

# Financing or Incentives: Disentangling Attribution

*Antje S. Flanders, Opinion Dynamics Corporation, Waltham, MA*

## ABSTRACT

Financing programs are getting more and more attention as program administrators are trying to find new ways to attract hard-to-reach and underserved populations and to reduce first-cost barriers to the installation of energy-efficient equipment. In some cases, financing is offered as an alternative to incentives; in other cases, both are offered for the same project – sometimes through the same program and sometimes through two different programs. When incentives and financing are both offered for the same installation, the question of attribution can become challenging.

This paper presents results from a recent impact evaluation of the PY 2013/14 California non-residential On-Bill Finance (OBF) programs (Opinion Dynamics 2017) that offer loans at zero percent interest. Participants in the programs also participate in the utilities' incentive programs. Two key objectives of the evaluation, discussed in this paper, were (1) to quantify incremental net energy savings attributable to the OBF programs, beyond the savings realized by the incentive programs alone; and (2) to assess the relative importance of the loan and the incentive. The key research approach was a participant survey, which included a freeridership (FR) battery that was built upon the FR battery used for the California non-residential incentive programs, but was modified to tease apart the relative influence of the incentive and the OBF loan on participants' decision-making.

## Introduction

### Program Background

The California non-residential OBF programs are offered by the four California investor-owned utilities (IOUs): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), the Southern California Gas Company (SCG), and the San Diego Gas and Electric Company (SDG&E). The four programs are open to all non-residential customers. While implementation details (e.g., delivery channels, loan tracking, application processing) differ, many key elements are the same across all four IOUs, including repayment through the utility bill, 0% interest, bill neutrality, and maximum loan terms and caps. In order to participate in the 2013/14 OBF programs, customers also had to participate in one of the IOUs' non-residential incentive programs. Savings from OBF-funded projects are claimed through the incentive programs in which customers participate. The IOUs currently do not directly claim savings for the OBF programs.

### Evaluation Background

The OBF impact evaluation was conducted in two phases. Phase I included an assessment of available data and early data collection efforts. The primary objectives of Phase II were to:

- Develop an estimate of gross energy savings associated with projects that were completed and received an OBF loan during the 2013/14 evaluation period;
- Develop an estimate of FR and net savings for the OBF programs;
- Develop an estimate of incremental net savings of the OBF program, relative to net savings already claimed by the incentive programs;

- Assess the relative importance of the OBF loan and the incentive in customer decision-making; and
- Determine sources of OBF project funding.

The key research approach was a survey of 136 participants, fielded in the summer/fall of 2016. The survey included a FR battery that was built upon the FR battery used for the California non-residential incentive programs (The Nonresidential Net-to-Gross Ratio Working Group 2012). We augmented the incentive program battery with questions about the OBF loan to enable us to tease apart the influence of the incentive and the loan on participants' decision-making. We used a stratified random sampling approach with sampling domains defined by PA and by technology (lighting and non-lighting).

### **Focus of This Paper**

This paper focuses on two key aspects of the OBF impact evaluation and answers the following questions:

1. What were the incremental net impacts of the 2013/14 OBF programs, relative to net impacts already claimed by the incentive programs?
2. What was the relative importance of the loan versus the incentive in participants' decision to complete the energy-efficient installations?

### **Policy Context**

The selection of the most appropriate methodology to assess attribution and determine the relative contribution of financing and incentives to program outcomes is highly dependent on the policy context of the offered program(s). In the case of the evaluated California OBF programs, customers could only receive a loan if they also participated in a utility incentive program. In addition, there was an established methodology and an existing estimate of net impacts for the incentive programs, and savings from OBF projects were being claimed under the incentive programs. Given this context, we selected the attribution approach described in this paper to determine OBF net incremental impacts. However, it is important to recognize that this approach may not be the most appropriate in other policy situations.

When considering whether to offer loans, or incentives, or both, it might be useful to think of customers as falling into one of five mutually exclusive and exhaustive groups:

1. Those who need neither incentives nor financing to take action
2. Those who need both incentives and financing to take action
3. Those who need incentives but not financing to take action
4. Those who need financing but not incentives to take action
5. Those who need *either* financing *or* incentives, but not both, to take action

The FR and relative importance approaches described in this paper draw on survey data that enable categorization of participants into the first four groups. However, in a policy context different from the one described here, the fifth group would be equally important to characterize in order to fully understand the interaction between loans and incentives and to optimize program design decisions.

## OBF Net Incremental Impact Analysis

OBF incremental net impacts are defined as net impacts that are attributable to the OBF programs but that have not already been claimed by the PAs through the incentive programs.

### Methodology

To determine incremental net impacts from the OBF programs, we compared two sets of net-to-gross ratios (NTGRs) for the same set of 2013/14 OBF projects. The first set of NTGRs was developed based on the results of the OBF participant survey (referred to as “OBF NTGR”). The second set of NTGRs is based on measure-level NTGRs developed through the incentive program evaluations for projects that received an OBF loan (referred to as “Incentive Program NTGR for OBF Projects”). This second set of NTGRs was used to calculate the net savings the IOUs have claimed for their 2013/14 incentive programs (for projects that received an OBF loan). OBF incremental NTGRs are calculated as the difference between the two estimates:

$$\text{OBF Incremental NTGR} = \text{OBF NTGR} - \text{Incentive Program NTGR for OBF Projects}$$

The methodology for both NTGRs is described below.

**OBF NTGRs.** We developed IOU/technology-specific NTGRs for the OBF programs based on results of the participant survey. The NTG analysis for the OBF programs only included consideration of FR; it did not include spillover or market effects. The NTGR is therefore defined as:

$$\text{NTGR} = 1 - \text{FR}$$

The NTGRs represent the overall influence of the OBF programs (including the OBF loan, the incentive, and other support provided by the programs) on customers’ decision to install energy-efficient equipment.

We used a FR methodology that closely follows the methodology developed by the California Nonresidential Net-to-Gross Working Group and employed in the net impact evaluations for the California large non-residential incentive programs. This methodology is based on three program attribution indices (PAIs) which can range from 0 (full freerider) to 1.0 (not a freerider). We adapted this method to explicitly incorporate consideration of the OBF loan. The three PAIs are defined as follows:

- **Program Attribution Index 1 (PAI-1)** reflects the influence of the most important of various program-related elements in the customer’s decision to select a given program measure. The PAI-1 score is calculated as the highest program influence factor (rated on a scale of 0 to 10) divided by the sum of the highest program influence factor and the highest non-program influence factor. In the participant survey, we asked respondents to rate the following program and non-program influence factors:
  - **Program factors:** OBF loan, program incentive, information from PA-provided audit, information from PA-provided training, information from program marketing materials, assistance from a program contractor, recommendation from an account representative, and other program factors (based on open-ended response).
  - **Non-program factors:** Age or condition of the old equipment, recommendation from a non-program contractor or vendor, previous experience with energy-efficient products, previous experience with energy efficiency programs, standard industry practice, corporate policy, improved product quality, government regulations, organization's

remodeling or equipment replacement practices, and other non-program factors (based on open-ended response).

In addition, we asked respondents to rate the importance of financial criteria (payback or return-on-investment) in their decision to install the program measure. Financial criteria are considered a program factor if the incentive moved the energy-efficient project within the acceptable range of their financial criteria (based on a follow-up question), but it is considered a non-program factor if it did not.

- **Program Attribution Index 2 (PAI-2)** captures the perceived importance of program factors relative to non-program factors in the decision to implement the program measure. This score is determined by asking respondents to divide a total of 10 points between the OBF program (including the OBF loan, the incentive, and other support provided by the programs) and other factors. The points given to the program are adjusted (i.e., divided by 2) if the respondent reports that they had made the decision to implement the measure before learning about the program. This adjusted score is divided by 10 to convert it into decimal format, thus making it consistent with PAI-1.
- **Program Attribution Index 3 (PAI-3)** reflects the likelihood that the respondent would have implemented the exact same project if the OBF program had not been available (the counterfactual). This score is calculated as 10 minus the likelihood that the respondent would have implemented the same measure in the absence of the OBF program. This score is divided by 10 to convert it into decimal format, thus making it consistent with PAI-1 and PAI-2.

Table 1 summarizes the three PAIs and the adjustments made to support the OBF FR analysis.

Table 1. Changes to Nonresidential Incentive Program Freeridership Algorithm

PAI	Description of Nonresidential Incentive Program Algorithm	Changes to Determine Overall Influence of OBF Program	
		Survey Questions	NTG Algorithm
PAI-1	Max Program Factor / (Max Program Factor + Max Non-Program Factor)	<u>Add question about importance of loan:</u> “How important was the on-bill finance loan in your decision to install this equipment?”	Same algorithm; include loan as an additional program factor
PAI-2	Points given to program / 10 (divided by 2, if respondents made decision about equipment before they found out about the program)	<u>Ask respondent to allocate 10 points between two factors:</u> 1) the OBF program 2) other factors  <u>Add new timing of decision-making question:</u> “Did your organization make the decision to install this new equipment before or after you became aware of the OBF loan?”	Same algorithm; program points refer to the OBF program (which includes the incentive) rather than the incentive program  Timing adjustment (division by 2) is applied if respondents made decision about equipment before they found out about the loan or the incentive
PAI-3	(10 - Likelihood they would have installed the exact same EE equipment if the incentive program had not been available) / 10	<u>Ask likelihood question about OBF program:</u> “What is the likelihood that you would have installed exactly the same program qualifying energy-efficient equipment if you had received neither the loan, nor the rebate, nor any other support from the On-Bill Finance Program?”	Same algorithm; likelihood rating refers to the overall OBF program

We estimated the respondent-level NTGRs as the average of the three PAI scores. In cases where PAI-3 is equal to zero (0.0) or one (1.0), PAI-1 is dropped, and the NTGR is calculated as the average of PAI-2 and PAI-3. If one of the three scores was not available (generally due to respondents giving a “don’t know” response or refusing to answer the question), then the NTGR was estimated as the average of the two available scores. If two or more scores were missing, we dropped the respondent from the FR analysis.

We calculated separate NTGRs for each sampling domain, i.e., by IOU and technology (lighting and non-lighting projects). To develop these domain-level NTGRs, we applied savings-based weights to the sampled projects within each sampling domain. We then developed IOU-level NTGRs by applying technology-level savings weights that reflect the relative contribution to program savings from lighting and non-lighting measures. We developed the statewide NTGRs by applying IOU-level savings weights that reflect the relative contribution to statewide OBF savings by each IOU.

**Incentive program NTGRs for OBF projects.** Incentive program NTGRs for OBF projects are based on measure-level NTGRs developed in the incentive program evaluations, which we aggregated across 2013/14 OBF projects, by IOU and technology. These incentive program NTGRs were developed based on research with a sample of incentive program participants, which are mostly customers who only received an incentive. These incentive program NTGRs are applied to all incentive program participants, including

those who also got an OBF loan. Incentive program net savings for 2013/14 OBF projects thus represent the net savings that the California IOUs have already claimed for 2013/14 OBF projects.

## Results

Based on the OBF net impact analysis, the overall NTGR for the 2013/14 OBF programs is 0.67 (with a relative precision of 0.04 at 90% confidence). The NTGR for lighting is 0.70 (with a relative precision of 0.04 at 90% confidence) while the NTGR for non-lighting is 0.63 (with a relative precision of 0.07 at 90% confidence). These values are higher compared to incentive program NTGRs for OBF projects of 0.58 (overall), 0.56 (lighting), and 0.59 (non-lighting). The resulting incremental NTGRs are 0.09 for the overall program, 0.13 for lighting projects, and 0.04 for non-lighting projects.<sup>1</sup>

Applied to gross savings from OBF projects, OBF incremental net savings were estimated to be 25,539 MMBtu, with lighting projects accounting for 20,370 MMBtu (or 80%). Table 2 summarizes these results.

Table 2. OBF Incremental Net Impacts

	OBF Gross Savings (MMBtu)	Estimate 1		Estimate 2		OBF Incremental Net Impacts	
		OBF NTGR	OBF Net Savings (MMBtu)	Incentive Program NTGR	Incentive Program Net Savings for OBF Projects (MMBtu)	Incremental NTGR	Incremental Savings (MMBtu)
	(1)	(2a)	(2b=1*2a)	(3a)	(3b=1*3a)	(2a-3a)	(2b-3b)
Overall	287,142	0.67	191,476	0.58	165,937	0.09	25,539
Lighting	152,680	0.70	106,331	0.56	85,962	0.13	20,370
Non-Lighting	134,461	0.63	85,145	0.59	79,976	0.04	5,169

## OBF Loan-to-Incentive Ratio Analysis

The primary objectives of this analysis were to determine the relative importance of the OBF loan and the program incentive in customers' decision to install energy-efficient equipment and to develop relative importance ratios.

## Methodology

The analysis was based on the responses to the FR questions in the participant survey. We used three concepts to develop an overall importance score for the OBF loan and for the program incentive. The concepts are the same as those used to develop the three PAI scores discussed above. For each concept, we developed a score that can range from 0 to 10, where 0 means not important and 10 means very important. The three scores are defined as follows:

- Score 1 reflects the importance ratings of the OBF loan and of the incentive (based on PAI-1 questions). The scores are equal to the importance ratings.
- Score 2 reflects the points allocated to the OBF loan and to the incentive (based on additional PAI-2 questions). The scores are equal to the allocated points.

<sup>1</sup> Note that the relative precision around these incremental NTGRs is unknown. However, we expect the confidence intervals around these estimates to be relatively wide, given the small overall difference between the two means.

- Score 3 reflects the likelihood to install the exact same equipment without the OBF loan and without the incentive (based on additional PAI–3 questions). The scores are equal to 10 minus the likelihood ratings.

For both the OBF loan and the incentive, we averaged the three scores and developed a respondent-level Loan-to-Incentive Ratio (LIR) by dividing the average score for the loan by the average score for the incentive. Similar to the FR analysis, if one of the scores was missing, then the ratio was estimated as the average of the two available scores. If two or more scores were missing, we dropped the respondent from the ratio analysis.

We developed PA-level and technology-level LIRs by applying MMBtu-weights to the respondent-level average loan and incentive scores. The weights reflect both the savings of the respondent’s project as well as the relative contribution of the respondent’s sampling domain to overall OBF savings. We then developed the aggregate LIRs by dividing the sum of the weighted loan scores by the sum of the weighted incentive scores.

## Results

LIR analysis results include average loan and incentive scores and the resulting LIRs. In addition to these aggregate results, we developed a series of scatter plots that show the distribution of participant responses. Each scatter plot shows the loan importance score on the y-axis and the incentive importance score on the x-axis. Values on both axes range from 0 to 10, where 0 means not important and 10 means very important. The diagonal line shows score equality, where a particular loan score is equal to the corresponding incentive score. Respondents plotted above this line reported a higher relative importance of the OBF loan, whereas those falling below this line reported a higher relative importance of the incentive. The relative size of each circle corresponds to the size of the respondent’s project. Each scatter plot also shows the weighted average loan and incentive scores (calculated as the average of Scores 1, 2, and 3 for the loan and the incentive, respectively) and the weighted average LIR (calculated as the weighted average loan score divided by the weighted average incentive score).<sup>2</sup>

**Overall LIR results.** Participants generally provided higher importance ratings to the OBF loan than to the incentive, resulting in an average loan score of 6.2, an average incentive score of 5.6, and an LIR of 1.10. The top left quadrant of Figure 1 shows the distribution of the combined importance scores (i.e., the average of Scores 1, 2, and 3). The figure shows a clustering of circles around the middle of the graph, with slightly more of the volume of respondent’s circles falling above the equality line.

The other three quadrants of Figure 1 show scatter plots for the three component scores:

- Score 1 compares each respondent’s importance rating of the loan with that of the incentive. Participants generally gave high importance ratings to both the loan and the incentive, resulting in a clustering of circles in the upper right hand portion of the graph, centered around the equality line. The resulting Score 1 weighted averages are 8.9 for the loan and 8.8 for the incentive with an LIR of 1.01, indicating almost equal importance of the loan and the incentive for this measurement.
- Score 2 compares the number of points each respondent allocated to the loan with points allocated to the incentive. In contrast to Score 1, circles are centered around the bottom left corner of the graph. This is not an indication of low importance of the loan and incentive but a function of how the score is constructed: While the ratings underlying Score 1 can each range

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<sup>2</sup> All averages are weighted. The weights reflect both the savings of the respondent’s project as well as the relative contribution of the respondent’s sampling domain to overall OBF savings.

from 0 to 10, for Score 2, the respondent is asked to *divide* 10 points, between the OBF loan, the incentive, and other OBF program factors, as well as non-program factors. Because the 10 points are split between three facets of the OBF program and other non-program factors, the average scores for the loan (3.8) and incentive (3.2) are significantly lower than those for Score 1. Importantly, however, it is not the magnitude of the loan and incentive scores that is the focus of this analysis, but the scores in relation to one-another, i.e., their ratio. While Score 1 shows equal importance of the loan and incentive, Score 2 shows a clustering of circles above the diagonal equality line and an LIR of 1.21, indicating a higher relative importance of the OBF loan.

- Score 3 compares the likelihood that a respondent would have completed the exact same project without the OBF loan and without the incentive.<sup>3</sup> Responses for Score 3 are more dispersed compared to Scores 1 and 2, with an average loan score of 5.8 and an average incentive score of 4.9. The resulting LIR is 1.19, again indicating a higher relative importance of the OBF loan.

Figure 1 summarizes the results of the LIR analysis, by score and combined.

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<sup>3</sup> Based on the survey question, a higher likelihood to install the same equipment without the program means lower program importance. In order for higher scores to indicate higher importance, the scores were calculated as 10 minus the likelihood rating.



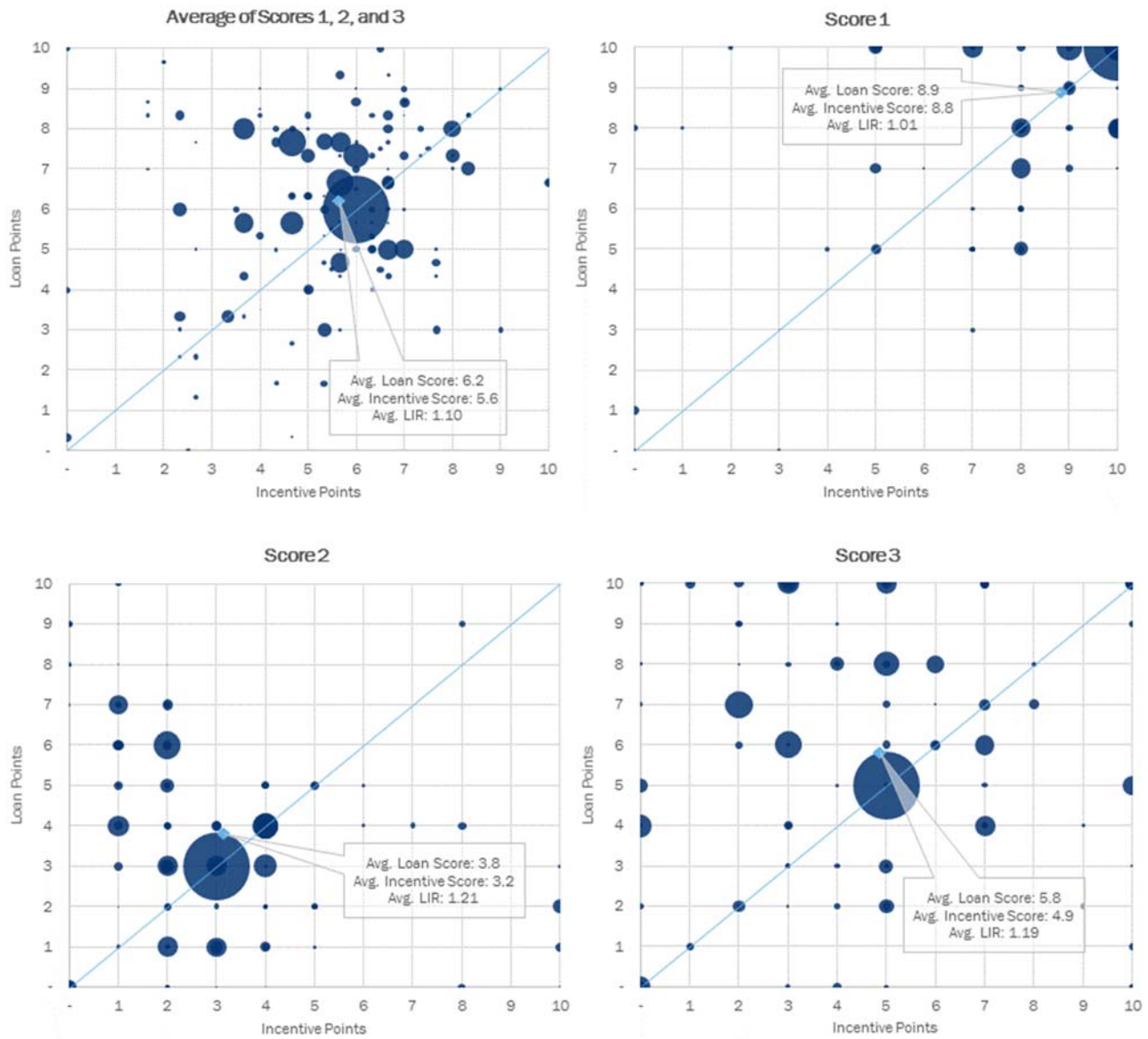


Figure 1. Overall Loan-to-Incentive Ratio, Average and by Score

**LIR results by technology.** The relative importance of the loan and the incentive is similar for lighting and non-lighting projects. Both technologies have similar LIRs (1.09 for lighting and 1.11 for non-lighting), although non-lighting projects have higher average loan scores and incentive scores.

Figure 2 summarizes the weighted average OBF loan and incentive scores and resulting LIR, by technology.

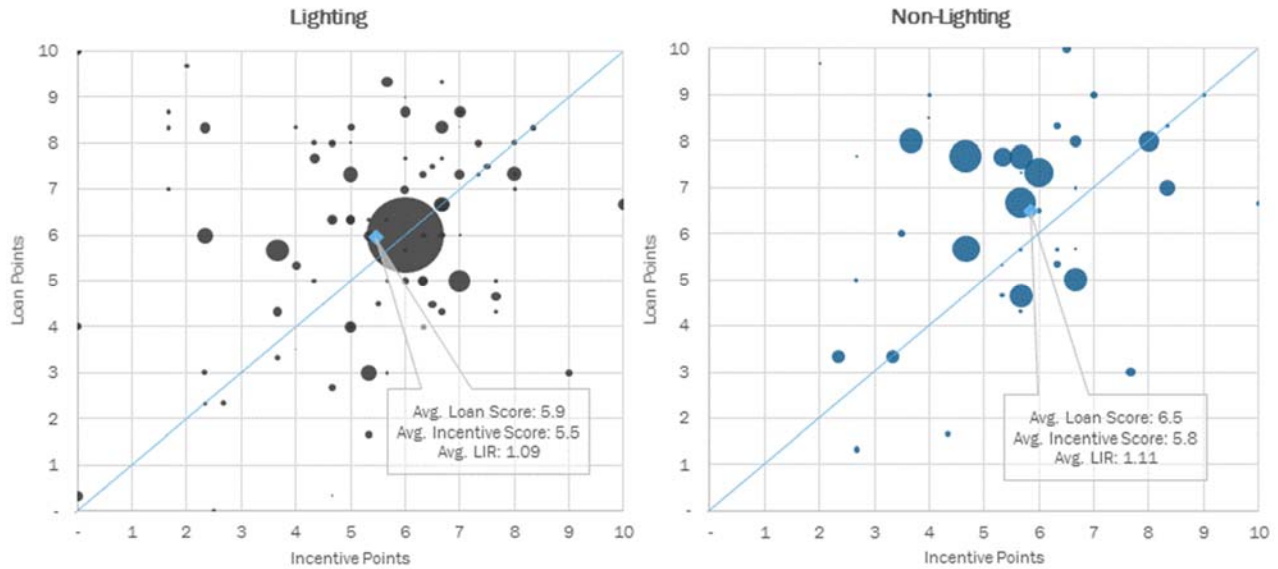


Figure 2. Loan-to-Incentive Ratio, by Technology

## Conclusions

The results of the OBF incremental net impact analysis indicate that there are incremental net savings associated with OBF loans that exceed those currently being claimed by the IOU incentive programs. The overall NTGR of 0.67 exceeds the incentive program NTGR for OBF projects by 0.09. It should be noted, however, that the incremental NTGR of 0.09 does not represent the relative importance of the OBF loan in the overall OBF program attribution. Rather, it shows the degree by which the incentive program NTGR for OBF projects underestimates the OBF NTGR.

Our research into the relative importance of the OBF loan and the incentive shows that both are very important in customers' decisions to implement high-efficiency projects and that both are often needed to allow the customer to go forward with their project. Based on statewide survey responses and our LIR analysis, customers consider the loan to be slightly more important than the incentive.

## References

- Opinion Dynamics. 2017. "PY 2013/14 On-Bill Finance Programs: Impact Evaluation." June 1, 2016. [http://www.calmac.org/publications/PY2013-14 On-Bill Finance Impact Evaluation.pdf](http://www.calmac.org/publications/PY2013-14%20On-Bill%20Finance%20Impact%20Evaluation.pdf)
- The Nonresidential Net-to-Gross Ratio Working Group. 2012. "Methodological Framework for Using the Self-report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers." October 16, 2012. <http://www.energydataweb.com/cpucFiles/pdaDocs/910/Nonresidential%20NTGR%20Methods%202010-12%20101612.docx>.