times n_{\text{days}})}{2}$ and $\frac{(n_{\text{cust}} \times n_{\text{days}})}{2} + 1$.

• The relative average error for each hour. This is calculated as the ratio of the average error to the average actual load that occurred in the hour:

$$REL. \bar{e}_{ij} = \frac{\bar{e}_{ij}}{\sum_{j=1}^{n_{\text{days}}} \sum_{i=1}^{n_{\text{cust}}} \frac{L_{ij}}{n_{\text{cust}} \times n_{\text{days}}}} \quad (4-2)$$

where:

\bar{e}_{ij} = the average error across customers and proxy days for the hour of interest

• The relative median error for each hour. This is calculated as follows:

$$REL. \bar{e}_{ij}^M = \frac{\bar{e}_{ij}^M}{L_{ij}^M} \quad (4-3)$$

where:

\bar{e}_{ij}^M = the median error across customers and proxy days for each hour for the entire day, as calculated above

L_{ij}^M = the median load for the customer on the proxy day of interest

• The Coefficient of Alienation²³, which describes the percentage of the variation in actual load for each hour that is not explained by variation in the predicted load. This is calculated as follows:

$$\frac{\sum_{j=1}^{n_{\text{days}}} \sum_{i=1}^{n_{\text{cust}}} (L_{ij} - \hat{L}_{ij})^2}{\sum_{j=1}^{n_{\text{days}}} \sum_{i=1}^{n_{\text{cust}}} (L_{ij} - \bar{L}_{ij})^2} \quad (4-4)$$

where:

i = the cross-sectional unit or customer

j = the event-like day

k = the hour of the day

L_{ij} = the actual load for the customer on the proxy day of interest for the hour of interest

\hat{L}_{ij} = the predicted load for the customer on the proxy day of interest for the hour of interest

\bar{L}_{ij} = the average load on the proxy day of interest for the hour of interest

n_{hours} = the total number of hours being observed on the proxy day

• Theil's U , calculated as follows:

$$\frac{\left[\frac{1}{n_{\text{hours}}} \sum_{k=1}^{n_{\text{hours}}} (L_k - \hat{L}_k)^2 \right]^{1/2}}{\left[\frac{1}{n_{\text{hours}}} \sum_{k=1}^{n_{\text{hours}}} (L_k)^2 \right]^{1/2} + \left[\frac{1}{n_{\text{hours}}} \sum_{k=1}^{n_{\text{hours}}} (\hat{L}_k)^2 \right]^{1/2}}$$

where:

n_{hours} = the number of periods

k = the period of interest

L_k = the actual observed load for the period of interest

\hat{L}_k = the predicted load for the period of interest

	10	Error metrics for regression method results	For regression-based methods, the following statistics and information shall be calculated and stored by the evaluator for a period of one year after April 1 of filing year: <ul style="list-style-type: none"> • Adjusted R-squared or, if R-squared is not provided for the estimation procedure, the log-likelihood of the model; • Total observations, number of cross-sectional units and number of time periods; • Coefficients for each of the parameters of the model; • Standard errors for each of the parameter estimates; • Optional: The variance-covariance matrix for the parameters; and • The tests conducted and the specific corrections conducted, if any, to ensure robust standard errors.
Ex post for non-event-based DR (only required if filer has non-event-based DR program(s))	11	Hour-of-day and daily impact estimates	The mean change in energy use per hour (kWh/hr) for each hour of the day shall be estimated for each day type and level of aggregation defined in Protocol 15. The mean change in energy use for the day shall also be reported for each day type.
	12	Average and total impact	The mean change in energy use per month and per year may optionally be reported for the average across all participants and for the sum of all participants in a DR resource option in each year over which the evaluation is conducted.
	13	Percentile-based uncertainties	Estimates of the 5 th , 50 th , and 95 th percentiles of the change in energy use in each hour, day and year, as described in Protocols 11 and 12, for each day-type and level of aggregation described in Protocol 15, shall be provided.
	14	Tabular output format	Impact estimates shall be reported in the format depicted in Table 4-1 for all required day types, as delineated in Protocol 15. In lieu of an average event hour, provide an average hour as applicable to resource. For example, provide the average on-peak window for a non-event-based pricing resource like a Time-of-Use (TOU) rate.
	15	Reporting requirement	The information shown in Table 4-1 shall be provided for each of the following day types for the average across all participants sum of all participants: <ul style="list-style-type: none"> • For the average weekday for each month in which the DR resource is in effect. • For the monthly system worst day for each month in which the DR resource is in effect. Day type definitions and additional reporting requirements for each day type are summarized below: Average Week Day for Each Month: The average across all weekdays in each month during which the DR resource is in effect. In addition to the information contained in Table 4-1, the following information shall be provided: <ul style="list-style-type: none"> • Average temperature⁵⁴ for each hour for a typical week day for each month. • Average degree hours for the typical week day for each month. • Average number of customers participating in the DR resource option each month Monthly System Worst Day for Each Month: The day with the highest system load in each month. In addition to reporting all of the information shown in Table 4-1, the following information shall be provided: <ul style="list-style-type: none"> • Temperature for each hour on the system peak day for each month • Average degree hours on the system peak day for each month. • Average number of customers participating in the DR resource option on the system peak day for each month.
	16	Error metrics for regression method results	For regression-based methods, the following statistics and information shall be calculated and stored by the evaluator for a period of one year after April 1 of filing year: <ul style="list-style-type: none"> • Adjusted R-squared or, if R-squared is not provided for the estimation procedure, the log-likelihood of the model • Total observations, number of cross-sectional units and number of time periods • Coefficients for each of the parameters of the model • Standard errors for each of the parameter estimates • Optional: The variance-covariance matrix for the parameters and • The tests conducted and the specific corrections conducted, if any, to ensure robust standard errors.
Ex ante	17	Ex ante based on ex post results	Whenever possible, ex ante estimates of DR impacts should be informed by ex post empirical evidence from existing or prior DR resource options. Evidence from resource options and customer segments most relevant to the ex ante conditions being modeled should be used, regardless of whether they come from the host utility or some other utility. If ex post estimates or models are not used as the basis for ex ante estimation, an explanation as to why this is the case shall be provided.
	18	Hour-of-day impacts for all day types	The mean change in energy use per hour (kWh/hr) for each hour of the day shall be estimated for each day type and level of aggregation defined in Protocol 22. The mean change in energy use for the day shall also be estimated for each day type.
	19	Change in monthly/annual energy us	The mean change in energy use per month may optionally be estimated for non-event-based resources and the mean change in energy use per year shall be estimated for both event and non-event-based resources for the average across all participants and for the sum of all participants on a DR resource option for each year over the forecast horizon.

20	Uncertainty-adjusted impacts by percentile.	Estimates of the 5 th , 50 th , and 95 th percentiles of the change in energy use in each hour, day and year, as described in Protocols 17 and 18, and for each day-type described in Protocol 22, shall be provided.																																																																																																																											
21	Tabular reporting format	<p>Impact estimates shall be reported in the format depicted in Table 6-1 for all required day types and levels of aggregation, as delineated in Protocol 22.</p> <p>Table 6-1. 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	22	Estimates for typical event, average, and system peak day types (1-in-2 and 1-in-10)	<p>The information shown in Table 6-1 shall be provided for each of the following day types using 1-in-2 weather conditions for the average across participants and for the sum of all participants for each forecast year:</p> <ul style="list-style-type: none"> • Optional: For a typical event day for a 1-in-2 weather year for event-based resource options. • Optional: For the average weekday for each month in which the resource option is in effect for a 1-in-2 weather year for non-event-based resource options. • For the monthly system worst day for each month in which the resource option is in effect, for a 1-in-2 weather year for event based and non-event-based resources. <p>Day type definitions and additional reporting requirements for each day type are summarized below:</p> <p>Typical Event Day for a 1-in-2 Weather Year may optionally be reported: This day type requirement applies primarily to event-based resources. It is meant to capture both the exogenous factors such as weather and the event characteristics for a day on which an event is likely to be called. The relevant characteristics can be defined by the evaluator. At a minimum, the following information shall be provided:</p> <ul style="list-style-type: none"> • An explanation of how the weather and any other relevant day-type characteristics were chosen • Detailed information on the timing and duration of the event or any other factors (e.g., notification lead time) that were explicitly factored into the impact estimates (e.g., factors that, if different than those reported, would change the estimated impacts) • The number of notified consumers included in the aggregate impact estimate • Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resource options and population characteristics (e.g., air conditioning saturation, business type, etc.). <p>Average Weekday for Each Month in a 1-in-2 Weather Year: This day type applies primarily to non-event-based resources. It is meant to capture the weather conditions and other relevant factors for an average weekday. In addition to the information contained in Table 6-1, the following information must be provided:</p> <ul style="list-style-type: none"> • An explanation of how the weather and any other relevant day-type characteristics were chosen for the typical weekday in each month • The number of enrolled customers included in the aggregate impact estimate. • Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resource options and population characteristics (e.g., air conditioning saturation, business type, etc.). <p>Monthly System Worst Day for Each Month In a 1-in-2 Weather Year: This day type applies to event- based and non-event-based resources. It is meant to capture impacts for the day with the highest system load in each month. In addition to reporting all of the information shown in Table 6-1, the following information must be provided:</p> <ul style="list-style-type: none"> • An explanation of how the weather and any other relevant day-type characteristics were chosen for the typical monthly system worst day • The number of enrolled customers included in the aggregate impact estimate • Any other factors that have been explicitly incorporated into the impact estimate, such as prices for price based resources and population characteristics (e.g., air conditioning saturation, business type, etc.). 									
	23	Statistical tests and methods (same as 10,16 regression statistics)	All ex ante estimates based on regression methodologies shall calculate and store the same statistical measures as delineated in Protocols 10 and 16 for a period of one year after April 1 of filing year.									
Misc. technical	24	Portfolio adjustment	The evaluation of a DR resource should identify correlations, synergies and overlaps across the set of DR resource options offered in a region or being proposed for a region. A judgmental determination of the impact of the magnitude of adjustment in program impacts should be made for all programs. In some cases, a zero adjustment may be recommended. In other cases, identified correlations, synergies and overlaps may result in a recommended adjustment to the ex ante estimate of program impacts.									
	25	Sampling requirements	<p>If sampling is required, evaluators shall use the following procedures to ensure that sampling bias is minimized and that its existence is detected and documented.</p> <p>8. The population(s) under study must be clearly identified and described – this must be done for both participants and control groups to the extent that these are used;</p> <p>9. The sample frame(s) (i.e., the list(s) from which samples are drawn) used to identify the population(s) under study must be carefully and accurately described and if the sample frame(s) do not perfectly overlap with the population(s) under study, the evaluator must describe the measures they have taken to adjust the results for the</p>									

			<p>sample frame so that it reflects the characteristics in the population of interest – this would include the use of weighting, matching or regression analysis;</p> <p>10. The sample design used in the study must be described in detail including the distributions of population and sample points across sampling strata (if any);</p> <p>11. A digital snapshot of the population and initial sample from the sample frame must be preserved – this involves making a digital copy of the sample frame at the time at which the sample was drawn as well as a clean digital copy of the sample that was drawn including any descriptors needed to determine the sampling cells into which the sampled observations fall;</p> <p>12. The “fate” of all sampled observations must be tracked and documented throughout the data collection process (from initial recruitment to study conclusion) so that it is possible to describe the extent to which the distribution of the sample(s) may depart from the distribution of the population(s) of interest throughout the course of the study;</p> <p>13. If significant sample attrition is found to exist at any stage of the research process (i.e., recruitment, installation, operation), a study of its impact must be undertaken. This study should focus on discovering and describing any sampling bias that may have occurred as a result of selection. This should be done by comparing the known characteristics of the observed sample with the known characteristics of the population. Known characteristics would include such variables as historical energy use, time in residence, geographical location, reason for attrition from sample, and any other information that may be available for the population and sample.</p> <p>14. If selection bias is suspected, the evaluator must describe it as well as any efforts made to control for it.</p>																																																							
Evaluation report	26	Evaluation report requirements	<p>Evaluation reports shall include, at a minimum, the following sections:</p> <ol style="list-style-type: none"> Cover Title Page Table of Contents Executive Summary - this section should very briefly present an overview of the evaluation findings and the study’s recommendations for changes to the DR resource Introduction and Purpose of the Study - this section should briefly summarize the resource or resources being evaluated and provide an overview of the evaluation objectives and plan, including the research issues that are addressed. It should also provide a summary of the report organization. Description of Resources Covered in the Study - this section should provide a detailed description of the resource option being evaluated in enough detail that readers can understand the DR resource that delivered the estimated impacts. The description should include a history of the DR program or tariff, a summary of resource goals (both in terms of enrollment and demand impacts), tables showing reported progress toward goals, projections of future goals and known changes and other information deemed necessary for the reader to obtain a thorough understanding of how the resource has evolved over time and what changes lie ahead. Study Methodology - this section should describe the evaluation approach in enough detail to allow a repetition of the study in a way that would produce identical or similar findings. (See additional content requirements below.) <p>Table 9-3. Day Types to be Reported for Each DR Type*</p> <table border="1" data-bbox="732 1388 1511 1879"> <thead> <tr> <th rowspan="2">Day Types</th> <th colspan="3">Event Based Resources</th> <th colspan="3">Non-Event Based Resources</th> </tr> <tr> <th>Event Driven Pricing</th> <th>Direct Load Control</th> <th>Callable DR</th> <th>Non-event Driven Pricing</th> <th>Scheduled DR</th> <th>Permanent Load Reductions</th> </tr> </thead> <tbody> <tr> <td>Ex Post Day Types</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Each Event Day</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Average Event Day</td> <td>O</td> <td>O</td> <td>O</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Average Weekday Each Month</td> <td></td> <td></td> <td></td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>Monthly System Worst Day</td> <td></td> <td></td> <td></td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>Ex Ante Day Types</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Day Types	Event Based Resources			Non-Event Based Resources			Event Driven Pricing	Direct Load Control	Callable DR	Non-event Driven Pricing	Scheduled DR	Permanent Load Reductions	Ex Post Day Types							Each Event Day	X	X	X				Average Event Day	O	O	O				Average Weekday Each Month				X	X	X	Monthly System Worst Day				X	X	X	Ex Ante Day Types						
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Typical Event Day (1-in-2 Weather Year)	O	O	O																				
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Monthly System Worst Day (1-in-2 Weather Year)	X	X	X	X	X	X																	
	Study methodology	<p>The Study Methodology section shall include the following:</p> <ol style="list-style-type: none"> 1. Overview of the evaluation plan study methodology; 2. Questions addressed in the evaluation; 3. Description of the study methodology, including not just the methodology used and the functional specification that produced the impact estimates, but also methodologies considered and rejected and interim analytical results that led to the final model specification. The intent of this section is to provide sufficient detail so that a trained reviewer will be able to assess the quality of the analysis and thoroughly understand the logic behind the methodology and final models that were used to produce the impact estimates; and the statistics required to be reported in Protocols 9, 10, 16 and 23; 4. How the study meets or exceeds the minimum requirements of these protocols or, if any protocols were not able to be met, an explanation of why and recommendations for what it will take to meet these protocols in future evaluations; 5. How the study addresses the technical issues presented in these Protocols; and 6. Sampling methodology and sample descriptions (including all frequency distributions for population characteristics from any surveys done in conjunction with the analysis). 																					
	Validity assessment	<p>The Validity Assessment section of the report shall focus on the targeted and achieved confidence levels for the key findings presented, the sources of uncertainty in the approaches used and in the key findings presented, and a discussion of how the evaluation was structured and managed to reduce or control for the sources of uncertainty. All potential threats to validity given the methodology used must be assessed and discussed. This section should also discuss the evaluator’s opinion of how the types and levels of uncertainty affect the study findings. Findings also must include information for estimation of required sample sizes for future evaluations and recommendations on evaluation method improvements to increase reliability, reduce or test for potential bias and increase cost efficiency in the evaluation study(ies). The data and statistics outlined in Protocol 24 should be reported in this section.</p>																					
	Detailed study findings	<p>The Detailed Study Findings section shall include the following:</p> <ol style="list-style-type: none"> 1. A thorough discussion of key findings, including insights obtained regarding why the results are what they are. 2. All output requirements and accompanying information shown in protocols 4 through 10 for ex post evaluation of event based resources, protocols 11 through 16 for non-event based resources, and protocols 17 through 23 for ex ante estimation. If the number of data tables is large, the main body of the report should include some exemplary tables and explanatory text with the remaining required tables provided in appendices. Detailed data tables should also be provided in electronic format. 3. For ex post evaluations of event-based resources, a table summarizing the relevant characteristics associated with each event and the date of each event over the historical evaluation period. At a minimum, the table should include for each event: date, weather conditions (for weather sensitive loads), event trigger (e.g., emergency, temperature, etc), start and stop times for the event, event duration in hours, notification lead time, number of customers notified, and number of customers enrolled. 																					

			<p>4. For ex ante forecasts, detailed descriptions of the event and day type assumptions underlying the estimates.</p> <p>5. For ex ante forecasts, assumptions and projections for all exogenous variables that underlie the estimates for each forecast year, including but not necessarily limited to, the number of customers enrolled and notified (for event based resources), participant characteristics, weather conditions (if relevant), prices and price elasticities (if relevant), other changes in demand response over time due to persistence related issues and the reasons underlying the changes for the average customer. Information describing the probability distributions for these exogenous variables should be provided whenever such uncertainty is included in the ex ante impact estimates.</p> <p>A comparison of impact estimates derived from the analysis and those previously obtained in other studies and those previously used for reporting of impacts toward resource goals, and a detailed explanation of any significant differences in the new impacts and those previously found or used.</p>
Process and public review	27	Process and public review	<p>A comparison of impact estimates derived from the analysis and those previously obtained in other studies and those previously used for reporting of impacts toward resource goals, and a detailed explanation of any significant differences in the new impacts and those previously found or used.</p>

APPENDIX 2: Evaluation Plan Form Template Example

Evaluation Plan Form

Test for drop down evaluation plans for California Load Impact Protocols

* Required

Submitter Information

1. Submitter Name *



2. Submitter email *

3. Submitter Phone *

Program Information

4. Program Name *

5. Program Description *

6. Demand Response Provider *

7. Program Year *

The value must be a number

8. Evaluator *

9. Applicable CAISO Sub-LAPs *

- All Sub-LAPs (Statewide)
- All Sub-LAPs in PG&E service territory
- All Sub-LAPs in SCE service territory
- All Sub-LAPs in SDG&E service territory
- SLAP_PGCC-APND: PG&E Central Coast
- SLAP_PGEB-APND: PG&E East Bay
- SLAP_PGF1-APND: PG&E Fresno
- SLAP_PGFG-APND: PG&E Geysers (Napa/Sonoma)
- SLAP_PGHB-APND: PG&E Humboldt
- SLAP_PGLP-APND:
- SLAP_PGNB-APND: PG&E North Bay
- SLAP_PGNC-APND: PG&E North Coast
- SLAP_PGNV-APND: PG&E NV
- SLAP_PGP2-APND: PG&E Peninsula
- SLAP_PGSA-APND:
- SLAP_PGSB-APND: PG&E South Bay
- SLAP_PGSF-APND: PG&E San Francisco
- SLAP_PGSI-APND: PG&E Sierras
- SLAP_PGSN-APND:
- SLAP_PGST-APND: PG&E Stockton
- SLAP_SCEC-APND: SCE Central
- SLAP_SCEN-APND: SCE North (Central Valley)
- SLAP_SCEW-APND: SCE West (Oxnard / Santa Barbara)

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Evaluation Plan Form

- SLAP_SCHD-APND: SCE High Desert
- SLAP_SCLD-APND: SCE Low Desert
- SLAP_SCNW-APND: SCE Northwest

10. What sectors will be included? *

- Residential
- Small C&I (<20 kW)
- Medium C&I (20- 200 kW)
- Large C&I (200 kW and up)
- Agricultural

11. Is the resource weather sensitive? *

- Yes
- No

12. What is the expected number of sites/participants? *

The value must be a number

Ex-Post Analysis Plan

13. What data source(s) will be used for the evaluation? *

- Utility AMI data
- End use kW data
- End use run time data
- Vendor collected whole building data
- Other

14. What will be the granularity of the results? *

- Hourly intervals
- 15-minute intervals
- 5-minute intervals
- Sub-5-minute intervals

15. What is the expected percent (%) reduction in load? *

- 50% or more
- 25-50%
- 10-25%
- 5-10%
- Less than 5%

16. Will the evaluation rely on controls (includes RCT, matched controls, and synthetic controls)?

*

Yes

No

17. Control methods: Which method will be used to develop controls? *

Randomized control trial (RCT)

Matched control group using propensity score matching (PSM)

Matched control group using Euclidean distance matching (EDM)

Matched control group using stratified matching

Non-equivalent control group (unmatched)

Use of control profiles as right hand side variables (synthetic controls)

Other

18. What share (%) of randomly assigned sites will be withheld as control group for each event? *

- <5%
- 5-10%
- 10-25%
- 25-50%
- Over 50%
- Sites will be randomly assigned to 5 or fewer groups and at least one group will be withheld as control for each event
- Sites will be randomly assigned to 6-10 groups and at least one group will be withheld as control for each event
- Sites will be randomly assigned to more than 10 groups and at least one group will be withheld as control for each event
- Other

19. Will a tournament be used to identify the most accurate matched control group model? *

- Yes
- No

20. What metric(s) will be used to identify the most accurate matched control group model? *

Please select at most 2 options.

- % Bias
- Average Error (Bias)
- RMSE (root mean squared error)
- Normalized RMSE (RRMSE or CVRMSE)
- MAE (Mean absolute error)
- MAPE (Mean absolute percentage error)
- SSE (sum of squared errors)
- FSU (fractional savings uncertainty)
- Other

21. Please explain how the control group is developed and used (since it is not random assignment, a matched control group, or granular profiles)? *

22. Control methods: Which method will be used to analyze load impacts? *

Note: differences-in-differences (DID)

- 01 RCT with DID
- 02 RCT using simple means comparison
- 03 Matched control with panel regression DID
- 04 Matched control with simple DID (no regression)
- 05 Matched control using simple means comparison
- 06 Matched control with individual regression DID
- 07 Granular profiles with individual regression DID
- 08 Synthetic controls with individual regression DID
- 09 Synthetic controls with panel regression DID
- 10 Control methods other

23. Please explain how load impacts are analyzed. *

24. Within subject methods (no control group): Which method will be used to analyze load impacts? *

- 11 Individual customer regressions
- 12 Panel regression
- 13 Machine learning tree based models (e.g., XGBoost, Random Forest Regressor, etc.)
- 14 Neural networks
- 15 CAISO day matching baseline (aggregate-first)
- 16 CAISO weather matching baseline (aggregate-first)
- 17 CAISO Meter Generator Output (MGO) 10-in-10 baseline
- 18 Alternate day matching baseline (e.g., individual 10-in-10 baselines)
- 19 Alternate weather matching baseline
- 20 Within subjects methods other

25. Please explain how load impacts are analyzed. *

26. Will a tournament used to identify the most accurate counterfactual model specification? *

- Yes
- No

27. What metric(s) will be used to identify the most accurate counterfactual model? *

Please select at most 2 options.

- % Bias
- Average error (Bias)
- RMSE (root mean squared error)
- Normalized RMSE (RRMSE or CVRMSE)
- MAE (Mean absolute error)
- MAPE (Mean absolute percentage error)
- SSE (sum of squared errors)
- FSU (fractional savings uncertainty)
- Other

28. Will results be provided for different customer segments (minimum is by sub-LAP)? *

- Sub-LAP
- Local Capacity Area (LCA)
- Climate zone
- Other geographic segmentation
- Low income
- Solar/PV status
- Customer size
- Technology-enabled
- Business type
- Rate type
- Dual program enrollment
- Other

Ex-Ante Analysis Plan

29. Will the ex-ante estimates be grounded in historical data?

- Yes
- No
- Not applicable

30. How many years of historical performance data be used to develop ex-ante impacts?

- 1 year
- 2 years
- 3 years
- More than 3 years

31. What process will be used to model the relationship between event reductions and weather?

- Directly model the relationship between load impacts (kW), weather, and other factors that affect performance.
- Model the relationship between percent reductions (%), weather, and other factors that affect performance. Separately model the references loads. Combine the two.
- Apply the realization rate (e.g., % of nominated MW).
- The reductions are assumed to be weather insensitive.
- Other

32. Are load impact values per site or per nominated MW?

- Per site
- Per nominated MW

33. Will results be provided for different customer segments (minimum is by sub-LAP)? *

- Sub-LAP
- Local Capacity Area (LCA)
- Climate zone
- Other geographic segmentation
- Low income
- Solar/PV status
- Customer size
- Technology-enabled
- Business type
- Rate type
- Dual program enrollment
- Other

34. Does the ex-ante load impacts for future years factor in the share of functioning devices and communication success rates?

- Yes
- No
- Not applicable

35. Will the evaluation produce a time-temperature matrix?

- Yes
- No
- Not applicable

36. Are significant changes expected over the forecast horizon to either the program or participant characteristics (e.g., change of 20% or more, adding new technologies)?

- Yes
- No
- Not applicable

37. How will expected changes in the participant mix or program rules be incorporated into the ex-ante estimates?

38. Are there other data sources or factors that will be incorporated into the ex-ante load impacts?

39. Will an operation plan be developed in preparation for the subsequent year in order to introduce variation in weather conditions, event start times, duration, or weekday/weekend conditions?

Yes

No

Not applicable