APPENDIX A TABLE GENERATORS

One of the key deliverables is the table generators, which are Excel files that allow interested stakeholders to observe the impacts for varying domains of interest, including industry type, size, event day or weather scenario.

APPENDIX B   PROXY DAY TESTING PERFORMANCE

The selection of models for each participant was based on assessing performance on a set of proxy event days, which are non-event days that have event-like weather conditions. The assessment of these different models is concerned primarily with accuracy and precision. Accuracy represents how closely on average the calculated baseline matches the observed load. A component of measuring accuracy is bias, which indicates the extent to which the calculated baseline over or underestimates the load. In contrast, precision indicates how reliably a baseline is close to the observed load. It is possible to have a model that on average is highly accurate with very poor precision, such as when a method both under and over predicts by substantial amounts with regularity. Likewise, it is possible to have a method that is very precise but highly inaccurate, such as when a model over or underestimates the load with high consistency. Of course, a baseline can also be neither accurate nor precise.

The primary metrics for accuracy and precision in this analysis are Normalized Mean Bias Error (NMBE) and Normalized Mean Absolute Error (NMAE), respectively. Other assessments of baselines have often used the Mean Percent Error (MPE) as the metric to assess accuracy and the Mean Absolute Percent Error (MAPE) and Coefficient of Variation of the Root Mean Square Error (CVRMSE) as the metrics for precision.

The preference for these metrics was based primarily on a shortcoming of the MAPE and MPE when it comes dealing with observed values of zero, which will result in division by zero error and the loss of the data point. Table B-1 presents descriptions and the equations for two metrics calculated for accuracy and the three calculated for precision. One thing to note is that for the NMBE and NMAE, the formulas go against a convention seen in some contexts (e.g., ASHRAE), where the error is calculated as the baseline minus the observed. This runs contrary to the more typical conventions of calculating MPE and MAPE, so for the sake of consistent interpretation of the NMBE and MPE, where negative values indicate overestimation of the baseline, Verdant has calculated the error as the observed load minus the calculated baseline for all metrics.

TABLE B-1: DESCRIPTIONS AND EQUATIONS FOR PERFORMANCE METRICS

Metric Type	Metric	Description	Equation
Accuracy/Bias	Mean Percent Error (MPE)	Represents the average of the errors in the calculated baselines as a percentage of the observed load.	$MPE = \dfrac{1}{n}\sum_{i=1}^{n}\dfrac{y_i - \hat{y}_i}{y_i}$
	Normalized Mean Bias Error (NMBE)	Represents the normalized average bias in the calculated baselines.	$NMBE = \dfrac{\frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)}{\bar{y}}$
Precision	Mean Absolute Percent Error	Represents the average of the absolute errors in the calculated baselines as a percentage of the observed load.	$MAPE = \dfrac{1}{n}\sum_{i=1}^{n}\left|\dfrac{y_i - \hat{y}_i}{y_i}\right|$
	Normalized Mean Absolute Error (NMAE)	Represents that average of the normalized absolute error in the calculated baselines.	$NMAE = \dfrac{\frac{1}{n}\sum_{i=1}^{n}(|y_i - \hat{y}_i|)}{\bar{y}}$
	Coefficient of Variation of the Root Mean Squared Errors CV(RMSE)	Represents the normalized average of the squared errors between the observed load and calculated baselines.	$CV(RMSE) = \dfrac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}}{\bar{y}}$

Table B-2 through Table B-7 present summaries of the model performance metrics on proxy event days. For non-residential subgroups these metrics are show by NAICs description. For A.4 and A.6 these metrics are presented by LCA and by NEM status and enrollment groups respectively Overall, the models have good performance, with some expected variability based on industry type. The more industrial participants have poorer model performance, which is expected given the volatile load associated with many of these customers. In contrast, office and retail customers, which have more consistent occupancy and operations as well as weather-sensitivity, have the best performance metrics.

B.1 PERFORMANCE METRICS

TABLE B-2: SPECIFICATION TEST RESULTS FOR PROXY DAY TESTING- PG&E SUBGROUP A.1 BIP

NAICS	Num. of Customers	CV RMSE	NMBE	NMAE	Adjusted R²
Agriculture, Mining & Construction	2	0.009	0.001	0.007	0.871
Manufacturing	1	0.006	0.000	0.004	0.961
Offices, Hotels, Finance, Services	1	0.002	0.000	0.001	0.421
Other	1	0.006	0.000	0.004	0.977
Retail Stores	2	0.001	0.000	0.001	0.972
Wholesale, Transport, Other Utilities	2	0.012	-0.001	0.008	0.737
Agriculture, Mining & Construction	2	0.009	0.001	0.007	0.871

TABLE B-3: SPECIFICATION TEST RESULTS FOR PROXY DAY TESTING - PG&E SUBGROUP A.1 GENERAL

NAICS	Num. of Customers	CV RMSE	NMBE	NMAE	Adjusted R²
Agriculture, Mining & Construction	3,423	0.147	0.037	0.118	0.733
Institutional/Government	477	0.016	0.002	0.011	0.808
Manufacturing	122	0.006	0.000	0.004	0.834
Offices, Hotels, Finance, Services	1,038	0.009	0.001	0.007	0.855
Other	14	-0.002	-0.015	-0.005	0.686
Retail Stores	214	0.006	0.002	0.004	0.860
Schools	14	0.012	0.002	0.009	0.879
Wholesale, Transport, Other Utilities	1,009	0.271	0.048	0.216	0.769
Unknown	56	0.525	0.232	0.363	0.819

TABLE B-4: SPECIFICATION TEST RESULTS FOR PROXY DAY TESTING - PG&E SUBGROUP A.2 BIP

NAICS	Num. of Customers	CV RMSE	NMBE	NMAE	Adjusted R²
Agriculture, Mining & Construction	47	0.461	0.304	0.364	0.775
Manufacturing	29	0.008	-0.001	0.006	0.801
Offices, Hotels, Finance, Services	1	0.016	0.000	0.012	0.715
Wholesale, Transport, Other Utilities	30	0.016	0.002	0.012	0.774
Agriculture, Mining & Construction	47	0.461	0.304	0.364	0.775
Manufacturing	29	0.008	-0.001	0.006	0.801
Offices, Hotels, Finance, Services	1	0.016	0.000	0.012	0.715

TABLE B-5: SPECIFICATION TEST RESULTS FOR PROXY DAY TESTING - PG&E SUBGROUP A.4 VPP BY SEGEMENT

Local Capacity Area	Num. of Segments	CV RMSE	NMBE	NMAE
Greater Bay Area	27	0.011	0.007	0.008
Greater Fresno Area	4	0.040	-0.003	0.025
Humboldt	3	0.099	-0.044	0.063
Kern	1	0.012	-0.003	0.009
North Coast and North Bay	11	0.050	0.028	0.036
Other	16	-0.046	-0.006	-0.034
Sierra	5	-0.065	0.090	-0.062

TABLE B-6: SPECIFICATION TEST RESULTS FOR PROXY DAY TESTING - PG&E SUBGROUP A.4 VPP BY SEGEMENT

NEM Status	Enrollment Group	Num. of Customers	CV RMSE	NMBE	NMAE	Adjusted R^2
NEM	Auto-enrollment CARE	6,790	0.085	-0.013	0.070	0.507
NEM	Auto-enrollment FERA	2,307	0.051	0.012	0.041	0.503
NEM	Auto-enrollment HER	9,733	0.117	0.008	0.088	0.458
Non-NEM	Auto-enrollment CARE	11,793	0.059	-0.015	0.048	0.593
Non-NEM	Auto-enrollment FERA	9,640	0.067	-0.021	0.054	0.599
Non-NEM	Auto-enrollment HER	13,321	0.058	0.009	0.048	0.568
Non-NEM	Self-Enrollment	1,520	0.039	-0.007	0.033	0.605

TABLE B-7: SPECIFICATION TEST RESULTS FOR PROXY DAY TESTING - PG&E SUBGROUP B.2 CBP AGGREGATOR BY SEGEMENT

| NAICS	Num. of Customers	CV RMSE	NMBE	NMAE	Adjusted R^2
Agriculture, Mining & Construction	148	1.543	0.685	1.184	0.743
Institutional/Government	34	0.007	0.000	0.005	0.912
Manufacturing	13	0.009	0.002	0.007	0.758
Offices, Hotels, Finance, Services	9	0.014	-0.002	0.008	0.885
Other	1	0.003	0.000	0.002	0.727
Retail Stores	299	0.000	-0.001	0.001	0.942
Wholesale, Transport, Other Utilities	36	0.415	-0.144	0.304	0.745

B.2   ACTUAL VS PREDICTED PROXY DAY LOAD SHAPES

B.2.1   Ex Post Models

As a means of visually assessing how well the statistical models predicted usage, Figure B-1 through Figure B-6 show the average actual and predicted load on proxy event days for ELRP subgroup. In general, these figures show good model fits. However, these us some level of deviation from predicted loads across subgroups.
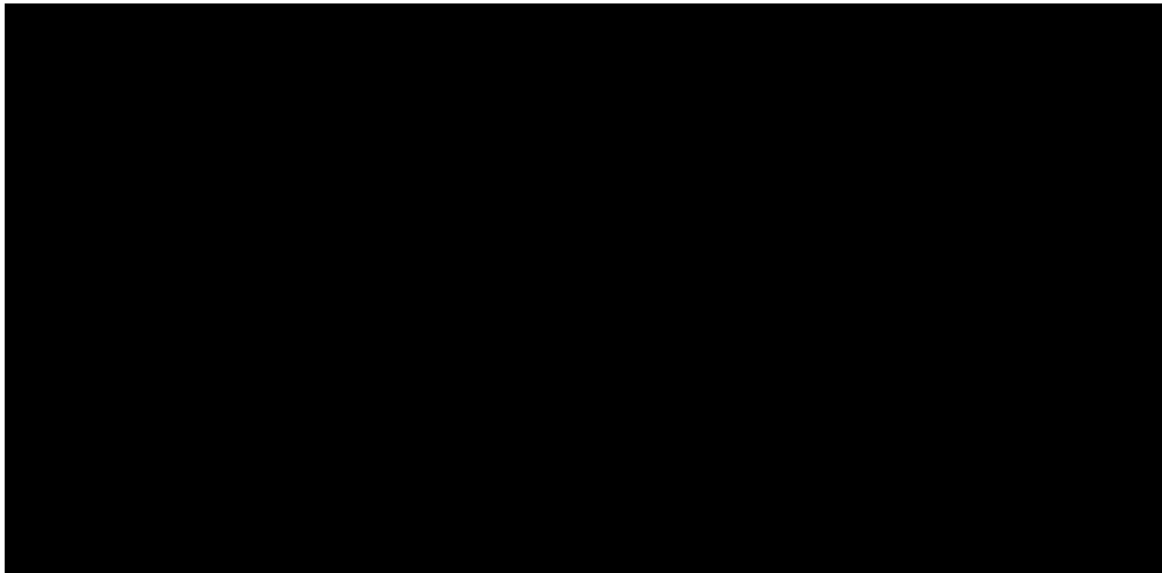
FIGURE B-1: PG&E EX POST INDIVIDUAL MODEL PROXY DAY ACTUAL VS. PREDICTED LOAD — A.1 BIP
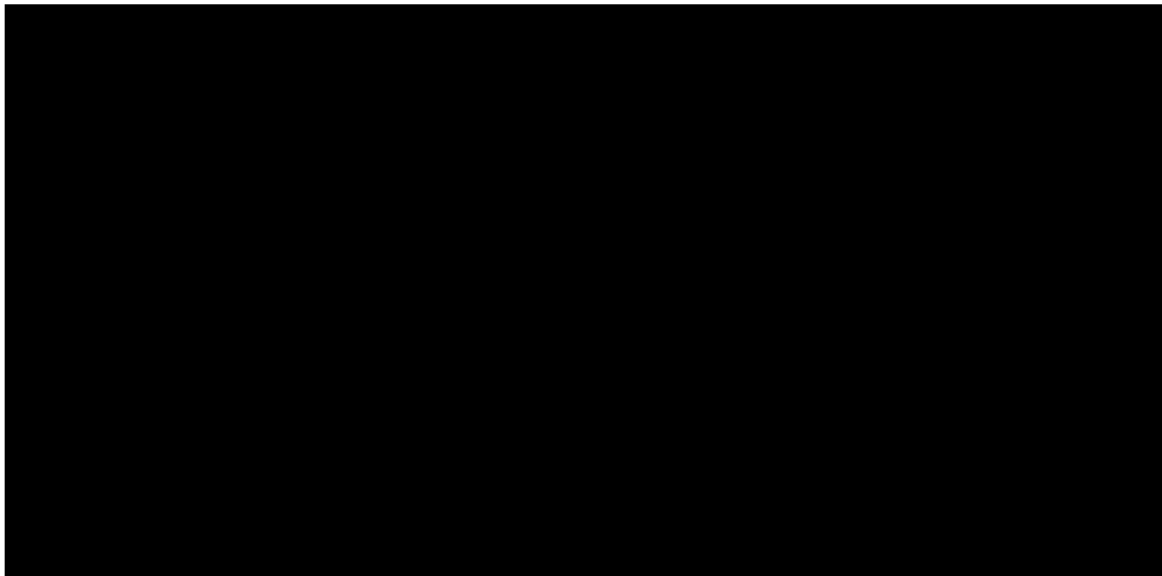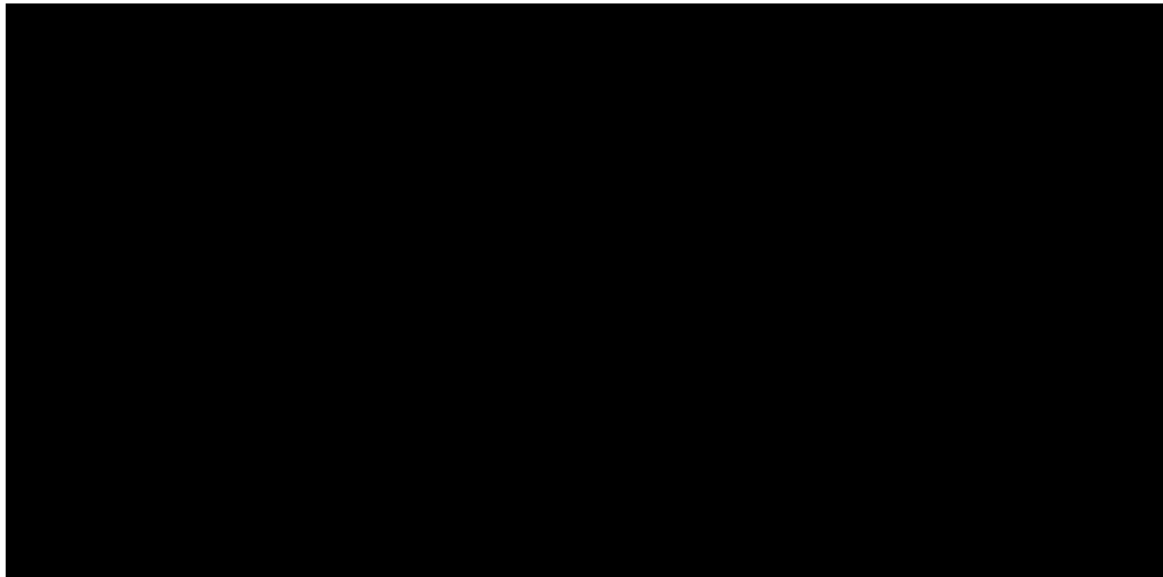
FIGURE B-2: PG&E EX POST INDIVIDUAL MODEL PROXY DAY ACTUAL VS. PREDICTED LOAD – A.1 GENERAL
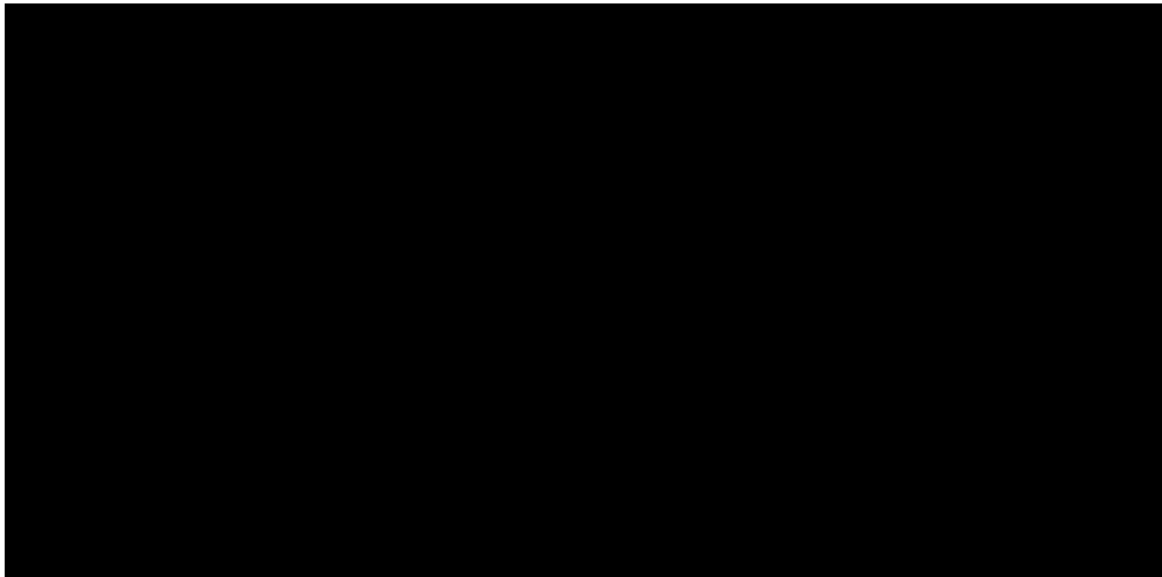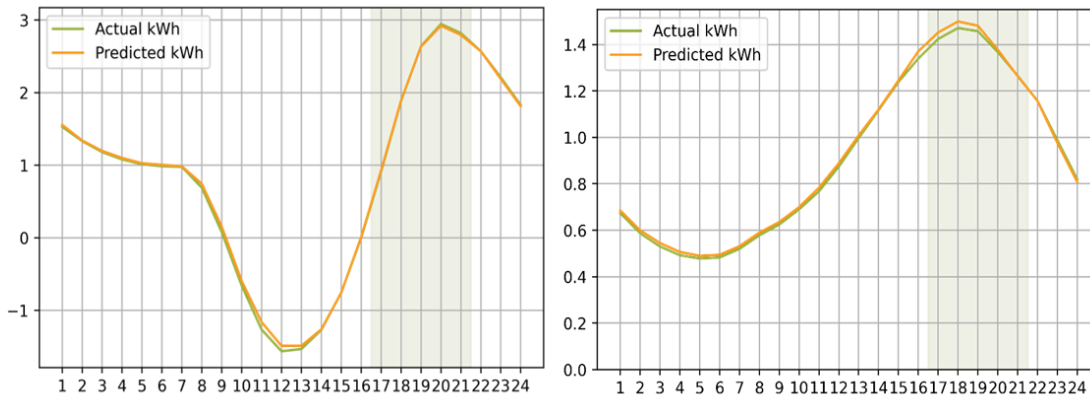

FIGURE B-3: PG&E EX POST INDIVIDUAL MODEL PROXY DAY ACTUAL VS. PREDICTED LOAD – A.2 BIP

FIGURE B-4: PG&E EX POST INDIVIDUAL MODEL PROXY DAY ACTUAL VS. PREDICTED LOAD — A.4 VPP

FIGURE B-5: PG&E EX POST INDIVIDUAL MODEL PROXY DAY ACTUAL VS. PREDICTED LOAD NEM (RIGHT) AND NON-NEM (LEFT) — A.6 RESIDENTIAL

FIGURE B-6: PG&E EX POST INDIVIDUAL MODEL PROXY DAY ACTUAL VS. PREDICTED LOAD — B.2 CBP AGGREGATOR