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MEMORANDUM

TO: Megha Lakhchaura

DATE: May 7, 2011

RE: Analysis of data screening methods and affect on final 2009 LIEE impact estimates

This memo details the alternative regression modeling that was done as part of the 2009 LIEE Impact Evaluation. This modeling was done to explore the possible affect that our data screening methods might be having on the final impact estimates reported in the Draft LIEE Program Impact Evaluation Report (March 11, 2011). This alternative modeling exercise was conducted to address questions raised in an April 18 memo from The East Lost Angeles Community Union (TELACU) regarding the screening criteria used for the regression model reported in the draft impact evaluation report. In this memo, TELACU hypothesizes that the low reported impact estimates are due not to market factors, but rather to screening criteria that were too stringent, thereby reducing savings by limiting the model to only customers with relatively low gas or electricity consumption.

One of the challenges of using a billing regression to estimate impacts for residential measures is that there is significant variation in energy consumption across households. This problem is compounded by the fact that the expected savings from many of the low-income measures is small relative to overall energy use in these homes. If this variation is not accounted for in the regression model, it can affect the savings estimates (either positively or negatively) depending on the source of variation. With the population model we estimated using the participant tracking data, there was limited information available on these households, which in turn limited our ability to create variables to control for the factors causing the variation. To help address this issue, we implemented a screening process that removed some customers with excessively large or small amounts of usage in particular months. This was done to increase the likelihood that the model would produce meaningful savings estimates and avoid the problem of having the savings effect overwhelmed by the variation in usage across customers.

To address the hypothesis that our screening methods (rather than other market factors) are responsible for producing the low impact estimates presented in the draft report, we re-ran the regression models with the screening criteria relaxed. In the original models, customers were dropped it they had usage of greater than 1,500 kWh in a single month or 100 therms in a single month. In the new model, these criteria were relaxed with the maximum limits set to 60,000 kWh per year and 10,000 therms per year – both of these limits far exceed the average usage for the

low income customers in our analysis dataset. In both models, additional observations were screened out for the following reasons:

- Missing data in critical fields used in the model
- Insufficient pre-period billing data
- Insufficient post-period billing data
- Monthly billing period had too few days (<20 days) or too many days (>40 days)

The results of the original and new screening methods are shown in Table 1. As shown in the bottom row, new screening criteria results in the sample for the regression increasing from 35,894 customers to 46,701 customers (30 percent) for the electric model and from 35,341 to 65,182 (84 percent) for the gas model. By relaxing the usage screens, the number of customers that are screened out due to high usage falls by 64 percent for the electric model and 96 percent of the gas model. The other screens for missing data described above were maintained in the new model.

Table 1: Comparison of Usage Screening Criteria

	Draft Report Screens		Relaxed Usage Screens	
	kWh Obs	Therm Obs	kWh Obs	Therm Obs
Raw Data	110,544	118,420	110,544	118,420
High / Low Screens	16,886	31,041	6,079	1,200
Other Screens	57,764	52,038	57,764	52,038
Screened Dataset	35,894	35,341	46,701	65,182
Screened Obs	74,650	83,079	63,843	53,238
Percent Screened	67.53%	70.16%	57.75%	44.96%

Once the new analysis dataset was created, a billing regression model was estimated using the same model specification presented in the draft report. The model estimates were then used to calculate program impacts and compared to the results presented in the draft report. These results are presented in Table 2 for the electric model and Table 3 for the gas model. Note that for both models, the measures with *negative* savings (that is, measures where the model predicts an *increase* in energy use) are capped at zero savings.

As shown in Table 2, the new electric model with the relaxed screening criteria results in generally lower savings overall (41 percent decrease). With the relaxed screening criteria, CFL savings fall to zero and HWD Light savings decrease by 21 percent. Savings for Refrigerators and Insulation/Cooling also decrease with the relaxed usage screen method. While some measures do show an increase in savings in the new model (Evaporative Cooler, Weatherization/Cooling), these increases are not enough to overcome the decrease in savings estimated for the other measures.

Table 2: Electric Model Results Comparison (Per Unit kWh Savings)

	Model from Draft Report		Relaxed Usage Screen	
Measure	**# Homes**	**Savings (kWh)**	**Savings (kWh)**	**Change**
Refrigerator	9,086	709.46	544.75	-23%
DHW Conservation	2,253	0.00	0.00	0%
CFL	32,077	93.20	0.00	-100%
HWD Light	11,951	100.21	79.55	-21%
Pool Pump	7	0.00	0.00	0%
Evaporative Cooler	1,191	464.57	503.18	8%
AC	112	56.23	178.10	217%
Insulation/Heating	44	0.00	125.63	0%
Insulation/Cooling	58	148.76	105.66	-29%
Weatherization/Heating	1,213	0.00	65.02	0%
Weatherization/Cooling	803	80.16	90.03	12%
Total Savings		**11,265,990**	**6,682,301**	**-41%**

Results of the gas model using both screening methods are shown in Table 3. As with the electric model, the relaxed screening method results in lower overall savings (decrease of 13 percent overall). For the individual measure estimates, there is an increase in the Insulation impact estimate (24 percent increase) and a slight increase in DHW Conservation (3 percent increase). However, these increases are overwhelmed by decreases in the Duct savings (68 percent decrease) and the Weatherization measures, where savings disappear entirely when using the relaxed screening criteria.

Table 3: Gas Model Results Comparison (Per Unit Therm Savings)

	Model from Draft Report		Relaxed Usage Screen	
Measure	**# Homes**	**Savings (Therms)**	**Savings (Therms)**	**Change**
DHW Conservation	35,200	8.2	8.5	3%
DHW Repair/Replace	1,570	0.0	0.0	--
Insulation	2,404	8.6	10.5	23%
Furnace Repair	1,596	0.0	0.0	--
Furnace Replace	2,778	0.0	0.0	--
Ducts	3,689	4.0	1.3	-68%
Weatherization	25,783	1.9	0.0	-100%
Total Savings		**375,883**	**328,359**	**-13%**

As these results show, the original usage screening methods used in the draft report are not the cause of the low impact estimates for either the electric or gas model. Given the generally lower savings estimates from relaxing the usage screen criteria, we believe that the original, more stringent screening method is appropriate. Therefore, we do not recommend changing the impact estimates from the values already presented in the draft impact evaluation report.