Review and Benchmarking
of the
New Jersey Clean Energy Program
prepared for
The New Jersey Board of Public Utilities

energy & resource solutions

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1. EXECUTIVE SUMMARY

This report documents the results of a review and benchmark of the New Jersey Clean Energy Program (NJCEP). The report was authored by ERS with support from the Office of Clean Energy (OCE), Rutgers' Center for Energy, Economic & Environmental Policy, and the market manager teams: Applied Energy Group, TRC Engineering Services, and Honeywell. The goal of the effort was to:

- Update and expand the Portfolio and Program Benchmark Analysis of September 2012.
- Determine the reasons why NJCEP's programs compared as they did to other programs during the benchmark and articulate recommendations in response.
- Propose target metrics that NJCEP's programs should strive towards.

The report includes a discussion of the approach used to achieve these objectives, portfolio-level findings, and a detailed examination of the results for each program provided as appendices. This executive summary highlights the key aspects of the work and results, with detail provided in the subsequent sections and appendices. Please note that Appendix L summarizes all the recommendations in a two-page table, including the page numbers on which more detail can be found.

The program-specific findings and recommendations are the primary outcome of this study. The total detail associated with the fourteen in-scope programs may be too much for readers interested in a wide-angle review. Readers with portfolio-wide responsibilities are recommended to use the executive summary (in particular, the program-specific summaries in Section 1.3) as a guide, diving deeper on particular issues by referencing the later sections and appendices as needed. Those with an interest in a single program or a subset of programs are recommended to focus on the program appendices relevant to them after using the executive summary and approach sections to familiarize themselves with the mechanics of the study.

1.1 Approach

The project was composed of three steps. First, the programs were benchmarked. Second, the benchmark helped prioritize qualitative research on key program features for select programs. Finally, the qualitative research was combined with the original benchmark to develop target metrics for program planning and goals.

The programs[1,2] were benchmarked against twenty five program administrators (PAs) nationwide. The PAs selected for the comparison set were either regional neighbors (that are likely to experience similar climates and economic environments) or PAs nationally recognized for excellence in the delivery of efficiency programs; a full list of PAs is shown in Section 2.2. ERS matched the NJCEP programs to similar program models offered by the PAs and benchmarked the programs for the metrics shown in Table 1-1.

Table 1-1. Benchmarked Metrics[3]

Metric	Description
$/kWh	The average cost for the program to acquire a unit of electric energy savings
$/kW	The average cost for the program to acquire a unit of electric demand savings
$/therm	The average cost for the program to acquire a unit of gas savings
kWh/participant	The average electric energy savings acquired per participating customer
kW/participant	The average electric demand savings acquired per participating customer
therm/participant	The average gas savings acquired per participating customer
% spending on incentives	The percentage of program spending that goes towards incentives (as opposed to administrative costs)

Key aspects of the benchmarking approach include the following:

- The most recent full year of data available for NJCEP was 2012, which is "the year of record" for the NJCEP programs. Historical data as far back as 2010 was also reviewed for context.
- Each program-year (e.g., NJCEP Residential Existing Homes 2011) was used as one data point, such that a given program – from both NJCEP and comparison PAs – shows up multiple times in the data set.
- Only actual, first-year savings estimates were used, not lifetime savings values or planned savings.
- Because NJCEP does not report net values, gross savings were the primary comparison metric. Net values are presented for reference in the program-specific appendices.
- All values are presented on an unadjusted basis, but the two primary systematic biases observed in the data roughly cancel out (greater detail on these factors is presented in Section 2.2):
  - NJCEP's accounting (i.e., centralized marketing and evaluation budgets) differs from most programs and leads to an underestimate of NJCEP program spending of up to 20%, but more commonly between 5% and 15%.[4]NJCEP experiences costs of

[1] Note that only NJCEP programs were included, not programs run by utilities in New Jersey.
[2] The Energy Efficient Products program was split into component parts: Appliance Recycling, Upstream Lighting, and Appliance Rebates.
[3] The cost portion of the $/savings metrics refers to program costs only: the incentives and the administrative costs necessary to acquire the measure savings, not the cost to the customer or other societal costs.
[4] An analysis of spending patterns showed that comparison programs spent, on average, 7% of their program budgets on marketing, with 56% of the programs spending between 2% and 10% of their budgets on marketing and 88% spending less than 15% of their budgets on marketing. Additionally, evaluation is commonly mandated between

construction that are 9% higher than the average cost of construction among the comparison set.

- NJCEP tracks contractor payments and other non-incentive costs as incentives. This rendered unusable the budget breakdown benchmarking results for most NJCEP programs.
- Where necessary, ERS used average savings acquisition costs and program-specific savings volumes to split overall budgets into electric- and gas-specific budgets. This was necessary to develop meaningful spending metrics for those programs claiming both gas and electric savings.

Additional detail on the technical assumptions that went into the benchmark can be found in Section 2.2.

The benchmarking results helped ERS select programs for further research and identify questions on key features (e.g., savings assumptions, delivery model, etc.). ERS performed follow-up interviews for certain programs with both NJCEP and comparison PAs nationwide in order to understand why the benchmarking results came out as they did. This also enabled ERS to make recommendations on how to improve NJCEP's performance by leveraging ideas and program features from top performing programs nationwide. The specific areas and comparison PAs researched are articulated (along with the resulting conclusions and recommendations) in the program-specific appendices and are summarized in a later portion of this executive summary.

Finally, ERS set target metrics for each program. Target metrics focused on the prime benchmarking values: the average cost of procuring savings. ERS used the benchmark to identify the bounds of what can be reasonably achieved for a given program model. Furthermore, ERS used the qualitative findings to triangulate a specific target metric that takes into account NJCEP's particular approach and the possible steps it could take to improve a given program's performance.

1.2 Portfolio-Level Findings and Recommendations

The focus of the research and this report are the individual programs. Program-specific results are summarized in Section 1.3. Certain findings spanned across programs and thus are reported at the portfolio level. These are summarized here.

1.2.1 Portfolio-Wide Benchmarking Trends

The overall portfolio benchmark results are shown in Table 1-2 and Figure 1-1. The table shows the results for all metrics, both the calculated value and the percentile, for NJCEP's 2012 gross savings and spending data, which was the last full year available at time of research. Note that high percentiles (e.g., 90th percentile) are good.

3% and 5% of spending, with New York, California, and Massachusetts all spending 5% of program budgets on evaluation. More detail is provided in Section 2.2

- For "$/savings" metrics, a *high percentile* means that the program had a *low cost per unit savings* when compared to peer programs.
- For "savings/participant" metrics, a *high percentile* means that the program had a *high level of savings per participant* when compared to peer programs.
- For the "% spending on incentives" metric, a *high percentile* means that the program spent a *higher percentage of its money on incentives (*as opposed to administration) when compared to peer programs.

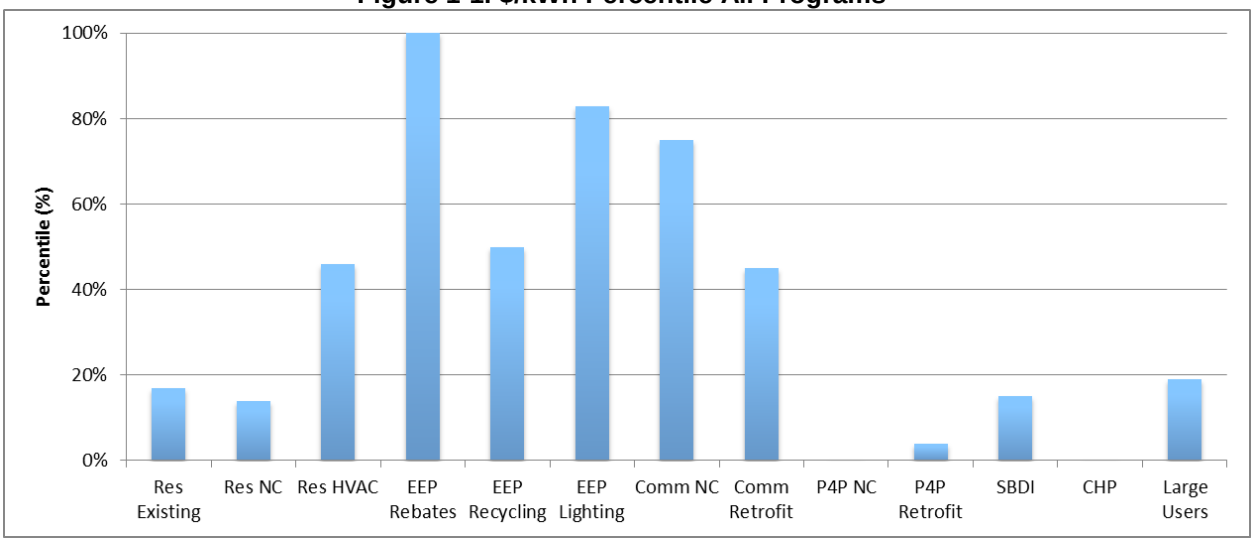
The first portfolio-wide trend of note in the data is an overall high cost per kWh relative to other programs. Figure 1-1 plots the percentile for $/kWh, the primary metric. It is only one perspective, but from that perspective it appears there is room for improvement. The portfolio's average percentile is the 39th percentile (with a median performance among the programs of 32nd percentile). It is neither possible nor desirable for NJCEP to be the top in all program categories. In many cases, being the "best" at a $/savings metric means overstating savings. Moreover, different variations on program models will lead, inherently, to different results, and those variations may be pursued for reasons beyond cost efficiency. Furthermore, as the preceding section notes in brief and Section 2.2 explains in detail, these data are imperfect indicators. Nonetheless, the program-by-program $/kWh results fall short of the level of excellence desired by the NJCEP administrators, with few exceptions. This portfolio-wide trend of cost inefficiency in the acquisition of savings is significant enough to demand attention, but too broad an observation to be actionable on its own. The challenges faced by each program are different and require different solutions. At the program level, the team researched causes in greater detail and proposed steps that can be taken to improve the programs' benchmarking results. These program-specific recommendations are the focus of this report and are summarized in Section 1.3.

The second interesting portfolio-wide trend from the overarching benchmarking results is that the programs tend to acquire demand savings more efficiently than they acquire energy savings. This turns out to be a function, primarily, of program design with either a de-emphasis of lighting measures (e.g., Residential Existing Homes) or an emphasis on non-lighting measures (e.g., Small Business Direct Install) leading to a more HVAC-heavy savings mix. HVAC measures tend to offer much better demand savings than energy savings on a per-dollar basis. Section 3.2 examines this trend in great detail.

Table 1-2. Summary of Benchmarking Results

Program / Metric	Res Existing	Res NC	Res HVAC	EEP Rebates	EEP Recycling	EEP Lighting	Comm NC	Comm Retrofit	P4P NC	P4P Retrofit	SBDI	CHP	Large Energy Users
$/kWh	$3.51	$2.47	$0.80	$0.16	$0.19	$0.04	$0.18	$0.19	$0.72	$0.33	$0.50	-	$0.66
Percentile	17%	14%	46%	100%	50%	83%	75%	45%	0%	4%	15%	-	19%
$/kW	$12,193	$1,316	$1,443	$1,141	$677	$359	$621	$623	$837	$1,249	$2,173	$1,758	$4,308
Percentile	22%	73%	70%	100%	87%	82%	83%	70%	92%	57%	52%	N/A	24%
$/therm	$29.42	$8.88	$3.23	-	-	-	$1.79	$0.70	$0.34	$2.08	-	-	$0.37
Percentile	9%	23%	25%	-	-	-	50%	84%	100%	46%	-	-	88%
kWh/part.	764	823	1,644	n.d.	950	n.d	116,505	48,775	452,431	324,486	28,094	-	N/A
Percentile	50%	0%	100%	N/A	30%	N/A	47%	20%	67%	86%	88%	-	N/A
kW/part.	0.2	1.5	0.9	n.d.	0.2	n.d.	34.6	14.6	389.0	85.8	6.5	645.0	N/A
Percentile	64%	100%	100%	N/A	75%	N/A	75%	50%	100%	86%	100%	N/A	N/A
therms/part.	137	153	407	-	-	-	12,031	12,933	9,598	3,284	-	-	N/A
Percentile	67%	50%	N/A	-	-	-	N/A	N/A	N/A	N/A	-	-	N/A

Figure 1-1. $/kWh Percentile All Programs[5]



1.2.2 Other Portfolio-Wide Findings and Recommendations

Beyond the benchmarking data itself, ERS came to a series of conclusions that apply to the overall portfolio. These were arrived at through interviews or through a triangulation of multiple programs' data. These recommendations are discussed in detail in Section 3:

- The current method of aggregating marketing and evaluation spending at the sector or portfolio level leads to an underestimation of actual program-attributable costs. Most other comparison programs reviewed (California IOUs, NYSERDA, NY IOUs, MA IOUs…) track these at the program level.
  - R1[6]: ERS recommends that NJCEP account for all relevant spending at the program level in order to better understand the total cost of programs and improve accountability.

[5] CHP has no value because it does not report kWh savings (it is not 0 percentile).

- The programs currently track many spending categories, such as contractor payments, as incentives, when really they are non-incentive costs. This leads to an overestimation of the percentage of spending going to incentives vs. administrative costs.
  - R2: ERS recommends that NJCEP only count dollars that go to end users (or their vendors) as incentives to improve tracking and accountability.
- The combination of programs in the commercial portfolio is atypical. The pay-for-performance program model (with high minimum savings threshold and $/sf incentive components) was the only program model of its type in the sample. The lack of a standalone custom program was also an uncommon feature among comparison PA portfolios. Furthermore, the lack of a broader audit program merits review as audit programs are fairly standard features of commercial portfolios. The upcoming process evaluation provides an opportunity to analyze this question with customer input. This isn't to say that the programs necessarily must change, just that they should be looked at to ensure they are achieving NJCEP's goals.
  - R3: ERS recommends that NJCEP reevaluate the composition of the commercial retrofit portfolio as part of the process evaluation.
- The Energy Efficient Products: Upstream Lighting program represents roughly *half of the entire portfolio of electric savings* and is facing a significant market transformation that will slash those savings in the coming years. CFLs are supplanting incandescents as the dominant technology (i.e., the baseline is changing) and LEDs replacing CFLs as the incentivizible technology (i.e., the measure is changing). The change in technology, assuming run hours and program volumes remain the same, could reduce the electric savings of the Upstream Lighting program by as much as 90%[7], which translates to an overall shortfall of 45% portfolio-wide. NJCEP will need to look elsewhere within the portfolio to make up these savings.
  - R4: ERS recommends that NJCEP make long-term plans on a portfolio level to make up for the anticipated loss of savings that will result from transitioning to a CFL baseline.
- Certain important assumptions were found to depend on outdated research. This led to overstated savings claims in certain instances. For example, the upstream lighting program is based on studies performed as long ago as 2003 and only as recent as 2009.
  - R5: ERS recommends that NJCEP perform updates to the protocols with greater regularity.

[6] Recommendations are numbered R# in order to aide tracking. A complete list of recommendations is provided in Appendix L.

[7] As an estimate, consider that a standard 60W incandescent bulb is typically replaced by an approximately 15W CFL bulb, for a savings of 45W. Under a CFL-to-LED paradigm, a 15W CFL bulb will ultimately be replaced by a 10W LED, for a savings of 5W or roughly 11% the savings of the previous paradigm. These are not precise figures (e.g., 60W-equivalent LEDs exist that are lower wattage than 10), but no matter how you slice it the fundamental premise is true that savings from CFL-to-LED retrofits are significantly less than those from incandescent-to-CFL retrofits.

- The prevalence of reported net savings among comparison PAs suggest it is a common feature of efficiency programs. In certain programs, the benchmarking data suggests that free ridership is significant. More importantly, variability of free ridership across programs may impact relative cost effectiveness, which may in turn impact decisions on how to distribute funds among programs.[8] All these observations suggest that NJCEP should include impact evaluation as a regular feature of its normal program cycle.
  - R6: ERS recommends that NJCEP regularly perform impact evaluations and include net-to-gross as a part of that evaluation activity.
- ERS reviewed incentive levels for nine of the programs and found that five had incentives that were high relative to comparison PAs (i.e., Residential Existing Homes, Residential New Construction, Pay-for-Performance New Construction, CHP, and Large Energy Users). We have recommended reductions ranging from 20%-50%. None of the nine programs were low. Each program is addressed individually in the program-specific sections, but the trend bears mentioning.
- Inspection processes were reviewed in-depth for six of the programs. ERS recommended that half of those programs (i.e., Residential Existing Homes, Commercial Retrofit, and Small Business Direct Install) *reduce* inspection rates in order to come into alignment with industry norms. Details on the particulars of those inspection rates can be found in each program's respective section.

The above represent the handful of findings and recommendations that have cross-program impact. The vast majority of results pertain to specific programs. The following section addresses that material.

1.3 Program-Specific Findings and Recommendations

The following tables present a snapshot of program-specific results. These are summaries of the full results and discussion provided in the program-specific appendices. For more detail, please refer to the expanded discussions in those appendices.

[8] For example, the EEP Upstream Lighting program's peer programs estimated an average of 38% free ridership.

Residential Existing Homes

Benchmarking Results							*Proposed Target Metrics*	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$3.51	$12,193	$29.42	764	0.2	137	$/kWh	$1.50
Percentile	17%	22%	9%	50%	64%	67%	$/therm	$13.50

Conclusions

- On an unadjusted basis and compared only with those programs that follow the ENERGY STAR model, the NJCEP Residential Existing Homes program had $/kWh costs among the highest in the country.
- The incentive levels offered by the program are 20%-40% higher than other similar programs.
- The program's loan buy-down component is part of the program budget, which is atypical. If the program budgeted these funds separately, it would improve program $/kWh by roughly 20%.
- If the program reduced the incentives to a more average level and budgeted loans separately, the program's $/kWh costs would align to the median among programs in the benchmarking sample.
- The program approach and delivery mechanisms are generally in line with those of similar programs across the country.
- Other programs more typically offer measure-specific rebates as opposed to lump incentives.
- Other programs perform inspections at a significantly lower rate than NJCEP.

Recommendations

- R7: Reduce incentive levels by 20%-40% to better align with industry average.
- R8: Consider converting to a measure-specific rebate approach, which is more common and ties rebates to savings more directly.
- R9: Budget program loans separately in program accounting (i.e., as if a separate program) in order to track program performance more directly.
- R10: Consider reducing inspections by as much as half in order to reduce costs.

Residential New Construction

Benchmarking Results							*Proposed Target Metrics*	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$2.47	$1,316	$8.88	823	1.5	153	$/kWh	$1.00
Percentile	14%	73%	23%	0%	100%	50%	$/therm	$4.00

Conclusions

- Program performance degraded significantly from 2011 to 2012. Most ENERGY STAR New Homes (ESNH) programs experienced an increase in $/kWh during that time, as a consequence of increasing ENERGY STAR standards that had higher costs. However, NJCEP's program $/kWh increased approximately 150%, roughly three times the nationwide average increase.
- ESNH programs nationwide are grappling with how to incentivize and claim savings associated with unregulated loads (i.e., those not covered by the energy code such as lighting, appliances, and plug loads) in order to counteract the diminishing and increasingly expensive savings offered by regulated loads (i.e., those covered by the energy code).
- The NJCEP ESNH program incentives are higher and less targeted, by and large, than nationwide counterparts.

Recommendations

- R11: Review and consider alternative ESNH models that better incentivize and claim savings from unregulated loads.
- R12: Reduce incentive levels to better align with industry average. The specific reductions will vary by tier and offering.
- R13: Adopt a more targeted incentive approach to align program spending more closely to project savings (e.g., by aligning payments to home size or type, or by including prescriptive requirements that more consistently deliver savings than the ENERGY STAR requirements).

Residential Gas and Electric HVAC								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.80	$1,443	$3.23	1,644	0.9	407	$/kWh	$0.75
Percentile	46%	70%	25%	100%	100%	N/A	$/therm	$2.50

Conclusions

- Program performance is overall fairly typical. Although the NJCEP program's performance percentiles for $/kWh, $/kW, and $/therm range widely, the raw data is tightly grouped and the NJCEP values are around the middle of the pack in all instances. Moreover, those programs with significantly better results are in jurisdictions with less rigorous standards for evaluation, suggesting that their performance may be based on dubious assumptions.
- The key program assumptions, specifically heating and cooling full load hours, are reasonable, suggesting that savings claims are reasonable as well.
- Incentive levels and measure requirements align to industry-wide averages and trends, which suggests that program is well targeted.

Recommendations

- R14: Examine application and review processes as well as measure mix as part of upcoming process evaluation to identify any opportunities for improvement.

Energy Efficient Products: Appliance Recycling								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.19	$677	N/A	950	0.2	N/A	$/kWh	$0.20
Percentile	50%	87%	N/A	30%	75%	N/A	$/kW	$1,000

Conclusions

- The program's performance is around the median on a $/kWh-basis, with $/kW somewhat better than average.
- Energy savings claims are on the high side, with very high demand savings claims.
- Other programs commonly structure the contract to pay less for the second unit picked up at the same location.
- There is a lack of consensus in the industry on how to approach the difference between primary and secondary refrigerators, but knowing the percentage of each being picked up can help programs gauge their performance.

Recommendations

- R15: Restructure the contract with the implementation firm to pay less for the second unit picked up at a location recycling more than one unit.
- R16: Savings claims, in particular the demand (kW) savings, should be revisited during an upcoming evaluation to ensure they are realistic and in line with units being recycled by the program.
- R17: Differentiate between primary and secondary units during screening calls or as part of pickup. Down the road, the program could then consider claiming different savings levels based on the type of unit picked up.

Energy Efficient Products: Appliance Rebates								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.16	$1,141	N/A	N/A	N/A	N/A	$/kWh	N/A
Percentile	100%	100%	N/A	N/A	N/A	N/A	$/kW	N/A

Conclusions

- The benchmarking data is shown, but should be considered with less confidence than other conclusions. The program was not selected for further review.

Recommendations

- No recommendations are offered

Energy Efficient Products: Upstream Lighting								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.04	$359	N/A	N/A	N/A	N/A	$/kWh	$0.08
Percentile	83%	82%	N/A	N/A	N/A	N/A	$/kW	$500

Conclusions

- The program performance appears strong ($/kWh was in the top quartile). However, upstream lighting programs' $/kWh depends heavily on savings-per-unit because program delivery is low cost and fairly straightforward. Thus, strong $/kWh performance tend to correlate exaggerated savings claims, as opposed to operational excellence.
- Key NJCEP savings assumptions come from studies that are many years old.
- Programs nationwide are struggling with the erosion of the incandescent baseline and are looking for ways to continue to promote and claim savings from CFLs.
- Programs nationwide are ramping up LED promotions.
- Free ridership in point-of-sale programs is high, and NJCEP does not take it into consideration.

Recommendations

- R18: Accelerate promotion of LEDs.
- R19: Consider creative ways to retain CFLs through targeted promotions, in particular a geographically targeted approach.
- R20: Commission a new residential lighting study to update hours-of-use and CFL penetration estimates to develop a mixed baseline for accurate savings estimates.
- R21: Perform regular impact evaluations that include FR and apply an appropriate net-to-gross estimate to program savings.

Commercial New Construction								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.18	$621	$1.79	116,505	34.6	12031	$/kWh	$0.15
Percentile	75%	83%	50%	47%	75%	N/A	$/therm	$2.00

Conclusions

- The program has operational characteristics similar to the analogous retrofit program and is a comparatively small program.
- The program appears to be performing well, with both the $/kWh and $/kW values in the top quartile with meaningful comparison samples (both samples greater than twenty data points).
- The program was not slated for further review following the initial benchmark.

Recommendations

- No recommendations are offered.

Commercial Retrofit								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.19	$623	$0.70	48,775	14.6	12933	$/kWh	$0.20
Percentile	45%	70%	84%	20%	50%	N/A	$/therm	$1.00

Conclusions

- The program appears to be a solid to strong performer, with some variability in key metrics. The $/savings metrics have generally been in the top quartile the last few years, the most notable exception being the 2012 $/kWh figure which came in at the median.
- The savings/participant values are somewhat low, but this may be more attributable to portfolio construction (specifically the pay-for-performance program) and not a fault of the Commercial Retrofit program specifically.
- Overall, savings assumptions are reasonable, though lighting assumptions may be leading to underestimated savings while HVAC assumptions may be leading to overestimated savings.
- Incentive levels are in line with comparable programs.
- NJCEP's inspection rates are the highest among programs that ERS interviewed.

Recommendations

- R22: Revise key savings assumptions as part of any upcoming evaluation.
- R23: Consider reducing inspection rates to roughly half their current levels.

Pay-for-Performance (P4P): New Construction								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.72	$837	$0.34	452,431	389.0	9598	$/kWh	$0.25
Percentile	0%	92%	100%	67%	100%	N/A	$/therm	$0.75

Conclusions

- Program incentives are much higher than peer programs.
- The $/square-foot approach to incentives is abnormal, with most peer programs utilizing a $/savings approach to incentives.
- The program's quality assurance approach is relatively light touch, compared to peer programs' more rigorous review approaches.

Recommendations

- R24: Reduce incentive levels by roughly one half to better align with industry averages.
- R25: Convert the incentive approach to $/savings (as opposed to the current $/square-foot approach).
- R26: Increase quality assurance rigor if migrating to a $/savings incentive approach.

Pay-for-Performance (P4P): Retrofit								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.33	$1,249	$2.08	324,486	85.8	3284	$/kWh	$0.30
Percentile	4%	57%	46%	86%	86%	N/A	$/therm	$3.00

Conclusions

- The program's $/savings are high compared to other non-prescriptive programs, but so are the savings/participant. This should be expected of a deep savings program that goes beyond the low hanging fruit.
- This is a unique program, with no true comparables in the comparison set.

Recommendations

- No recommendations are offered.

Small Business Direct Install (SBDI)								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.50	$2,173	N/A	28,094	6.5	N/A	$/kWh	$0.45
Percentile	15%	52%	N/A	88%	100%	N/A	$/kW	$2,000

Conclusions

- The program is relatively expensive among its peers on a $/kWh basis, but also achieves higher average savings/participant.
- NJCEP's program is unique in its emphasis on HVAC-related measures, which is a strategic choice that does lead to the higher average $/kWh and deeper savings mentioned above.
- Key program parameters – cost-share and peak kW maximum – are reasonable and in line with industry standard practice, though other PAs are trying new approaches that may be worth a look.
- The NJCEP assumed hours of use for lighting projects are reasonable.
- There is a trend in industry towards greater and greater use of turnkey contractor models, which offer greater efficiency in program delivery and greater control by the program.
- NJCEP's inspection rates are relatively high compared to those PAs selected for further review.

Recommendations

- R27: Examine implementing a 0% cost-share model to increase sales conversion rate and expand participants and market penetration.
- R28: Investigate subcontractor attitudes towards measure prices as part of the process evaluation. Greater-than-needed incentives are common in SBDI programs and may be contributing to poor $/savings results with this program.
- R29: Consider re-orienting the contractor model to a turnkey approach, which reduces costs and increases control and quality. Note that it is challenging to follow this approach while also emphasizing HVAC-related measures; contractors generally do not do both the lighting and HVAC measures on a turnkey basis.
- R30: Review inspection processes as part of the process evaluation. Reasonable quality assurance may be attainable with a lower inspection rate. Overall inspection rates can come down even as greater quality assurance efforts are targeted at larger or riskier projects.

Combined Heat and Power (CHP) and Fuel Cells								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Percentile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Conclusions

- The program has suffered through years of instability arising from circumstances beyond the program's control.
- The nature of the CHP program comparison sample – few programs, often bundled, few projects per cycle, etc. – did not lend itself to benchmarking. Moreover, NJCEP experienced fewer than ten projects per year for the years in question, which leads to high variability. Consequently, the program was benchmarked on a very limited basis.
- The program's incentive levels are somewhat higher on a per-kW basis than comparison programs for the smaller scale projects (i.e., <1 MW).
- The incentive structure is complex and likely confusing to potential participants.
- The project intake process, including sizing evaluation and technology filtering, follow industry standard practices, but potentially more effective alternatives exist.
- NJCEP's post-installation performance period and associated requirements are somewhat limited in comparison to other programs. For example, the performance period is shorter (only 1 year) than most and does not include any recommissioning requirements.

Recommendations

- R31: Reboot the program, both the offerings and the approach. The following recommendations feed into this reboot.
- R32: Use the process evaluation to identify demand-side/perception factors that are impeding participation.
- R33: Simplify, harmonize, and consolidate the incentive system.
- R34: Consider using an "exploding" incentive rate (i.e., one that has a scheduled decline in incentive rate over a period of years) to signal a long-term commitment and to motivate projects today.
- R35: Consider adopting NYSERDA's alternative approaches to sizing evaluation and technology approval.
- R36: Reexamine M&V and performance payment structure and levels as part of the upcoming process evaluation, with an eye towards expanding performance data collection and including recommissioning requirements.

Large Energy Users								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	$0.66	$4,308	$0.37	N/A	N/A	N/A	$/kWh	$0.30/kWh
Percentile	19%	24%	88%	N/A	N/A	N/A	$/therm	$1/therm

Conclusions

- The NJCEP LEU is more expensive than other industrially focused programs on a $/savings basis as well as more expensive than NJCEP nonresidential alternatives.
- The incentive rates are very high for $/kWh ad $/therm incentives.
- The program reports a challenge of recruiting new members.

Recommendations

- R37: Reduce the incentives by about half.
- R38: Consider developing an outreach model to expand participation and tap into the deep savings potential of the industrial sector.

Local Government Energy Audit								
Benchmarking Results							***Proposed Target Metrics***	
Category	**$/kWh**	**$/kW**	**$/therm**	**kWh/part.**	**kW/part.**	**Therm/part.**	**Metric**	**Value**
Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Percentile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Conclusions								
• The LGEA program did not receive a benchmarking analysis or further review • It is atypical for a PA to offer only a targeted audit program								
Recommendations								
• R39: Explore the appetite for audit programs within NJ as part of the process evaluation.								

2. OBJECTIVES AND APPROACH

This section outlines the purpose of the project and the resultant report. It also outlines the three-step approach taken.

2.1 Objectives and Scope

This project had three primary goals:

1. To update and expand the Portfolio and Program Benchmark Analysis of September 2012. This entails comparing key program metrics (e.g., $/kWh) against those of similar programs nationwide.
2. To determine the reasons why NJCEP's programs compared as they did to other programs during the benchmark. This entails going beyond the data to understand the key drivers of NJCEP's ultimate performance.
3. To propose target metrics that NJCEP's programs should strive towards. This entails identifying reasonably attainable target metrics.

These three goals were accomplished in a three-step process. The first step – the benchmarking – achieved goal number one and is discussed in detail in Section 2.2. By triangulating the results of the benchmark for step two, ERS was able to identify areas for further research that might shed light onto the data provided by the benchmark; the further research is discussed in Section 2.3. In step three, the benchmark, combined with that further research, enabled the team to make judgments about how to set reasonable target metrics for the programs; this is discussed in Section 2.4.

In order to reasonably limit the scope, the team and the Office of Clean Energy (OCE) limited the investigation to those efficiency programs under the purview of OCE and the respective market managers. These programs include:

1. Residential Existing Homes
2. Residential New Construction
3. Residential Gas & Electric HVAC
4. Energy Efficient Products (EEP): Appliance Recycling
5. EEP: Appliance Rebates
6. EEP: Upstream Lighting
7. Commercial New Construction
8. Commercial Retrofit
9. Pay-for-Performance (P4P): New Construction
10. P4P: Retrofit
11. Small Business Direct Install (SBDI)

12. Combined Heat and Power (CHP) and Fuel Cells
13. Large Energy Users
14. Local Government Energy Audit

Note that the EEP program was split into its component parts for analysis, making a total of fourteen distinct investigations. Each of these fourteen programs has a dedicated section of this report, though different programs were subject to differing levels of review.

2.2 Benchmarking Approach

ERS benchmarked the fourteen programs above against programs overseen by a curated set of twenty-five program administrators (PAs) nationwide. These PAs were selected either because they were a regional neighbor (thus likely to face similar markets and climates) or because they were recognized as a top PA nationwide. Table 2-1 shows the twenty-five PAs, their abbreviated name (used throughout the report, their state, and whether they are a utility or a statewide PA.

Table 2-1. Comparison Program Administrators

#	Program Administrator (PA)	State	Utility or Statewide
1	Con Edison	NY	Utility
2	Long Island Power Authority (LIPA)	NY	Utility
3	National Grid (NGrid NY)	NY	Utility
4	NYSERDA	NY	Statewide PA
5	Connecticut Light & Power (CL&P)	CT	Utility
6	Baltimore Gas & Electric (BGE)	MD	Utility
7	Potomac Electric Power Co (Pepco)	MD	Utility
8	Southern Maryland Electric Cooperative (SMECo)	MD	Utility
9	Delmarva Power (Delmarva)	MD	Utility
10	Pacific Gas & Electric (PG&E)	CA	Utility
11	Southern California Edison (SCE)	CA	Utility
12	San Diego Gas & Electric (SDGE)	CA	Utility
13	Southern California Gas (SCG)	CA	Utility
14	PECO	PA	Utility
15	Duquesne Light (Duquesne)	PA	Utility
16	First Energy Met-Ed	PA	Utility
17	First Energy Penelec	PA	Utility
18	PPL Electric Utilities (PPL)	PA	Utility
19	NSTAR	MA	Utility
20	National Grid (NGrid MA)	MA	Utility
21	Public Service of New Hampshire (PSNH)	NH	Statewide PA
22	Efficiency Vermont (Vermont)	VT	Statewide PA
23	Wisconsin Focus on Energy (Wisconsin)	WI	Statewide PA
24	Commonwealth Edison (ComEd)	IL	Utility
25	Austin Energy	TX	Utility

ERS purchased a subscription to ESource's DSM Insights (the database) in order to gather data on the range of PAs. All of the PAs are in the database to some degree or another. Where necessary, ERS supplemented the database with its own internal data. Additionally, some

manipulations of the data were necessary to align it to the objectives of this project. These are addressed below.

The metrics used for benchmarking are shown in Table 2-2.

Table 2-2. Benchmarked Metrics

Metric	Description
$/kWh	The average cost for the program to acquire a unit of electric energy savings
$/kW	The average cost for the program to acquire a unit of electric demand savings
$/therm	The average cost for the program to acquire a unit of gas savings
kWh/participant	The average electric energy savings acquired per participating customer
kW/participant	The average electric demand savings acquired per participating customer
therm/participant	The average gas savings acquired per participating customer
% spending on incentives	The percentage of program spending that goes towards incentives (as opposed to administrative costs)

The $/savings metrics show the overall cost efficiency of the program in achieving its primary goal: acquiring energy savings.[9] Given that these are resource acquisition programs that tend to prioritize the acquisition of electric energy savings, the $/kWh figure is given the most attention throughout the report. The savings/participant metrics illustrate the depth of savings that projects in a given program experience on average; greater savings/participant may be an indicator of approach or strategy (e.g., emphasis on multi-measure programs). Finally, the spending breakdown, as measured by the percentage of spending on incentives, shows how "lean" a program is. A low percentage of spending going towards incentives indicates that the program has a lot of overhead, which may indicate poor operational efficiency.

There are many aspects of the benchmarking that must be understood in order to properly interpret the results. They are:

- **Apples and Oranges** – Not all programs in a given category offer the same measures. All PAs face different climates and markets. Accounting of savings and spending differ from one PA to the next. All of these facts complicate the analysis, and it is important to acknowledge right up front: there is no way to arrive at a perfect apples-to-apples comparison. While the goal may be to isolate operational differences between programs (as opposed to measurement or contextual differences), there are too many differences and too many gaps in the data to normalize for all parameters. As such, ERS has chosen to present all data in a "raw" form – there have been no adjustments to the underlying data, except where necessary to compute a given metric. Certain recurring questions are addressed in this list so that the reader can know with what caveats and through what lens the data should be viewed. In most cases, the volume of data paints a clear enough picture of what is happening that it enables the reader to arrive at reasonable conclusions about NJCEP's performance. Thus, the benchmark was able to guide further research that could, through a qualitative lens, flush out the operational differences between NJCEP and other PAs.

[9] The cost portion of the $/savings metrics refers to program costs only: the incentives and the administrative costs necessary to acquire the measure savings, not the cost to the customer or other societal costs.

- **Time Frame of the Analysis** – The project team reviewed data spanning 2010 to 2013 for all available PAs. Each year represents a distinct data point. Thus, a given program may reappear in the data set multiple times (e.g., NJCEP SBDI 2012 and NJCEP SBDI 2011). The year of greatest focus for NJCEP was 2012, which was the last year for which full data was available at the time of analysis.
- **Gross vs. Net Savings** – NJCEP does not regularly complete impact evaluation and thus does not report evaluated savings. As such, the NJCEP data most closely resembles the gross savings claims of other PAs. ERS leveraged and plotted both gross and net savings for many purposes because the additional data provides useful context. However, for the purposes of medians and percentiles, NJCEP was only compared against the gross savings of other programs.
- **Annual vs. Lifetime Savings** – All savings are annual estimated savings (often known as "first year" savings) not lifetime savings.
- **Differences in Accounting** – Different programs include different categories of spending in their reported program spending. NJCEP was an outlier in a few respects when it came to accounting. First, marketing is budgeted at the sector level, meaning that the programs pay for very little of their own marketing. It is much more common for programs to report marketing spending as part of their own budget, and a review of budget data in the database suggests that this most typically accounts for 2%-10% of total budget.[10] Additionally, NJCEP also budgets evaluation separately. Evaluation spending is sometimes included within a program's reported spending and sometimes not, but may represent an additional 3%-5% of total program budget that is missing from NJCEP's spending figures.[11] Both of these factors would make NJCEP's programs look *less expensive* than is fair for comparison by about 5%-15%.
- **Market Cost Variability** – The cost to execute projects will vary market to market, and New Jersey is among the highest cost markets in the country. To estimate what impact this might have on program metrics, ERS performed an analysis of RS Means data by geography to estimate the cost of construction by geography.[12] The cost per square foot, as estimated by RS Means, of constructing a low-rise office building ranges from $120/sf to $200/sf among the twenty-five comparison PAs. NJCEP was the PA with the seventh highest costs, and a

[10] A significant number of programs in the comparison database provided spending figures broken down by budget category, including marketing. Among those that broke out marketing-specific spending, the average spending level was 7% of total budget, while the median was 4%. More than 56% of programs spent between 2% and 10% of their budget on marketing, and 88% spent less than 15%.

[11] California, New York, and Massachusetts, for example, require that programs dedicate 5% of their spending to evaluation.

[12] ERS collected data from RS Means, a construction cost estimation database, for all the comparison jurisdictions in the benchmarking analysis. ERS gathered the $/square-foot cost of construction for a 1-3 story multifamily structure for representative metropolitan areas and use them as proxies for the cost of doing business. For utilities with large jurisdictions or for statewide PAs, multiple metropolitan areas were gathered. NJCEP's average cost came out to $173.10/square-foot. This was 9% higher than the average of $158.24/square-foot. The median was 156.25/square-foot. NJCEP's costs are approximately the same as PECO's and NYSERDA's, which collectively tied for fifth among the 26 PAs. ConEd, LIPA, PG&E, and ComEd were the only PAs with a higher average cost.

typical project would endure 9% higher costs than the average PA. This factor would make NJCEP's programs look *more expensive* than is fair for comparison. As noted above, ERS did not normalize data, but as a rough rule of thumb, the higher construction costs and the exclusion of marketing and evaluation spending counteract one another.

- **Budget Breakdown Accounting** – NJCEP classifies nearly all non-staff expenditures as "incentives" in reporting. This is an atypical practice that deeply skews the spending breakdown benchmarks even beyond the fact that marketing and evaluation are excluded. For nearly every program reviewed, this unfortunately makes the %-spending-on-incentives metric relatively meaningless.
- **Electric vs. Gas Spending** – For those programs that offer both gas and electric measures, not all report separate spending totals for those savings streams. To arrive at the most meaningful $/savings metrics, the numerator should be only those dollars spent dedicated to a particular fuel type. In order to develop those spending values, ERS performed the following analysis: ERS averaged the $/kWh and $/therm of those programs that do report spending separately (a pair of values for each program category); those values were then multiplied against the kWh and therm savings of each program to estimate the proportion of spending each program spent on each fuel type; that proportion was then multiplied against the actual reported spending of that program in order to estimate fuel-specific spending. For NJCEP, ERS used tracking data that identified incentive spending by fuel type to approximate the fuel-specific spending breakdown. For those programs that did not have appropriate tracking data, ERS used program-reported fuel-specific spending estimates. In a couple cases, ERS found these estimates to be problematic; that is discussed in the program-specific results.

The net result of all these caveats and considerations is an imperfect, but still useful set of data, which was able to provide the team with one perspective on each program's performance. The benchmarking results were then triangulated with further interviews and research on both NJCEP and the comparison PAs. Overarching results are discussed in Section 3.1, with each program's detailed results in their respective appendix.

2.3 Further Research Topics

In order to arrive at actionable intelligence and meaningful recommendations, the benchmarking results needed to be supplemented by qualitative information regarding how differences in program approach and operation lead to the outcomes seen in the benchmarking data. Consequently, ERS and OCE used the benchmarking data and initial interviews with NJCEP market managers to identify target areas for further research. The budget could not accommodate a review of all programs, so those performing very well according to the benchmarking or those that were very small, were excluded from further research. Table 2-3 summarizes the target tasks that occurred as part of the second step of the project.

Table 2-3. Summary of Follow-Up Research Performed

Program	Sufficient Data for First-Pass Analysis?	Recommended Next Steps				
		No Further Research	Further Analysis	Web Research	External Interview	NJCEP Interview
Residential Existing Homes	Yes			X	X	X
Residential New Construction	Yes				X	X
Residential Gas & Electric HVAC	Yes			X	Partial	
EEP: Appliance Recycling	Yes		X		Partial	
EEP: Appliance Rebates	Yes	X				
EEP: Upstream Lighting	Yes		X		X	X
Commercial New Construction	Yes	X				
Commercial Retrofit	Yes		X	X	X	X
Pay for Performance New Construction	Yes			X		X
Pay for Performance Retrofit	Yes	X				
Direct Install (SBDI)	Yes			X	X	X
Combined Heat & Power and Fuel Cells	No		X		X	X
Large Energy Users Program	Partial	X				
Local Government Energy Audit	No	X				

The program-specific appendices articulate the specific research objectives pursued for each program. In addition, the program-specific appendices address which comparison PAs were targeted for additional research. In general, PAs chosen for further research were chosen because they either performed really well in the benchmark or were known to have a unique or interesting feature. The goal in interviewing them was to identify practices that had led to superior performance and which could potentially be imported to the NJCEP programs.

2.4 Target Metrics

ERS set target metrics using both the benchmarking results and the contextual understanding provided by the further research on both NJCEP's and other PAs' operations. The metrics that ERS chose to target are $/savings metrics: primarily $/kWh and $/therm, but also including $/kW where appropriate (i.e., electric-only programs). The reason for choosing this sort of metric is that it best represents overall program performance at least in terms of operational efficiency and effective use of rate payer funds. The $/savings metrics also have the most robust data sets on which to base a judgment regarding the target metric.

When choosing the target metric, ERS sought to identify reasonably attainable, yet challenging targets. ERS considered:

- The current state of the $/savings of the program.
- The recommendations provided and their likely impact on program metrics.
- The "best-case" results, as represented by top performing programs in the category. Note that certain categories (e.g., Residential Existing Homes) contain multiple tiers of programs that perform very differently (e.g., those following the ENERGY STAR model and those offering only prescriptive rebates for basic measures). In those cases, ERS considered the performance of only those comparison programs that share key characteristics with NJCEP's program. ERS generally targeted metrics in the top quartile of the relevant tier.

The desired net result is a target metric that is attainable, would result in NJCEP ascending to a point of excellence within the comparison set, and which can be achieved by implementing the recommendations included within this report.

3. PORTFOLIO-LEVEL FINDINGS AND RECOMMENDATIONS

In analyzing each of the fourteen programs in question, some thematic results were observed. Those portfolio-level findings are presented here.

3.1 Overall Results

Table 3-1 summarizes the overall results of the benchmarking. A few notes:

- "-" indicates that a value is not relevant to a given program (e.g., gas savings in an electric-only program)
- "n.d." indicates that NJCEP data could not be calculated (e.g., no participant count for the EEP Lighting program)
- "N/A" indicates that the sample was too small (n=<5) to generate a meaningful percentile

The results are subsequently presented graphically in Figures

Table 3-1. Summary of Benchmarking Results

Program / Metric	Res Existing	Res NC	Res HVAC	EEP Rebates	EEP Recycling	EEP Lighting	Comm NC	Comm Retrofit	P4P NC	P4P Retrofit	SBDI	CHP	Large Energy Users
$/kWh	$3.51	$2.47	$0.80	$0.16	$0.19	$0.04	$0.18	$0.19	$0.72	$0.33	$0.50	-	$0.66
Percentile	17%	14%	46%	100%	50%	83%	75%	45%	0%	4%	15%	-	19%
$/kW	$12,193	$1,316	$1,443	$1,141	$677	$359	$621	$623	$837	$1,249	$2,173	$1,758	$4,308
Percentile	22%	73%	70%	100%	87%	82%	83%	70%	92%	57%	52%	N/A	24%
$/therm	$29.42	$8.88	$3.23	-	-	-	$1.79	$0.70	$0.34	$2.08	-	-	$0.37
Percentile	9%	23%	25%	-	-	-	50%	84%	100%	46%	-	-	88%
kWh/part.	764	823	1,644	n.d.	950	n.d	116,505	48,775	452,431	324,486	28,094	-	N/A
Percentile	50%	0%	100%	N/A	30%	N/A	47%	20%	67%	86%	88%	-	N/A
kW/part.	0.2	1.5	0.9	n.d.	0.2	n.d.	34.6	14.6	389.0	85.8	6.5	645.0	N/A
Percentile	64%	100%	100%	N/A	75%	N/A	75%	50%	100%	86%	100%	N/A	N/A
therms/part.	137	153	407	-	-	-	12,031	12,933	9,598	3,284	-	-	N/A
Percentile	67%	50%	N/A	-	-	-	N/A	N/A	N/A	N/A	-	-	N/A

Figure 3-1. $/kWh All Programs[13]

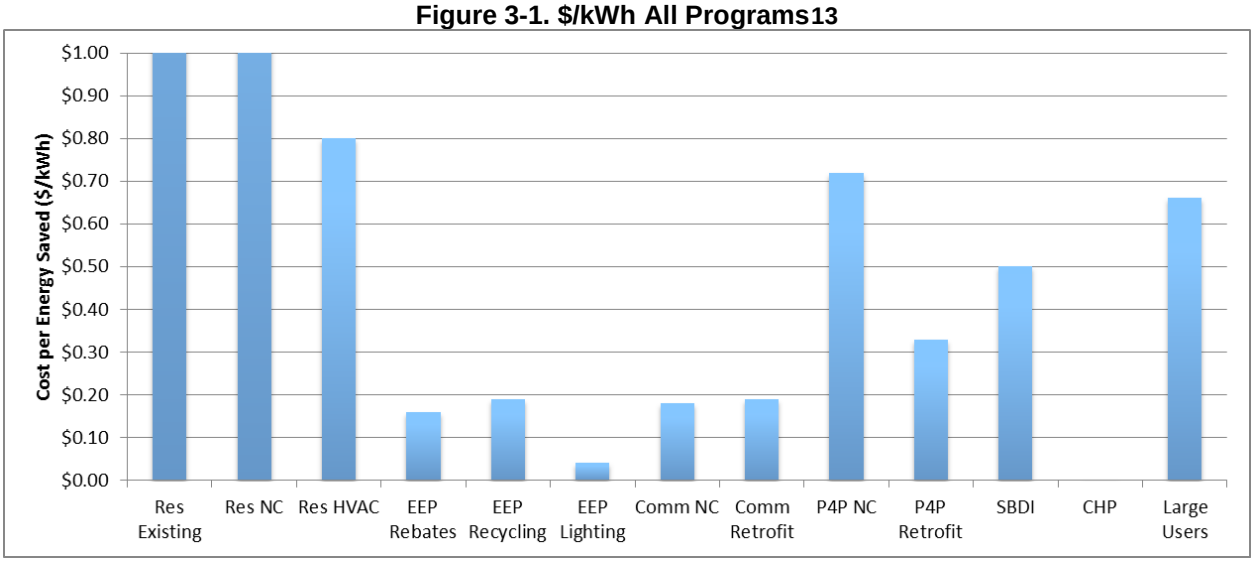
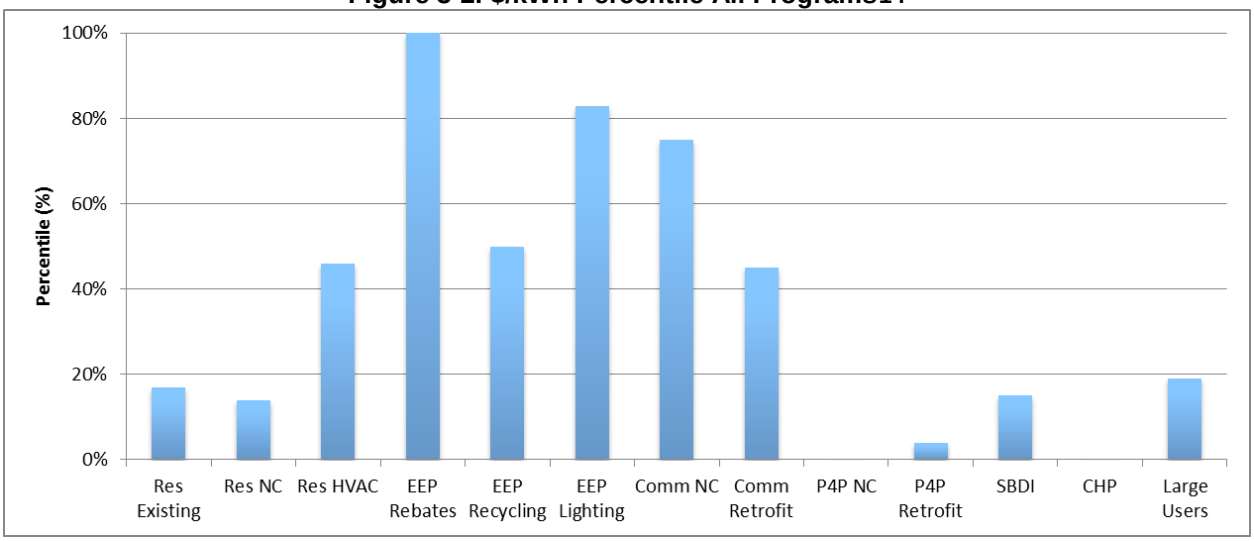


Figure 3-2. $/kWh Percentile All Programs[14]



[13] Scale capped at $1.00/kWh; Residential Existing Homes ($3.51/kWh) and Residential New Construction ($2.47/kWh) are clipped to ensure other values are clearly visible; CHP has no value (not $0/kWh).
[14] CHP has no value because it does not report kWh savings (it is not 0 percentile).

Figure 3-3. $/kW All Programs[15]

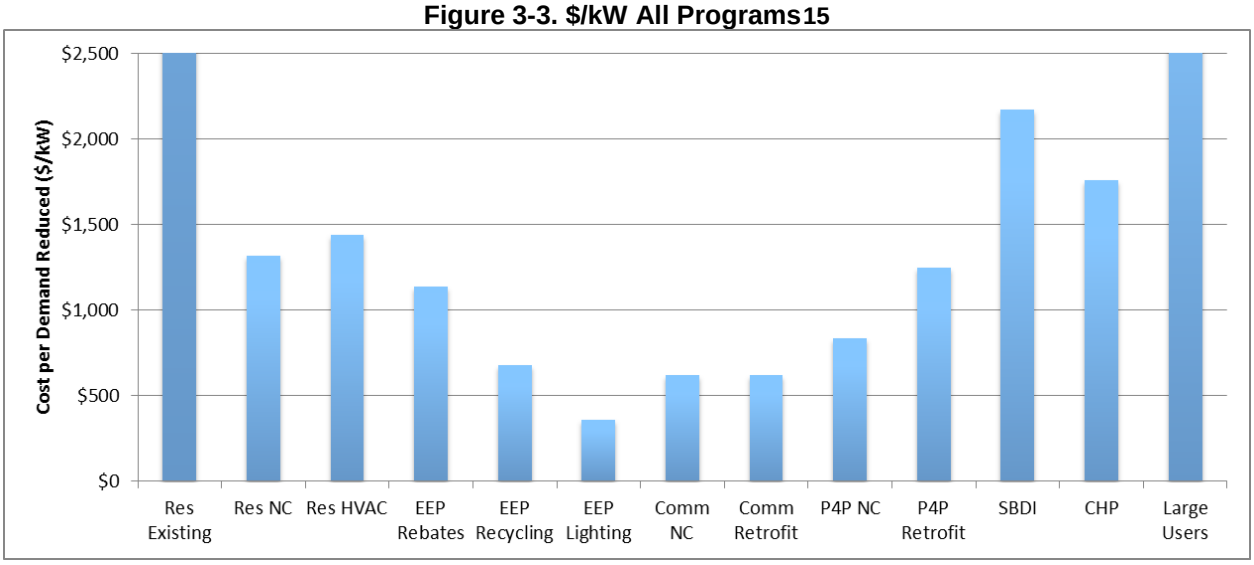
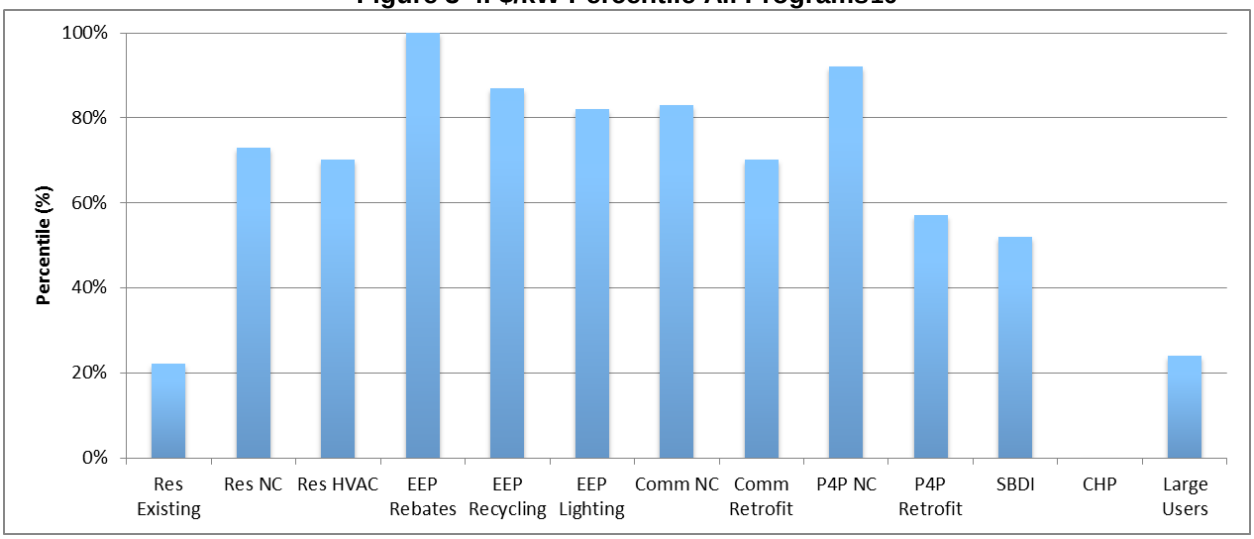


Figure 3-4. $/kW Percentile All Programs[16]



[15] Scale capped at $2,500/kW; Residential Existing Homes ($12,193/kW) and Large Energy Users ($4,308/kW) are clipped to ensure other values are clearly visible.

[16] CHP has no value because it does not report kWh savings (it is not 0 percentile).

Figure 3-5. $/therm All Programs[17]

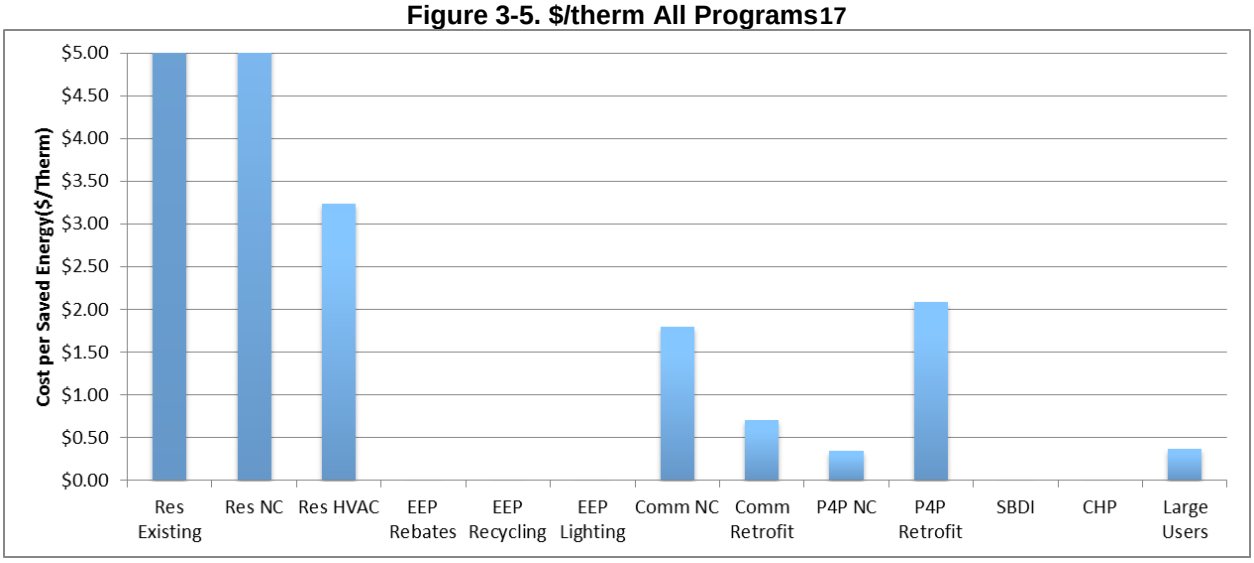
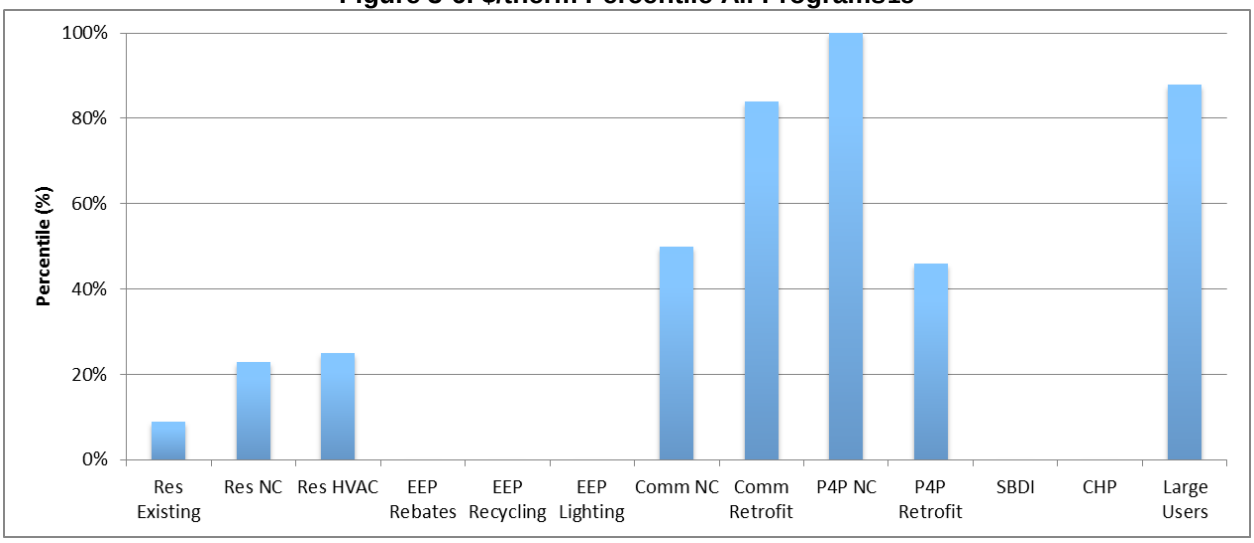


Figure 3-6. $/therm Percentile All Programs[18]



The program-specific appendices go into much greater detail on the data posted in these figures, but the big picture result is that there is room for improvement on the core metrics that matter: $/savings.

The cost of gross energy savings - $/kWh – is the metric with the most robust sample sizes and the generally the most importance. For that value, the portfolio's average percentile is the 39th

[17] Scale capped at $5.00/therm; Residential Existing Homes ($29.42/therm) and Residential New Construction ($8.88/therm) are clipped to ensure other values are clearly visible; the EEP programs, SBDI, and CHP have no value (not $0/therm).

[18] The EEP programs, SBDI, and CHP have no value because they do not report therm savings (they are not 0 percentile).

percentile (with a median performance among the programs of 32nd percentile). The demand savings fare better, with portfolio average of 68th percentile and a median of 72nd percentile; the reasons for difference between energy and demand performance are addressed in the following section. The cost of gas savings is around the median for the portfolio, with an average of 53rd percentile and the median program coming in at the 48th percentile.

It is neither possible nor desirable for NJCEP to be the top in all categories. In many cases, being the "best" at a $/savings metrics, means overstating savings. Moreover, different variations on program models will lead, inherently, to different results, and those variations may be pursued for reasons beyond cost efficiency. Indeed, NJCEP pursues laudable alternative objectives such as deep savings and ease of participation. The impact of those choices is acknowledged and addressed in the program-specific appendices. Nonetheless, in each program analysis, the team proposes steps that can be taken to improve the programs' benchmarking results.

3.2 Energy v. Demand Savings

One finding that stands out is the fairly consistent superiority of the programs' $/kW percentiles compared with their $/kWh percentiles. That is, the programs appear to be more cost efficient at acquiring demand savings than acquiring energy savings. The pattern is more random and scattered when comparing gas to electric savings of either kind. Table 3-2 compares the percentiles of the programs' $/kWh and $/kW.

Table 3-2. Comparison of $/kWh and $/kW Performance Relative to Sample

Category	Res Existing	Res NC	Res HVAC	EEP Rebates	EEP Recycle	EEP Lighting	Comm NC	Comm Retrofit	P4P NC	P4P Retrofit	SBDI	Large Users
$/kWh percentile	17%	14%	46%	100%	50%	83%	75%	45%	0%	4%	15%	19%
$/kW percentile	22%	73%	70%	100%	87%	82%	83%	70%	92%	57%	52%	24%
Difference ($/kW-$/kWH)	**5%**	**59%**	**24%**	**0%**	**37%**	**-1%**	**8%**	**25%**	**92%**	**53%**	**37%**	**5%**
$/kWh sample size	30	29	21	5	23	35	25	52	14	36	21	34
$/kW sample size	28	27	21	5	22	34	24	51	14	36	20	34

The middle row shows the key value: how many percentage points higher is the $/kW percentile compared to the $/kWh percentile? That is, how much more cost efficient are each of the program at acquiring demand savings v. energy savings. Of the twelve programs shown (CHP and LGEA have been excluded), seven have significantly divergent values (a difference in percentile greater than 10%) and all seven of those favor the procurement of demand savings. ERS dug into the details to see what was causing these divergences. Table 3-3 summarizes our results.

Table 3-3. Reasons for Divergent $/kW and $/kWh Percentiles

	Res NC	Res HVAC	EEP Recycling	Comm Retrofit	P4P NC	P4P Retrofit	SBDI
Difference ($/kW-$/kWH)	59%	24%	37%	25%	92%	53%	37%
Notes	Partial explanation - others claim more lighting savings	No explanation	Single deemed value; kW claims are 2x comparison PAs	Partial explanation - claiming kW savings on VFDs	Very small sample with high variabilty across years (P4P NC 2011 was worst in sample)	Deep savings emphasis is unusual in group	Deep savings emphasis is unusual in group

ERS was able to find reasons specific to four of the programs that were deemed sufficient to explain the result. They are:

- The Appliance Recycling program savings claims are too high for demand savings. While the energy savings claims are in the ball park of other programs, the demand savings are at least two times as high as the others.
- The P4P New Construction program had a small sample of comparison program data points (n=14) *and* the program exhibits high variability from year to year because of the small number of projects. In fact, in 2012, NJCEP had the worst $/kW in the sample, which would erase the difference entirely.
- The P4P retrofit program is unusual in its requirement that participants save at least 15% of their usage before even being allowed in the program. This will lead to projects that go beyond lighting into HVAC, which offer a high demand-to-energy ratio in savings.
- The SBD program is unusual it is requirements that participants install all viable measures, including HVAC measures, which offer a high demand-to-energy ratio in savings.

ERS also found partial explanations for Residential NC and Commercial Retrofit:

- Residential NC does not claim any lighting savings, while some other programs do. This could impact the mix of demand and energy savings.
- In reviewing a sampling of measures in the protocols for Commercial Retrofit, ERS observed that the program claims demand savings for VFDs. In most cases, VFDs will not yield demand savings and most other programs likely do not count significant demand savings from VFDs.

ERS did not find any reasons why the Residential HVAC program would have such a differential in performance. Nonetheless, the initially perceived gap – which seemed rather large and alarming – is much smaller and largely explainable by the nature of the programs in question.

3.3 Budget and Accounting Approach

NJCEP takes an atypical approach to budgeting and accounting with regards to marketing and evaluation spending and with regards to incentive tracking. These impact the ability of the programs to measure themselves accurately, on a standalone basis and in comparison to other programs nationwide.

Marketing funds are budgeted and tracked at the market manager level, with very little marketing spending directly attributed to the program. Elsewhere, marketing spending is generally tracked at the program level, often even in cases where PAs centralize marketing. Evaluation spending is also often tracked at the program level, though less commonly than marketing. ERS used the database to calculate typical rates of spending on marketing and found that programs most commonly spend between 2% and 10% of its budget on marketing. Certain programs require no marketing, while others will require significant amounts, particularly in the early stages; there is no hard and fast rule, but the above does provide a guideline based on empirical results. For evaluation, this value is generally between 3% and 5% as a consequence of regulatory requirements. Consequently, any sort of comparison against other programs that involves costs will often appear more favorable than it really is. **Recommendation #1**: ERS recommends that NJCEP budget and account for marketing and evaluation expenditures at the

program level, even if only an estimated basis. As positive examples, the Massachusetts, Baltimore, and New York programs track these components at the program level as a part of filings and other official reporting. Note that this approach does not preclude aggregated or multi-program spending on either evaluation or marketing. For example, Con Edison has consolidated its marketing, but that cost is redistributed, approximately, among the programs. Similarly, evaluation dollars are consolidated so that comparable programs (e.g., all the residential programs) are grouped and studies are performed at the group level.

NJCEP's tracking data in many cases identifies non-incentive costs as incentive costs. Contractor payments for a variety of activities are classified as incentives. This rendered useless all comparisons of budget breakdowns with other PAs; NJCEP consistently had the lowest percentage of spending dedicated to admin, and the highest percentage dedicated to incentives. Incentive classification should be reserved for dollars that end up in the hands of the end user (or which go to the vendor to buy down the cost of the product on behalf of the end user). Contractors are effectively an extension of the program staff, and their costs should be classified as administrative. **Recommendation #2**: ERS recommends that NJCEP review its incentive tracking procedures to ensure that program expenditures – in particular, payments to contractors – are properly classified.

3.4 Commercial Portfolio Composition

The commercial program portfolio composition – particularly the composition of the retrofit offerings – is atypical and may not be optimal. Aside from the small business direct install program (which is normal), the portfolio includes the following for medium to large existing buildings:

- A prescriptive program with a highly de-emphasized custom offering
- A deep savings program with a very high minimum savings threshold (15%)
- A large energy users program that focuses on a small segment of very large customers (primarily industrial)
- A local government audit program

The typical participant will only really have the option of participating in the prescriptive program or the deep savings program. There's nothing inherently wrong with that and nothing in the data set directly suggests that this is a flawed model. **Recommendation #3:** However, ERS recommends that NJCEP investigate whether this composition optimally positions NJCEP to achieve its goals. Specifically, ERS suggests the following:

- Examine the overall savings penetration and cost-per-savings of the overall retrofit portfolio and compare that to PAs pursuing alternative portfolio model
- Analyze the composition of the participating customer group to identify patterns of participation (or lack of participation) which may provide evidence of holes in offerings
- Query the market for their interest in expanded or alternative program offerings
- Consider the addition of a standalone custom program to offer an engagement option that is more significant than the rebate program and less burdensome than the deep savings program

- Consider the expansion of the audit program to the broader market or the inclusion of "outreach" programs to further engage the market

These topics should be considered as part of the upcoming process evaluation.

3.5 Upcoming Upstream Lighting Savings Shortage

The EEP: Upstream Lighting program represents roughly *half of the entire portfolio of electric savings* and is facing a significant market transformation that will slash those savings in the coming years. Although this is a program-specific finding, it is of significant to the portfolio because of the size of the savings shortfall. CFLs are supplanting incandescents as the dominant technology (i.e., the baseline is changing) and LEDs are replacing CFLs as the incentivizible technology (i.e., the measure is changing). The change in technology, assuming run hours and program volumes remain the same, could reduce the electric savings of the program by as much as 90%, which translates to an overall shortfall of 45% portfolio-wide. Details of this analysis are provided in Appendix D-3, but suffice to say that NJCEP will need to look elsewhere within the portfolio to make up these savings. **Recommendation #4:** ERS recommends that NJCEP make long-term plans on a portfolio level to make up for the anticipated loss of savings that will result from transitioning to a CFL baseline. These plans inevitably involve programs and measures outside of the EEP: Upstream Lighting program.

3.6 Evaluation

In a handful of areas, the benchmarking and subsequent review of programs led ERS to observe that key savings assumptions, such as baselines, hours values, or deemed savings did not accurately reflect current market conditions. This was determined by comparing NJCEP's programs' assumptions to those of programs offering similar measures in similar markets. Details of these reviews are shown throughout the program-by-program reviews, but the most notable examples are the baseline assumptions in the EEP Upstream Lighting program and the EEP Appliance Recycling program. For the lighting program, which assumes an incandescent baseline, key savings assumptions were being reported from evaluations ranging from 2003 to 2009. Similarly, for the EEP Appliance Recycling program, the deemed savings values are from sources ranging from 2001 to 2008. **Recommendation #5**: ERS recommends that NJCEP perform periodic updates to the protocols on a regular schedule. This would be most effectively accomplished by an independent third party that can bring an objective perspective to the savings. For example, New York and California both have outside groups who perform protocol updates.[19] They are hired and overseen by the regulators and cannot play any part in the implementation of the programs.

[19] In New York, the protocols take the form of the New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs or more colloquially The Tech Manual. In California, they are in two forms: the Database for Energy Efficient Resources (DEER) which provides deemed values for costs and savings and "white papers" that are developed and amended as needed on a measure-by-measure basis.

Additionally, ERS observes that most of the comparison programs report both gross and net savings values, implying that they are performing regular impact evaluation that includes an assessment of free ridership. In many cases, estimates of free ridership are significant, such as with the EEP Upstream Lighting program.[20] More importantly, the levels of free ridership vary by program; this variability may impact relative cost effectiveness and how funding is distributed among programs. **Recommendation #6**: ERS recommends that NJCEP expand its impact evaluation activities to include net-to-gross and recommends that this be performed on a regular basis.

3.7 Incentive Levels

ERS reviewed incentive levels for nine of the programs and found that five had incentives that were high relative to comparison PAs. Those programs with high incentives are: Residential Existing Homes, Residential New Construction, Pay-for-Performance New Construction, CHP, and Large Energy Users. ERS has recommended reductions ranging from 20%-50%. None of the nine programs were low. Each program is addressed individually in the program-specific sections, but the trend bears mentioning. ERS did not identify any particular organizational drivers that may have contributed to a high-incentive bias. This finding contributes to the overall high cost of savings experienced by NJCEP.

3.8 Inspection Processes

Inspection processes were reviewed in-depth for six of the programs. ERS recommended that half of those programs (i.e., Residential Existing Homes, Commercial Retrofit, and Small Business Direct Install) *reduce* inspection rates in order to come into alignment with industry norms. Details on the particulars of those inspection rates can be found in each program's respective section. This finding contributes to the overall high cost of savings experienced by NJCEP. There may be a relationship between higher-than-normal inspection rates on the part of the implementers and the relatively limited evaluation efforts undertaken by NJCEP (i.e., implementers are compensating for absent evaluation efforts).

[20] Comparable Upstream Lighting programs nationwide found an average free ridership level of 38%. The program makes up roughly one-half of the NJCEP residential portfolio's electric savings. Thus, if the free ridership in New Jersey is similar to other states, 20% or more of the entire residential portfolio's electric savings may be attributable to free riders.

APPENDIX A: RESIDENTIAL EXISTING HOMES

NJCEP's Residential Existing Homes (Existing Homes) program is based on the Home Performance with ENERGY STAR (HPwES) model that is used nationwide.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- On an unadjusted basis and compared only with those programs that follow the ENERGY STAR model, the NJCEP Residential Existing Homes program had $/kWh costs among the highest in the country.
- The incentive levels offered by the program are 20%-40% higher than other similar programs.
- The program's loan buy-down component is part of the program budget, which is atypical. If the program budgeted these funds separately, it would improve program $/kWh by roughly 20%.
- If the program reduced the incentives to a more average level and budgeted loans separately, the program's $/kWh costs would align to the median among programs in the benchmarking sample.
- The program approach and delivery mechanisms are generally in line with those of similar programs across the country.
- Other programs more typically offer measure-specific rebates as opposed to lump incentives.
- Other programs perform inspections at a lower rate than NJCEP.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R7. Reduce incentive levels by 20-40% to better align with industry average.
- R8. Consider converting to a measure-specific rebate approach, which is more common and ties rebates to savings more directly.
- R9. Budget program loans separately in program accounting (i.e., as if a separate program) in order to track program performance more directly.
- R10. Consider reducing inspections by as much as half in order to reduce costs. These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Twenty of the twenty-five priority comparison PAs have an offering targeting whole-home residential savings. We were able to gather data for all twenty comparable offerings:

- Eleven of them service their residential customers using the HPwES model
- Four, all California (CA) PAs, use the "Energy Upgrade California" model, which has not been successful

- The remaining five have more limited offerings such as audits, outreach, and weatherization services

In addition, following the completion of the benchmarking analysis described below, the ERS team completed further research on the offerings and incentives of the residential existing homes programs offered by NYSERDA, CL&P, BGE, Austin Energy, PEPCO, LIPA, Delmarva, PSNH, Efficiency Vermont, and Wisconsin Focus on Energy. These programs were selected because their offerings are based on the HPwES model. In addition, NYSERDA, CL&P, and BGE, were interviewed to gather in-depth information on the contractor models, savings and measures, non-incentive costs, and quality assurance approaches of these programs. These programs $/kWh values were among the lowest in the sample while still offering traditional HPwES features. Finally, the NJCEP HPwES manager was interviewed.

Benchmarking Analysis

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Analysis subsection refers to those graphics and tables.

NJCEP's Existing Homes program performed poorly on the three core cost metrics, with the 2012 program performance landing it in the 17th, 22nd, and 9th percentile respectively for $/kWh, $/kW, and $/therm. In fact, among those comparison PAs that follow the HPwES model, as NJCEP does, NJCEP's values are among the worst on a $/kWh basis and are the worst on a $/therm basis. This can be seen by closely examining the names of the programs in the $/kWh and $/therm bar graphs; those with $/gross savings values higher than NJCEP are almost all from California where the programs pursue a very different and more costly model than HPwES. These observations are drawn from a fairly large sample for the electric-side metrics (n=30).

NJCEP's 2012 savings per participant were typical among the sample, falling at median for kWh and at the 67th percentile for kW. These were drawn from a relatively small sample (n=13). Gas savings per participant was reported too infrequently for meaningful judgments to be made.

NJCEP's budgeting weighs heavily towards incentives for reasons of accounting not program approach. Meaningful judgments cannot be made on the basis of this data because NJCEP's budgeting is so atypical. However, budget breakdown figures are shown for comparison programs for reference.

Further Research on Key Program Components

ERS gathered information about program offerings and incentives from websites and available documents regarding on ten programs following the HPwES model. Three of those programs were interviewed for additional detail on implementation model, savings approach, and measure mix. The information from that research is summarized below.

Offerings and Incentives

NJCEP's Existing Homes program has significantly higher incentive levels than those offered by the ten PAs identified for further investigation. The offerings are complex making a simple

apples-to-apples comparison difficult. This can be seen in Tables A-1 and A-2, which summarize the incentive approaches and levels of each program.

Table A-1. Summary of Comparison PA HPwES Program Incentive Approaches

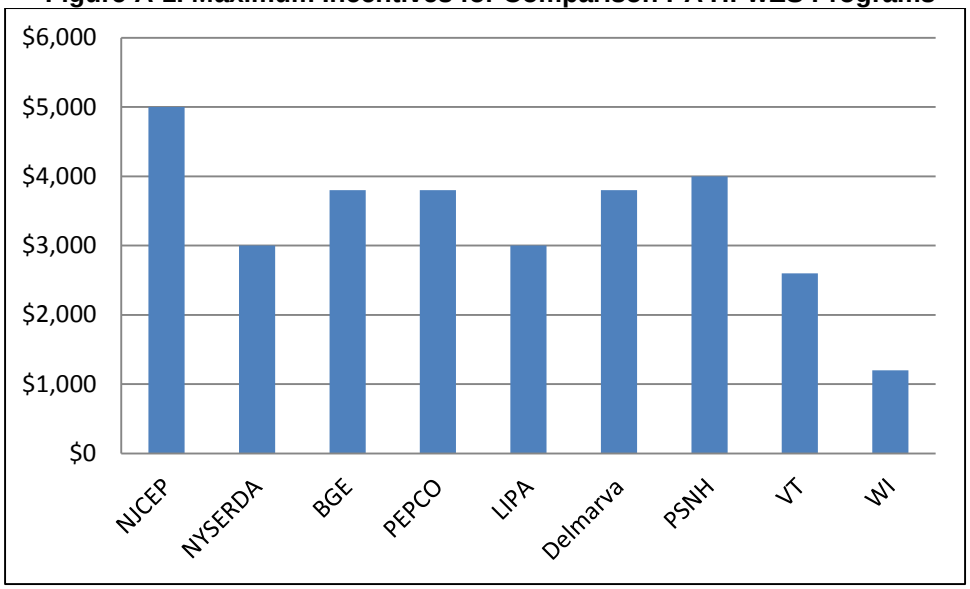
PA	NJCEP	NYSERDA	CL&P	CL&P	BGE	TX
General Incentive Approach	Tier 1 - 10%-20% savings - $2,000 Tier 2 - 20%-25% - $4,000 Tier 3 - >25% - $5,000	Measure-specific rebates with 10% discount	Measure specific rebates	Measure specific rebates	HVAC rebates - $100-$1,800 Shell measures - up to $2,000	Rebates for shell measures; bonus HVAC rebates IF shell measures implemented

Table A-2. Summary of Comparison PA HPwES Program Incentive Approaches

PA	PEPCO	LIPA	Delmarva	PSNH	VT	WI
General Incentive Approach	HVAC rebates - up to $1,800 Shell measures - up to $2,000	Primary Improvements - up to $3000 Ventilation - up to $400 Supplemental Improvements - measure specific	HVAC rebates - up to $1,800 Shell measures - up to $2,000	Up to $4,000 for whole home	Audit - $100 Meet min. requirements - $500 $2,100 - max for improvements heater bonus - $500	Tier 1 - 33% savings (+ potential $250 bonus) - cap: $1,250 Tier 2 - 75% savings - cap: $2,000

The maximum incentive can be more readily compared than the above detail and offers a good approximation of overall approach. Figure A-1 plots the discernible maximums on a bar graph.

Figure A-1. Maximum Incentives for Comparison PA HPwES Programs



The maximum incentive offered by NJCEP is $5,000. Of the ten PAs looked at in-depth, two did not make their incentive offerings apparent; of the eight remaining, the maximum incentive is $4,000, offered by PSNH. The average incentive offering of the eight comparison PAs is about $3,400. The lowest maximum incentive offered is $1,200 by WI Focus on Energy. NJCEP is 20%-40% higher than overall group. **Recommendation #7:** ERS recommends that the overall incentive structure be reduced to bring it more in line with comparison PAs.

In addition, only one of the ten comparison PAs has an incentive structure similar to NJCEP's. NJCEP's Residential Existing Homes program offers tiered "lump" incentives, based on percent savings. This is summarized in Table A-3.

Table A-3. Summary of Program Incentive Types

Program Administrator	NJCEP	NYSERDA	CL&P	BGE	TX	PEPCO	LIPA	Delmarva	PSNH	VT	WI
Lump incentives?	Yes	No	No	No	No	No	Yes	No	Unclear	Yes	Yes
Measure-specific rebates?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	No

The only other jurisdiction that was researched and has similar incentive offerings is Wisconsin. However, their highest savings tier requires a 75% energy savings (versus NJCEP's >25% requirement), with the incentive capped at $2,000 for income eligible recipients, which is vastly lower in comparison to NJCEP's $5,000 incentive cap, particularly when the savings requirements are considered.

Eight of the remaining comparison PAs use incentive structures that vary from that of NJCEP, with all of them placing some form of emphasis on measure-specific rebates. Often the program offers a menu of incentive rates for different measures, with category-specific caps (e.g., HVAC) that help to guide program spending towards specific types of measures. These approaches tie program dollars to savings at a more granular level. In the case of NJCEP, the program offers – for example - $2,000 for projects saving between 10%-20%. That is a wide range of outcomes that ultimately receive the same incentive. Moreover, projects approaching the 20% value have a strong incentive to pursue incremental measures in order to secure additional incentives. As a consequence, program data is likely to show clustering of projects on the low ends of the ranges (e.g., average savings values for the first tier in the low teens as opposed to at 15%, which would be expected if projects distributed randomly).

Recommendation #8: ERS recommends that NJCEP reconsider this incentive approach in favor of rebates that are tied to measure-specific purchases. An alternative improvement could be to offer a sliding scale (e.g., $-per-percent saved) or a greater number of narrow savings tiers (to reduce risk of low-savings clusters in each tier). Finally, a hybrid model, with measure-specific rebates and tier-based bonuses, could be a reasonable compromise to continue the programs emphasis on whole-home savings.

Contractor Model

The contractor model used by NJCEP was broadly similar to those of the few programs ERS was able to interview. NJCEP, BGE, CL&P, and NYSERDA have contractor models that include similar features:

- An application and approval process for all new contractors
- Minimum requirements that must be maintained, the most notable of which being BPI certification
- A free market approach to customer acquisition among those approved by the program
- Contractors are bolstered by technical field representatives who are on hand to answer questions and review contractors' work

Some details differed – for example, CL&P offer no certification reimbursement, NJCEP offers 25% reimbursement, and NYSERDA offers 50% reimbursements – but the big picture approach is approximately the same.

One important detail that differed was the audit scope requirements. In the case of NYSERDA and BGE, the programs require that participating contractors perform comprehensive whole-house audits. NJCEP and CL&P, on the other hand, had no such requirement, leaving the scope up to the contractors. ERS did not see any evidence that this was resulting in less comprehensive projects in the case of NJCEP, but did see evidence of this with CL&P. ERS attributes this to the NJCEP incentive approach. If the incentive approach is changed, the audit requirement be reevaluated to ensure whole-home savings are maintained.

Savings & Assumptions

The programs interviewed took differing approaches to savings calculations. NJCEP uses Real Home Analyzer to model whole-home savings. NYSERDA allows any modeling tool that is BPI HPXML compatible (including Real Home Analyzer); this reduces NYSERDA's training burden by not boxing contractors into any particular software suite. Finally, BGE and CL&P both use a deemed savings approach to match their measure-specific rebates. So long as incentives are based on whole-home savings, modeling software will be required. Converting to a measure-specific rebate could allow NJCEP to migrate to a deemed savings basis, which could reduce contractor costs (and allow for reductions in incentives) if they were no longer required to model program savings. That said, many of the contractors like to use those modeled savings estimates as a marketing tool. Further investigation of contractor preferences would be necessary to make that change.

NJCEP, NYSERDA, and BGE were able to report measure mix, which differed in two key ways. First, NJCEP claims no lighting savings while the other two claim lighting savings on significant numbers of their projects (33% and 70% of projects for NYSERDA and BGE, respectively).[21] Second, NYSERDA and BGE claim water heater savings on significantly fewer projects than NJCEP (33%, 20%, and 95% of projects, respectively).

Non-Incentive Costs

Most of the PAs researched (seven of eleven) offer some sort of financing option. However, unlike the others, NJCEP accounts for those loan buy-down costs in the program budgets. This represents a significant cost to the program: roughly 80% take advantage, the average buy-down costs are $4,200, and nearly half of those loans are supported by NJCEP directly (the other half are by the utilities. This comes out to almost $2,000 in additional spending per participant. **Recommendation #9.** ERS recommends budgeting those funds separately to allow for a more apples-to-apples comparison of program performance going forward.

[21] Importantly, these other programs include requirements that preclude contractors from purchasing CFLs through retail channels where those bulbs may be incentivized by the point-of-sale incentive program. This is to avoid double-counting the savings on those bulbs.

Quality Assurance

NJCEP's quality assurance practices exceeded those of NYSERDA, CL&P, and BGE. ERS did not locate information on quality assurance practices for those not interviewed. NJCEP's inspection rate is roughly 25%. That is on the high side compared to NYSERDA, CL&P, and BGE, which have inspection rates of 12.5%, 5%, and 10% respectively. Additionally, NJCEP inspects the first ten jobs that a new contractor submits to the program, while NYSERDA and BGE only inspect the first three and five respectively, and CL&P does not specifically inspect new contractors. **Recommendation #10.** Although the number of programs interviewed was small, ERS believes these inspection rates are representative of the general market and recommends that NJCEP reduce inspection activities by roughly half to help reduce costs.

Proposed Target Metrics

ERS believes that if incentives are reduced to an industry-average level and if loan payments are excluded from program accounting, the program could cut cost-per-savings metrics by about half. Further, less significant reductions could also be achieved by restructuring the incentives to better tie cost to savings and by reducing costs associated with inspections. Consequently, ERS proposes the target metrics shown in Table A-4.

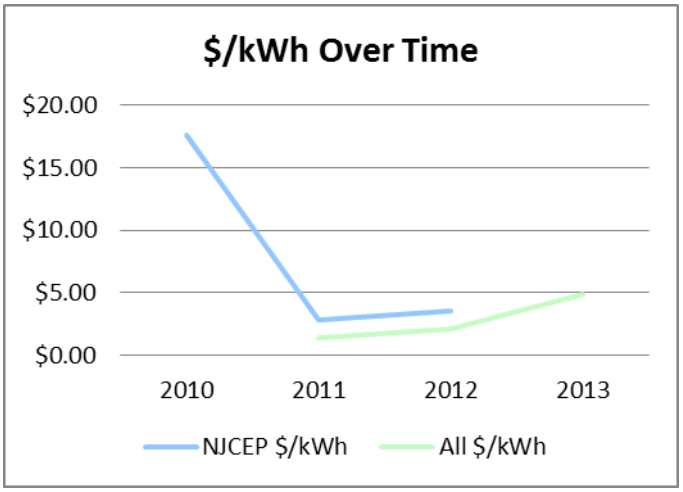
Table A-4. NJCEP Existing Homes Target Metrics

Metric	Target
$/kWh	$1.50/kWh
$/therm	$13.50/therm

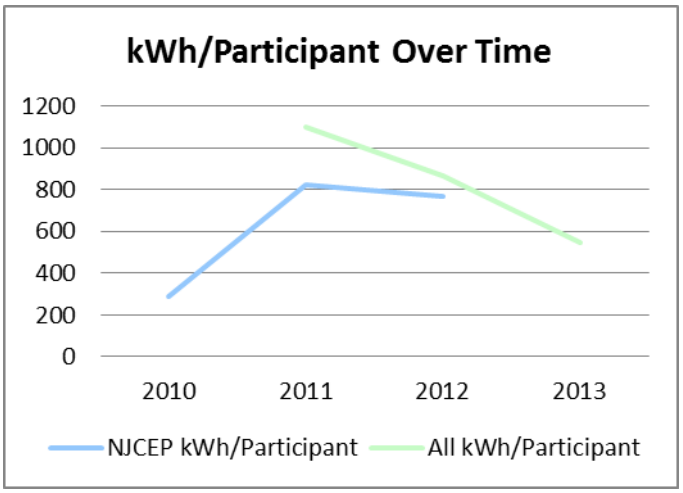
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

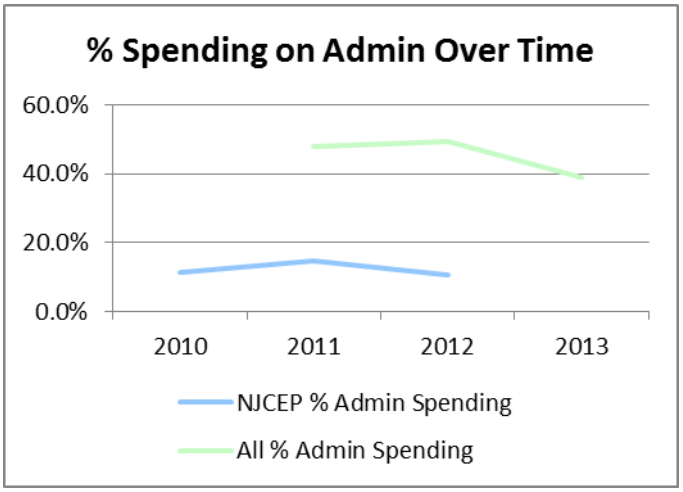
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
Existing Homes 2012	*$3.51*	*$12,193*	*$29.42*
NJCEP Percentile	*17%*	*22%*	*9%*
Sample Size	30	28	12
Std Deviation	$2.76	$8,369	$10.96
Min	$0.08	$1,496	$0.99
75th Percentile	$0.97	$3,513	$5.65
Average	$2.63	$8,696	$11.70
Median	$1.75	$5,954	$7.10
25th Percentile	$3.03	$10,522	$13.81
Max	$12.76	$38,545	$32.13

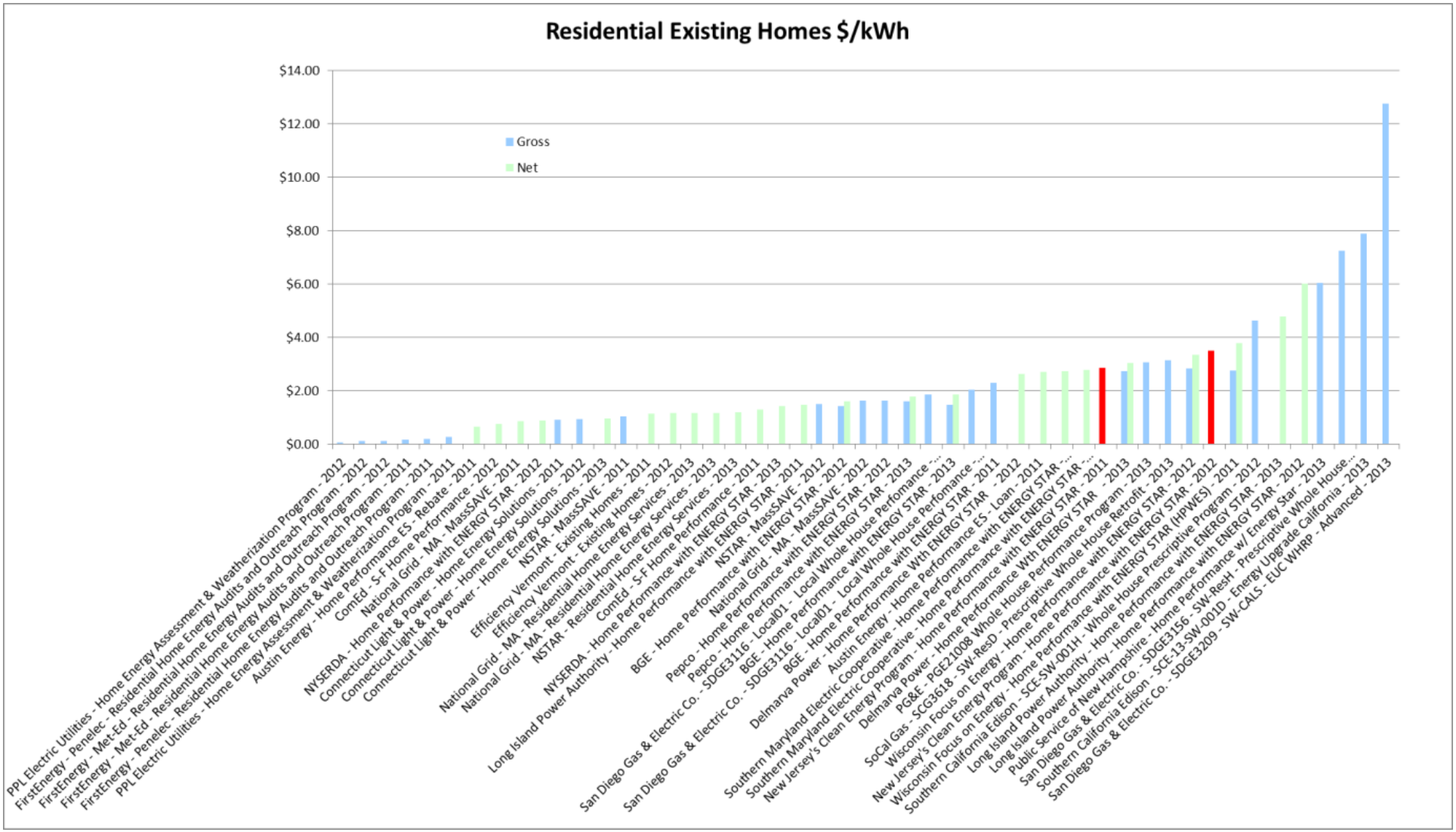


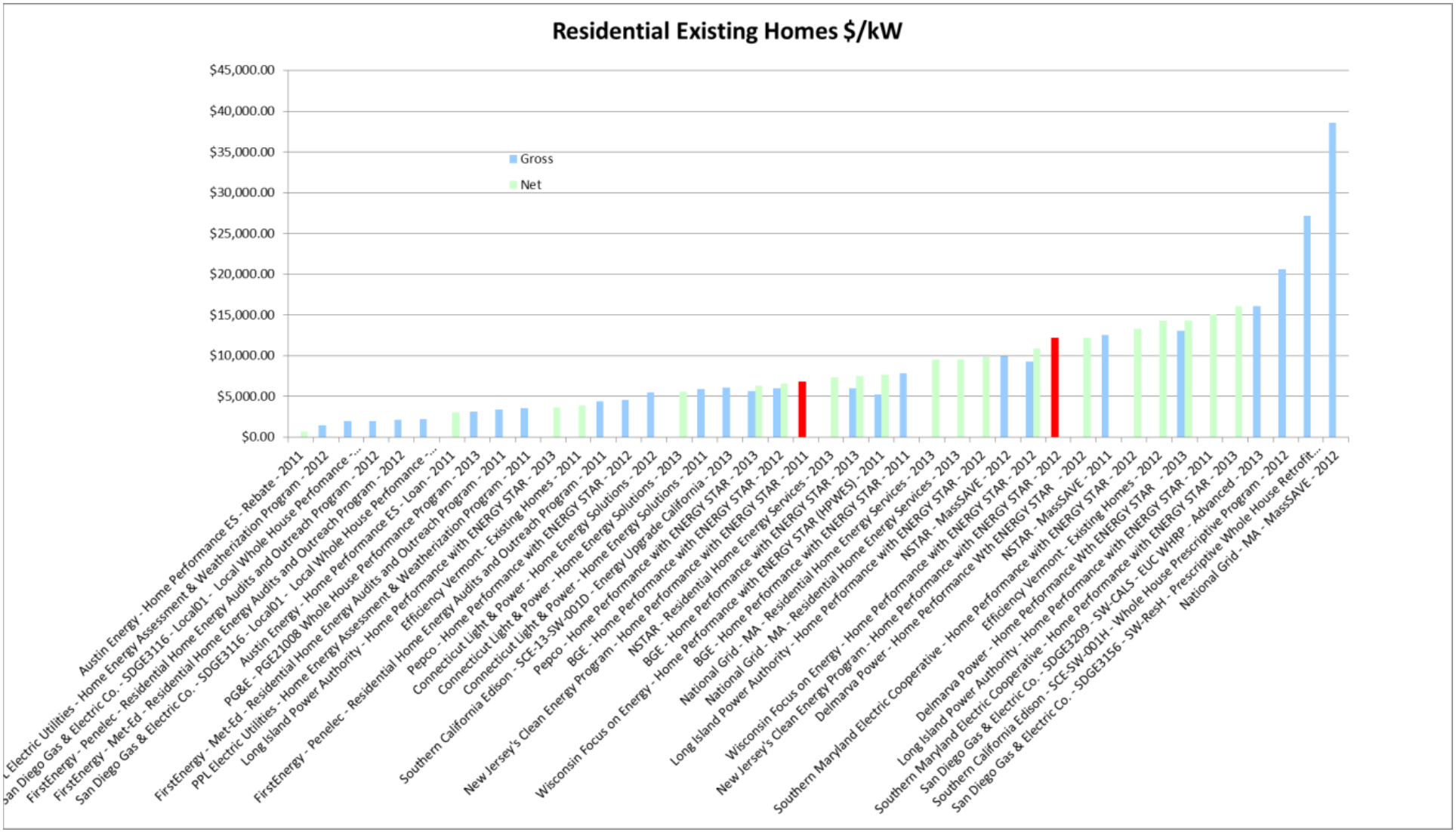
Gross Savings per Participant			
Category	kWh/part.	kW/part.	Therm/part.
Existing Homes 2012	*764*	*0.2*	*137*
NJCEP Percentile	*50%*	*64%*	*67%*
Sample Size	13	12	4
Std Deviation	548	0.2	148
Min	110	0.0	33
25th Percentile	563	0.1	N/A
Average	913	0.2	156
Median	764	0.1	N/A
75th Percentile	1,063	0.3	N/A
Max	2,209	0.5	369

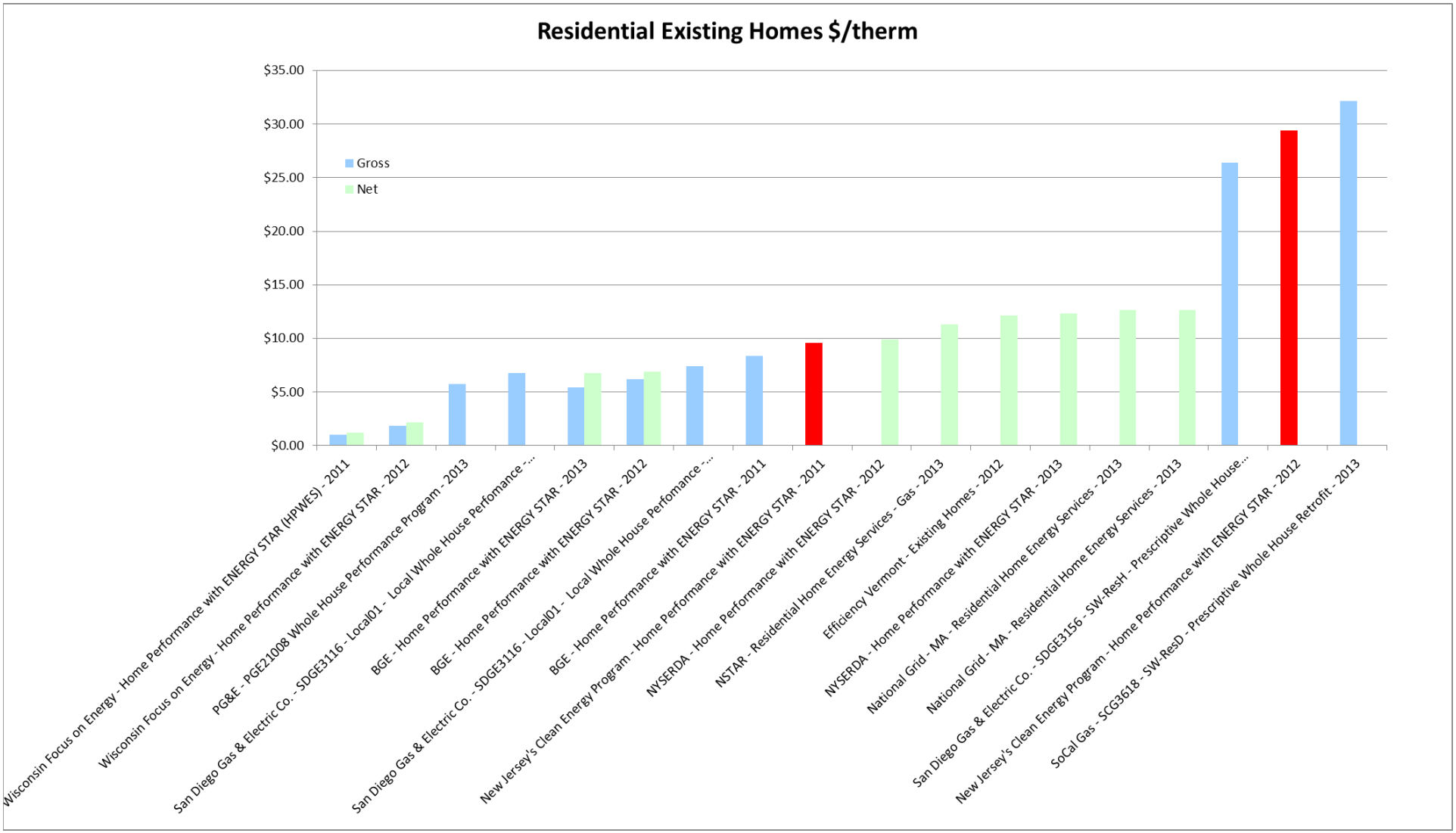


Spending Breakout	
Category	% Incentive
Existing Homes 2012	*90%*
NJCEP Percentile	*96%*
Sample Size	25
Std Deviation	26%
Min	1%
25th Percentile	38%
Average	55%
Median	62%
75th Percentile	72%
Max	97%




Residential Existing Homes $/kWh
$14.00
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
Gross
Net
PPL Electric Utilities - Home Energy Assessment & Weatherization Program - 2012
FirstEnergy - Penelec - Residential Home Energy Audits and Outreach Program - 2012
FirstEnergy - Met-Ed - Residential Home Energy Audits and Outreach Program - 2012
FirstEnergy - Met-Ed - Residential Home Energy Audits and Outreach Program - 2011
FirstEnergy - Penelec - Residential Home Energy Audits and Outreach Program - 2011
PPL Electric Utilities - Home Energy Assessment & Weatherization Program - 2011
Austin Energy - Home Performance ES - Rebate - 2011
ComEd - S-F Home Performance - 2012
National Grid - MA - MassSAVE - 2011
NYSERDA - Home Performance with ENERGY STAR - 2012
Connecticut Light & Power - Home Energy Solutions - 2011
Connecticut Light & Power - Home Energy Solutions - 2012
NSTAR - MassSAVE - 2011
Efficiency Vermont - Existing Homes - 2011
Efficiency Vermont - Home Energy Services - 2013
National Grid - MA - Residential Home Energy Services - 2013
NSTAR - Residential Home Energy Services - 2013
ComEd - S-F Home Performance - 2011
BGE - Home Performance with ENERGY STAR - 2013
Pepco - Home Performance with ENERGY STAR - 2011
National Grid - MA - MassSAVE - 2012
NSTAR - MassSAVE - 2012
BGE - Home Performance with ENERGY STAR - 2012
BGE - Local01 - Local Whole House Performance - ...
NSTAR - MassSAVE - 2012
BGE - Home Performance with ENERGY STAR - 2013
Austin Energy - Home Performance with ENERGY STAR - ...
Delmarva Power - Home Performance with ENERGY STAR - 2011
Southern Maryland Electric Cooperative - Home Performance with ENERGY STAR - 2013
New Jersey's Clean Energy Program - Home Performance with ENERGY STAR - 2012
PG&E - PGE21008 Whole House Prescriptive Whole House Retrofit - 2013
SoCal Gas - SCG3618 - SW-ResD - Prescriptive Whole House Performance Program - 2013
Wisconsin Focus on Energy - Home Performance with ENERGY STAR - 2012
New Jersey's Clean Energy Program - Home Performance with ENERGY STAR (HPWES) - 2011
Wisconsin Focus on Energy - Home Performance with ENERGY STAR - 2012
Southern California Edison - SCE-SW-001H - Whole House Prescriptive Program - 2012
Long Island Power Authority - Home Performance with ENERGY STAR - 2013
Public Service of New Hampshire - Home Performance with ENERGY Star - 2012
San Diego Gas & Electric Co. - SDGE3156 - SW-ResH - Prescriptive Whole House...
Southern California Edison - SCE-13-SW-001D - Energy Upgrade California - 2013
San Diego Gas & Electric Co. - SDGE3209 - SW-CALS - EUC WHRP - Advanced - 2013


Residential Existing Homes $/kW
$45,000.00
$40,000.00
$35,000.00
$30,000.00
$25,000.00
$20,000.00
$15,000.00
$10,000.00
$5,000.00
$0.00
Gross
Net
Austin Energy - Home Performance ES - Rebate - 2011
L Electric Utilities - Home Energy Assessment & Weatherization Program - 2012
San Diego Gas & Electric Co. - SDGE3116 - Local01 - Local Whole House Perfomance -...
FirstEnergy - Penelec - Residential Home Energy Audits and Outreach Program - 2012
FirstEnergy - Met-Ed - Residential Home Energy Audits and Outreach Program - 2012
San Diego Gas & Electric Co. - SDGE3116 - Local01 - Local Whole House Perfomance ES - Loan - 2011
Austin Energy - Home Performance ES - Rebate - 2012
PG&E - PGE21008 Whole House Performance with ENERGY STAR - 2013
FirstEnergy - Met-Ed - Residential Home Energy Audits and Outreach Program - 2013
PPL Electric Utilities - Home Energy Assessment & Weatherization Program - 2011
Long Island Power Authority - Home Performance with ENERGY STAR - 2013
FirstEnergy - Penelec - Residential Home Energy Audits and Outreach Program - 2011
Efficiency Vermont - Existing Homes - 2011
Pepco - Home Performance with ENERGY STAR - 2012
Connecticut Light & Power - Home Energy Solutions - 2012
Connecticut Light & Power - Home Energy Solutions - 2013
Southern California Edison - SCE-13-SW-001D - Energy Upgrade California - 2013
Pepco - Home Performance with ENERGY STAR - 2013
BGE - Home Performance with ENERGY STAR - 2012
New Jersey's Clean Energy Program - Home Performance with ENERGY STAR - 2011
Wisconsin Focus on Energy - Home Performance with ENERGY STAR - 2012
NSTAR - Residential Home Energy Services - 2013
BGE - Home Performance with ENERGY STAR - 2011
National Grid - MA - Residential Home Energy Services - 2013
Long Island Power Authority - Home Performance with ENERGY STAR (HPWES) - 2011
Wisconsin Focus on Energy - Home Performance with ENERGY STAR - 2011
New Jersey's Clean Energy Program - Home Performance with ENERGY STAR - 2013
Delmarva Power - Home Performance with ENERGY STAR - 2012
NSTAR - MassSAVE - 2012
Southern Maryland Electric Cooperative - Home Performance Wth ENERGY STAR - 2012
Efficiency Vermont - Existing Homes - 2012
Delmarva Power - Home Performance with ENERGY STAR - 2011
Long Island Power Authority - Home Performance with ENERGY STAR - 2013
Southern Maryland Electric Cooperative - Home Performance with ENERGY STAR - 2013
San Diego Gas & Electric Co. - SDGE3209 - SW-CALS - EUC WHRP - Advanced - 2013
Southern California Edison - SCE-SW-001H - Whole House Prescriptive Program - 2012
San Diego Gas & Electric Co. - SDGE3156 - SW-ResH - Prescriptive Whole House Retrofit...
National Grid - MA - MassSAVE - 2012


Residential Existing Homes $/therm
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
Gross
Net
Wisconsin Focus on Energy - Home Performance with ENERGY STAR (HPWES) - 2011
Wisconsin Focus on Energy - Home Performance with ENERGY STAR - 2012
PG&E - PGE21008 Whole House Performance Program - 2013
San Diego Gas & Electric Co. - SDGE3116 - Local01 - Local Whole House Perfomance -...
BGE - Home Performance with ENERGY STAR - 2013
BGE - Home Performance with ENERGY STAR - 2012
San Diego Gas & Electric Co. - SDGE3116 - Local01 - Local Whole House Perfomance -...
BGE - Home Performance with ENERGY STAR - 2011
BGE - Home Performance with ENERGY STAR - 2011
New Jersey's Clean Energy Program - Home Performance with ENERGY STAR - 2012
NYSERDA - Home Performance with ENERGY STAR - 2012
NSTAR - Residential Home Energy Services - Gas - 2013
Efficiency Vermont - Existing Homes - 2012
NYSERDA - Home Performance with ENERGY STAR - 2013
National Grid - MA - Residential Home Energy Services - 2013
National Grid - MA - Residential Home Energy Services - 2013
San Diego Gas & Electric Co. - SDGE3156 - SW-ResH - Prescriptive Whole House...
New Jersey's Clean Energy Program - Home Performance with ENERGY STAR - 2012
SoCal Gas - SCG3618 - SW-ResD - Prescriptive Whole House Retrofit - 2013

APPENDIX B: RESIDENTIAL NEW CONSTRUCTION

NJCEP's Residential New Construction (Residential NC) program is based on the ENERGY STAR Certified New Homes (ESNH) program model used nationwide.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- Program performance degraded significantly from 2011 to 2012. Though most ESNH programs experienced an increase in $/kWh, NJCEP's program $/kWh increased approximately 150%, roughly three times the nationwide average increase.
- ESNH programs nationwide are grappling with how to incentivize and claim savings associated with unregulated loads (i.e., lighting, appliances, and plug loads) in order to counteract the diminishing and increasingly expensive savings offered by regulated loads.
- The NJCEP ESNH program incentives are higher and less targeted, by and large, than nationwide counterparts.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R11. Review and consider alternative ESNH models that better incentivize and claim savings from unregulated loads.
- R12. Reduce incentive levels to better align with industry average. The specific reductions will vary by tier and offering.
- R13. Adopt a more targeted incentive approach to align program spending more closely to project savings (e.g., by aligning payments to home size or type, or by including prescriptive requirements that more consistently deliver savings than the ENERGY STAR requirements).

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Twenty of the twenty-five priority comparison PAs have offerings targeting whole-home residential savings for new construction. ERS was able to gather data for eighteen of the twenty comparable programs:

- Thirteen of which, like NJCEP, service their residential customers using the national ENERGY STAR model and the Home Energy Rating System (HERS) Index for savings and incentives
- Four, all CA PAs, use the "California Advanced Homes Program" model, which incentivizes per-kW, per-kWh, and per-therm saved at an increasing rate for every percent better than code a home is
- Wisconsin also diverges from ENERGY STAR and provides incentive tiers for percent-better-than-code

Following the benchmarking analysis, described below, additional interviews were conducted with NYSERDA, CL&P, and BGE regarding their residential new construction programs because they appeared to take a similar approach with lower $/kWh. Interviews were also completed with PG&E and Wisconsin Focus on Energy, which both use significantly different models for their residential new construction programs. Those two were included in order to identify alternative approaches that may offer superior results. Finally, the NJCEP ESNH manager was interviewed. During each interview, detailed information on program offerings, contractor model, quality assurance, and savings approach was gathered for comparison with NJCEP ESNH.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Analysis subsection refers to those graphics and tables.

The cost-per-savings performance of NJCEP's ESNH program was very poor for 2012. It had the highest $/kWh among those leveraging the ENERGY STAR model. The 2011 $/kWh was much better, which matches the pattern nationwide; for programs that had data spanning 2010-2012, there was an approximately 50% increase in $/kWh from 2010 to 2012. This is a result of changes in the ENERGY STAR standards that increased cost, but did not increase savings proportionally. However, for NJCEP, the increase between 2012 and 2011 was roughly 150%, which indicates further issue. NJCEP experienced less pronounced, but still measureable increases in $/kW and $/kWh over that time period.

Interestingly, while NJCEP's $/kWh and $/therm values were poor (14th and 23rd percentile in 2012, respectively), the $/kW value was much better (73rd percentile in 2012). Similarly, while kWh per project was lowest, kW per project was highest. Admittedly, the per-participant samples were small (n=13 and 11 for kWh- and kW-per-participant, respectively), but the trend is matched in larger $/savings samples. ERS speculates that this may be a result of measure mix and measure emphasis: NJCEP emphasizes shell measures which will tend to result in a higher kW-to-kWh savings ratio, whereas ERS observed anecdotally that other programs place an emphasis on lighting and sometimes appliances, which will have a lower kWh-to-kW ratio.

NJCEP's budgeting weighs heavily towards incentives for reasons of accounting not program approach. Meaningful judgments cannot be made on the basis of this data because NJCEP's budgeting is so atypical. However, budget breakdown figures are shown for comparison programs for reference.

Further Research on Key Program Components

ERS interviewed five programs – three offering what appeared to be a similar approach and two offering an alternative approach. Information on program offerings, contractor model, savings methods, non-incentive costs, and quality assurance was collected and is summarized below.

Offerings and Incentives

ESNH programs across the country promote efficiency in new homes by providing incentives for:

- Completing various versions of the ENERGY STAR standards (e.g., version 3.1 v. 2.0), which include a package of prescriptive requirements primarily geared towards insulation, sealing, and efficient heating and cooling systems.
- Achieving certain efficiency scores, primarily gauged on the Home Energy Rating System (HERS) Index, which measures the overall efficiency of a home.
- Completing certain prescriptive upgrades, such as installing all ENERGY STAR light bulbs.

Different programs choose one or more of the above to incentivize. Table B-1 summarizes the offerings of those programs that ERS interviewed.

Each program is unique in their offerings and incentives. All but BGE offer increasing incentives for achieving different tiers. Those tiers, though, are tied to different things:

- For PG&E and CL&P, the incentives are tied to energy scores exclusively, with bonuses for achieving ENERGY STAR and other standards.
- In Wisconsin, the tiers are energy score based along with requirements for increasing numbers of elective prescriptive requirements.
- NYSERDA's tiers are based entirely on ENERGY STAR tiers and other prescriptive packages.
- NJCEP's tiers are based primarily on the ENERGY STAR tiers, but include requirements associated with HERS. Notably, there is no difference in the HERS score required between tiers 1 and 2.

The primary conclusion here is that all programs come at this market from a different perspective; there is no consensus on approach.

An additional layer of context involves the fact that all the program managers ERS spoke with acknowledged a growing challenge in this program category. Namely, the ENERGY STAR requirements are reaching a point of diminishing returns and unregulated loads (i.e., those outside of the code and outside of HERS-based ratings) are an increasingly significant source of savings. Unregulated loads include lighting, appliances, and plug loads. Programs have begun to combat this issue in multiple ways:

- CL&P and BGE both include prescriptive requirements outside of ENERGY STAR that target unregulated loads. CL&P includes a requirement that 80% of all light fixtures use ENERGY STAR CFLs and that 100% of installed appliances be ENERGY STAR rated. Similarly, BGE requires 90% of fixtures to be CFLs. [22]
- Wisconsin requires participants to pull from a list of twelve different "technology packages" that include options such as installing ENERGY STAR light bulbs or efficient heat pumps.
- PG&E has designed a HERS-like system that includes unregulated energy consumption in the denominator and is working through ways to incentivize unregulated efficiency measures.

[22] It is important to note that these other programs include requirements that preclude contractors from purchasing CFLs through retail channels where those bulbs may be incentivized by the point-of-sale incentive program. This is to avoid double-counting the savings on those bulbs.

NJCEP is facing the same issues. **Recommendation #11:** ERS recommends that NJCEP consider adopting one or more of these approaches in an effort to increase savings and improve the cost-per-savings metrics of the program. A hybrid approach, such as Wisconsin's, offers the market transformation value of the whole-home approach, without limiting the program's effectiveness to regulated loads.

Finally, the overall incentive levels offered by NJCEP appear higher than those offered by other programs and less targeted. While an overall apples-to-apples comparison is near impossible in this case, it can be seen that:

- NYSERDA offers between $4,000 and $8,000 (depending on home size) for net zero homes, while NJCEP offers more than $10,000.
- BGE offers only $1,250 for a single family home achieving ENERGY STAR version 3.1 while NJCEP will offer over up to $3,500 for that same home under its tier 2 standard.
- Wisconsin's incentives cap out at $1,100 per home while NJCEP's obviously range into the thousands of dollars.

PG&E's standards are so drastically different it is difficult to compare. CL&P actually seems to offer similarly generous incentives, but is likely extracting a higher level of savings per home due to its additional prescriptive requirements beyond HERS scoring. This is evidenced in it having a lower $/kWh on a consistent basis throughout the study period. **Recommendation #12**: ERS recommends lowering the overall incentives. **Recommendation #13**: In addition, ERS recommends adopting features into the structure that will more closely tie incentives to savings, such as using home size or type as a tier for incentives or including prescriptive requirements that deliver more consistent savings than the overall ENERGY STAR requirements.

Table B-1. Summary of Residential New Construction Programs Offerings

Residential New Construction Program and Incentive Requirements						
PA	**NJCEP**	**NYSERDA**	**CL&P**	**BGE**	**PG&E**	**Wisconsin**
Program requirements	Tier 1: E* V2.0 + HERS 50-75 Tier 2: E* V3.0 + HERS 50-75 Tier 3: DOE Zero-Energy Ready + HERS <50	Tier 1: E* V3 & NY Energy $mart Homes Tier 2: E* V3.1 Tier 3: designed as net zero energy performance, inclusive of solar PV	Track 1 - HERS-based + 80% E* CFLs and 100% E* Appliances - Tier 1: 70-61 HERS - Tier 2: 60-50 HERS - Tier 3: Below 50 HERS - Bonus for E* V3.1, LEED, US DOE Challenge Home, or NGBS Track 2 - Prescriptive (insulation, sealing, and HVAC)	E* V3.1 + 90% CFL (or energy efficient measure equivalence) *Not based on HERS*	Must receive a CAHP Score (CA HERS) better than an 85, which is relative to Title 24 2013 Can get extra CAHP Score points for prescriptive items such as DOE Zero Energy Ready Home (3 points)	14 prescriptive requirements plus: Tier 1 - 10-20% better than code Tier 2 - 20-30% better + 2 techs Tier 3 - 30-40% better + 3 techs Tier 4 - >40% better + 4 techs Can choose from 12 different technology packages to fulfill upper tier requirements (e.g., ENERGY STAR light bulbs)
Program incentives	Tier 1: $2,500 for 50 -$250 per 5 pts above 50 Tier 2: $3,500 for 50 -$250 per 5 pts above 50 Tier 3: $10,000 for 50 +$800 per 5 points below 50	Tier 1: $2,000 Tier 2: <= 1500 ft^2 - $2,500 >1500 ft^2 - $3,000 Tier 3: <= 1500 ft^2 - $4,000 >1500 ft^2 - $8,000 Home OR Display Home: $1000 First Plan Review & Rating Incentive: $1000 Affordable Housing Incentive: $500	Track 1 - HERS-based + 80% E* CFLs and 100% E* Appliances - Tier 1: $3,000 - Tier 2: $4,000 - Tier 3: $4,500 + $50/point<50 HERS - Bonus of up to $1,250 Track 2 - Prescriptive (insulation, sealing, and HVAC) - $500/ton geothermal capped at $1,500 - $0.50/sf insulated capped at $960-$2,010 based on bedroom count	Based on home type - paid to builder: - Multifam low-rise: $400 - Two-on-Two Condo: $550 - Townhouse and duplex: $750 - Single family detached:$1250	$300 for 84 $100/point down to 75 $200/point below 75	Tier 1 - $150 ($100 electric only) Tier 2 - $625 ($150 e only) Tier 3 - $850 ($250 e only) Tier 4 - $1,100 ($350 e only)
Rater incentive?	No	Yes, HERS provider Incentive: $100/unit and eligible for coop marketing assistant (see below)	No	No	No	No

E = ENERGY STAR*

Contractor Model

The contractor model in the case of ESNH programs is primarily dictated by which member of the construction team is responsible to the program: the rater, the rater "provider", the modeler, or the builder. Among those interviewed, there was no consensus as to who the main point of contact was and the data did not reveal any obvious patterns of performance associated with choosing a "builder-centric" model over a "rater-centric" model or vice versa. NJCEP focuses on the rater and this seems like a sensible approach and is done successfully by other programs across the country.

One area of consensus that did appear related to the way raters were handled. In all cases except one, they were independent of the program, but program-approved (i.e., they fulfilled certain requirements and applied to the program for approval). The one exception was PG&E, which did not background check credentials; their rationale was that the market was so mature at this point that it was self-regulating. In all cases, very limited or no training was provided except on key program aspects or changes in program requirements. In this category, NJCEP is in line with others nationwide

Savings & Assumptions

NJCEP, like most of the programs, uses the REM/Rate software in order to calculate savings. The exception to this are PG&E – which uses a CA-specific software very similar to REM/Rate – and BGE, which has a deemed savings tool to calculate savings. For those that use modeling software, the programs identify the characteristics of the home and the installed equipment and compare the associated energy consumption to that of a similar, code-compliant home. One exception to this that is worth considering for NJCEP is the introduction of a custom, above-code baseline that reflects actual market trends among those not participating in the program; this is called a User Defined Reference Home or UDRH. CL&P uses a UDRH that is based on a once-every-few-years market study to observe baseline practices among those not participating in the program. PG&E uses one implicitly, since the software is custom designed using baseline market studies. This allows the programs to accurately assess their impacts. ERS does not formally recommend this because it may be beyond the resources of the program, but it is worth considering going forward.

Non-Incentive Costs

Most of the programs reported offering cooperative marketing opportunities to participating contractors, but also reported very little uptake of those offerings. This is consistent with NJCEP's experience. Most programs also reported, similar to NJCEP, very limited training.

Quality Assurance

NJCEP's inspection rate for projects is in line with other programs nationwide. NJCEP estimated inspecting between 5%-15% of projects. This is the exact range reported by all of the interviewed program managers. One difference was that NJCEP took a more stringent approach to new participants, inspecting their first five projects. NYSERDA inspects the first three, while

the others have no special requirement. This is a relatively minor difference, and no changes are recommended.

Proposed Target Metrics

A restructuring and reduction of the incentives, tied with a new emphasis on unregulated loads could dramatically improve program performance. This would reduce costs while expanding the potential savings pool. Those programs interviewed consistently achieved $/kWh values below $1.00/kWh, though it is hard to say how much is attributable to current program structures since they have all recently undergone changes. ERS believes that similar performance should be achievable – it was in the past by NJCEP and has been achieved by the interviewed programs with their 2013 data. Consequently, ERS proposes the target metrics shown in Table B-2.

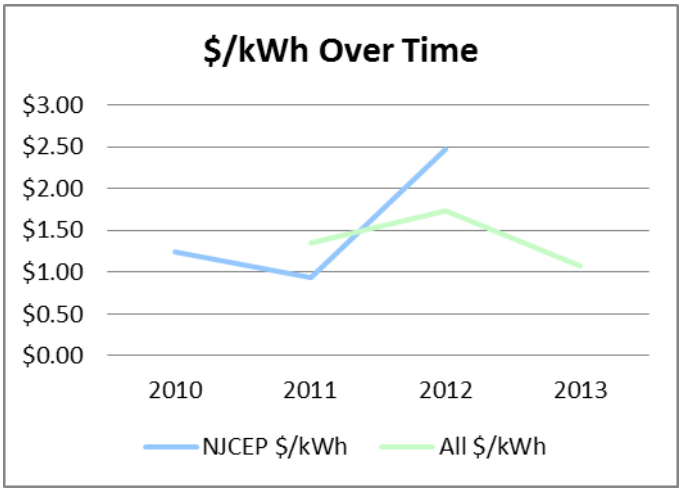
Table B-2. NJCEP Residential New Construction Target Metrics

Metric	Target
$/kWh	$1.00/kWh
$/therm	$4.00/therm

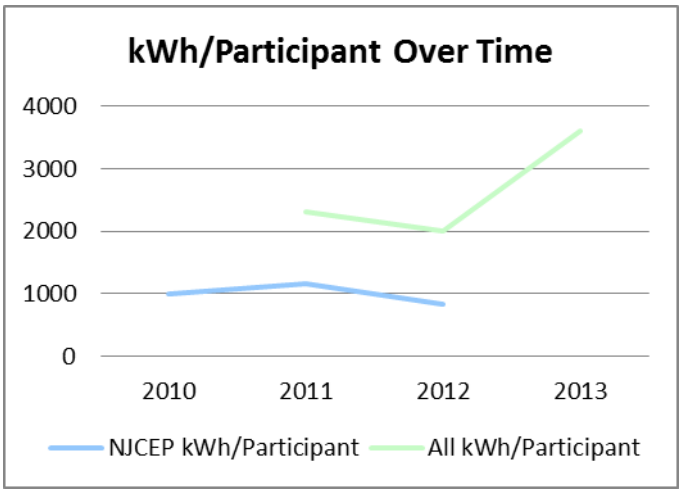
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

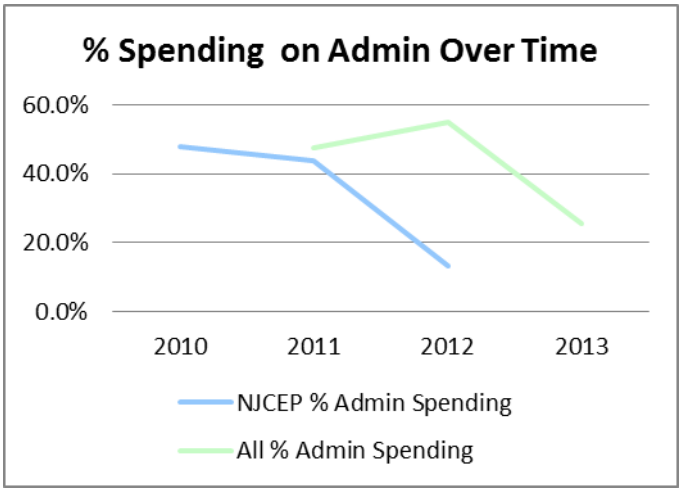
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
Residential NC 2012	*$2.47*	*$1,316*	*$8.88*
NJCEP Percentile	*14%*	*73%*	*23%*
Sample Size	29	27	14
Std Deviation	$1.04	$1,421	$4.12
Min	$0.47	$267	$0.60
75th Percentile	$0.71	$1,294	$2.31
Average	$1.43	$2,415	$5.45
Median	$0.96	$2,399	$4.18
25th Percentile	$1.81	$2,852	$8.59
Max	$4.86	$6,427	$12.70

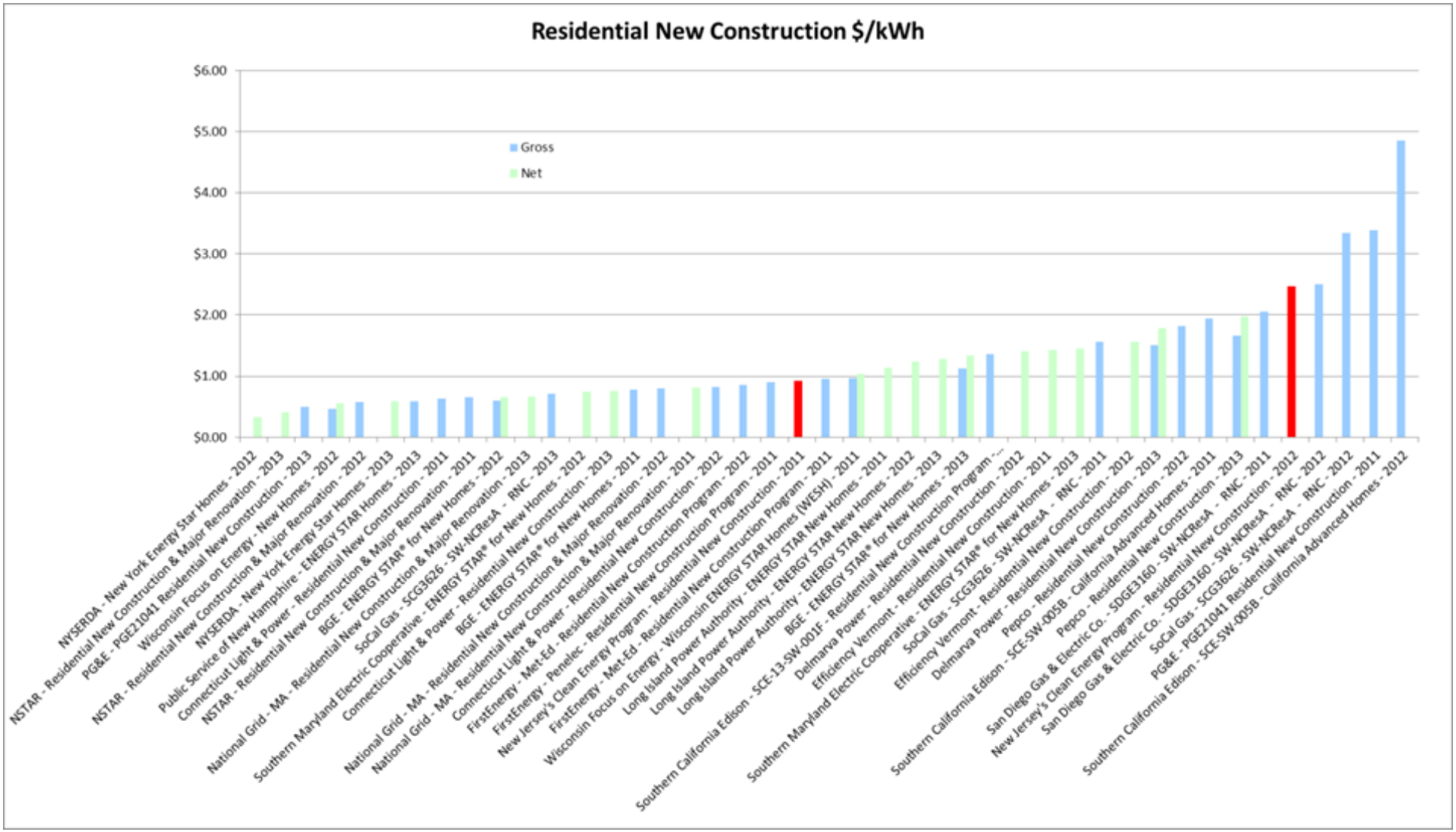


Gross Savings Per Participant			
Category	kWh/part.	kW/part.	Therm/part.
Residential NC 2012	*823*	*1.5*	*153*
NJCEP Percentile	*0%*	*100%*	*50%*
Sample Size	13	11	7
Std Deviation	879	0.4	99
Min	823	0.3	0
25th Percentile	1,607	0.6	0
Average	2,184	0.9	102
Median	1,970	1.0	153
75th Percentile	2,844	1.2	171
Max	3,656	1.5	223



Spending Breakout	
Category	% Incentive
Residential NC 2012	*87%*
NJCEP Percentile	*100%*
Sample Size	21
Std Deviation	24%
Min	9%
25th Percentile	40%
Average	57%
Median	60%
75th Percentile	75%
Max	87%

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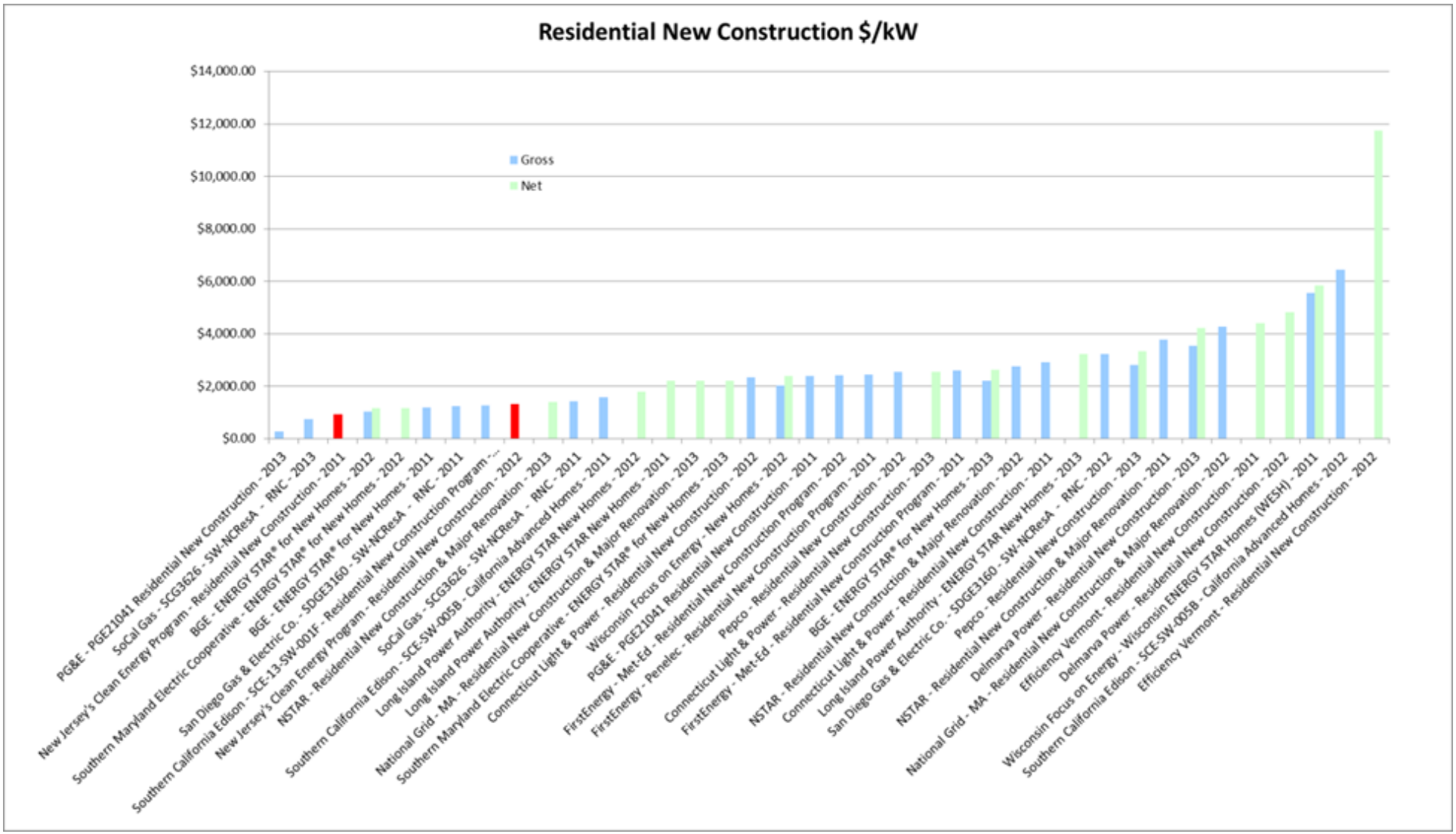
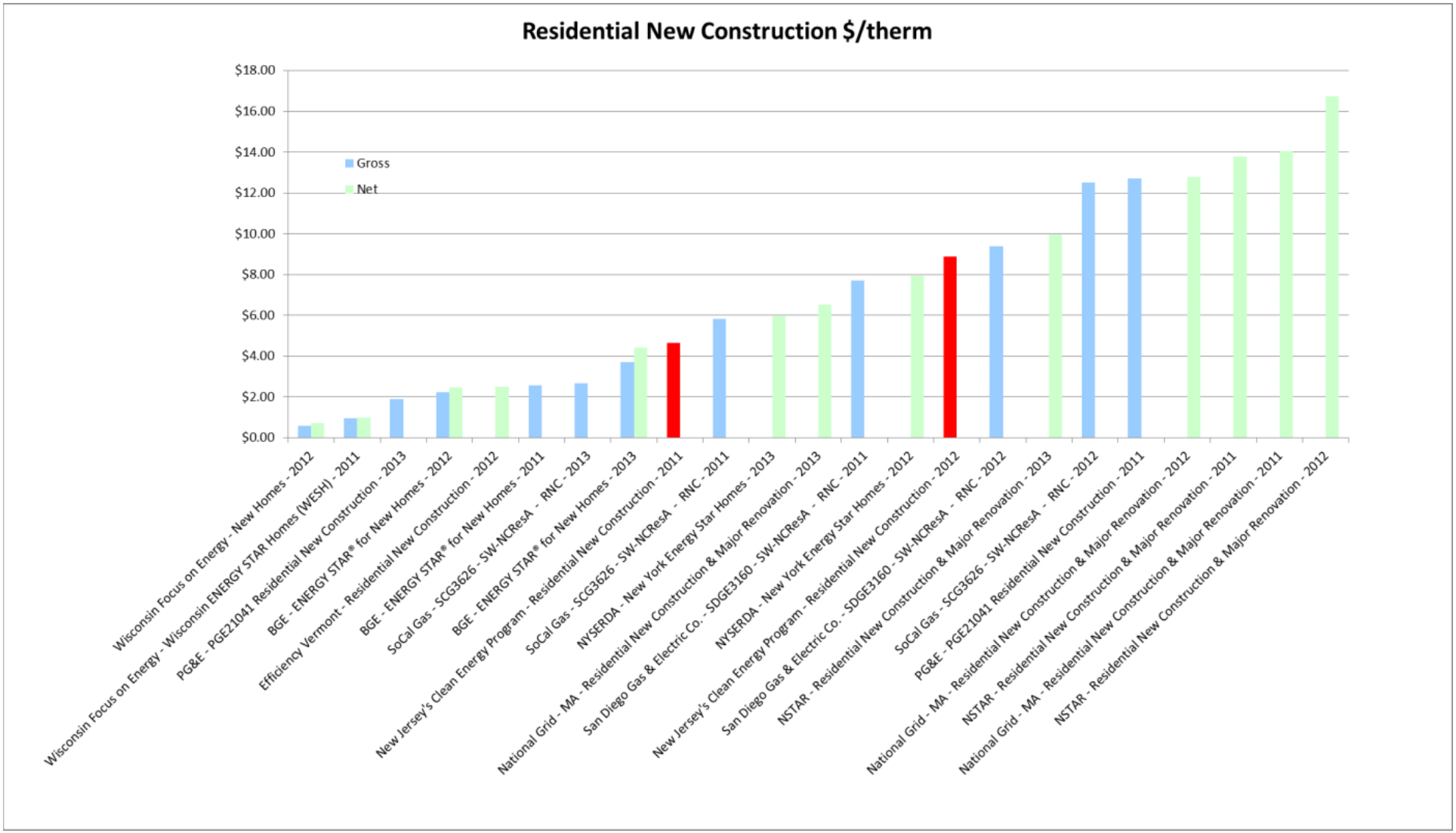
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Gross
Net
NYSERDA - New York Energy Star Homes - 2012
NSTAR - Residential New Construction & Major Renovation - 2013
PG&E - PGE21041 Residential New Construction - 2013
Wisconsin Focus on Energy - New Homes - 2012
NSTAR - Residential New Construction & Major Renovation - 2012
NYSERDA - New York Energy Star Homes - 2013
Public Service of New Hampshire - ENERGY STAR Homes - 2013
Connecticut Light & Power - Residential New Construction - 2011
NSTAR - Residential New Construction & Major Renovation - 2011
BGE - ENERGY STAR® for New Homes - 2012
National Grid - MA - Residential New Construction & Major Renovation - 2013
Southern Maryland Electric Cooperative - ENERGY STAR® for New Homes - 2011
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2013
Connecticut Light & Power - Residential New Construction Program - 2012
National Grid - MA - Residential New Construction & Major Renovation - 2012
National Grid - MA - Residential New Construction & Major Renovation - 2011
FirstEnergy - Met-Ed - Residential New Construction Program - 2012
FirstEnergy - Penelec - Residential New Construction Program - 2011
New Jersey's Clean Energy Program - Residential New Construction Program - 2011
FirstEnergy - Met-Ed - Residential New Construction Program - 2011
Wisconsin Focus on Energy - Wisconsin ENERGY STAR Homes (WESH) - 2011
Long Island Power Authority - ENERGY STAR New Homes - 2011
Long Island Power Authority - ENERGY STAR New Homes - 2012
Long Island Power Authority - ENERGY STAR New Homes - 2013
Southern California Edison - SCE-13-SW-001F - ENERGY STAR® for New Homes - 2013
BGE - ENERGY STAR® for New Homes - 2013
Delmarva Power - Residential New Construction Program -...
Efficiency Vermont - Residential New Construction - 2012
Southern Maryland Electric Cooperative - ENERGY STAR® for New Homes - 2013
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2011
Efficiency Vermont - Residential New Construction - 2013
Delmarva Power - Residential New Construction - 2011
Pepco - Residential New Construction - 2012
Southern California Edison - SCE-SW-005B - California Advanced Homes - 2011
Pepco - Residential New Construction - 2013
San Diego Gas & Electric Co. - SDGE3160 - SW-NCResA - RNC - 2011
New Jersey's Clean Energy Program - Residential New Construction - 2013
San Diego Gas & Electric Co. - SDGE3160 - SW-NCResA - RNC - 2012
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2012
PG&E - PGE21041 Residential New Construction - 2011
Southern California Edison - SCE-SW-005B - California Advanced Homes - 2012


Residential New Construction $/kW
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$0.00
Gross
Net
PG&E - PGE21041 Residential New Construction - 2013
New Jersey's Clean Energy Program - Residential New Construction - 2013
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2013
Southern Maryland Electric Cooperative - ENERGY STAR® for New Homes - 2012
BGE - ENERGY STAR® for New Homes - 2012
Southern California Edison - SCE-13-SW-001F - Residential New Construction Program - ...
San Diego Gas & Electric Co. - SDGE3160 - SW-NCResA - RNC - 2011
New Jersey's Clean Energy Program - Residential New Construction & Major Renovation - 2012
NSTAR - Residential New Construction - ENERGY STAR® for New Homes - 2011
Southern California Edison - SCE-SW-005B - California Advanced Homes - 2011
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2011
Long Island Power Authority - ENERGY STAR New Homes - 2011
National Grid - MA - Residential New Construction & Major Renovation - 2013
Southern Maryland Electric Cooperative - ENERGY STAR® for New Homes - 2013
Connecticut Light & Power - Residential New Construction - 2012
Wisconsin Focus on Energy - New Homes - 2012
PG&E - PGE21041 Residential New Construction - 2011
FirstEnergy - Met-Ed - Residential New Construction Program - 2012
FirstEnergy - Penelec - Residential New Construction Program - 2011
Pepco - Residential New Construction - 2012
Connecticut Light & Power - Residential New Construction Program - 2011
FirstEnergy - Met-Ed - Residential New Construction - 2012
NSTAR - Residential New Construction & Major Renovation - 2012
Connecticut Light & Power - Residential New Construction - 2013
Long Island Power Authority - ENERGY STAR® for New Homes - 2013
San Diego Gas & Electric Co. - SDGE3160 - SW-NCResA - RNC - 2012
NSTAR - Residential New Construction - 2013
Pepco - Residential New Construction & Major Renovation - 2011
Delmarva Power - Residential New Construction & Major Renovation - 2013
National Grid - MA - Residential New Construction - 2012
Efficiency Vermont - Residential New Construction - 2011
Wisconsin Focus on Energy - Wisconsin ENERGY STAR Homes (WESH) - 2011
Delmarva Power - Residential New Construction - 2012
Southern California Edison - SCE-SW-005B - California Advanced Homes - 2012
Efficiency Vermont - Residential New Construction - 2012


Residential New Construction $/therm
$18.00
$16.00
$14.00
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
Gross
Net
Wisconsin Focus on Energy - New Homes - 2012
Wisconsin Focus on Energy - Wisconsin ENERGY STAR Homes (WESH) - 2011
PG&E - PGE21041 Residential New Construction - 2013
BGE - ENERGY STAR® for New Homes - 2012
Efficiency Vermont - Residential New Construction - 2012
BGE - ENERGY STAR® for New Homes - 2011
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2013
BGE - ENERGY STAR® for New Homes - 2013
New Jersey's Clean Energy Program - Residential New Construction - 2011
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2011
NYSERDA - New York Energy Star Homes - 2013
National Grid - MA - Residential New Construction & Major Renovation - 2013
San Diego Gas & Electric Co. - SDGE3160 - SW-NCResA - RNC - 2011
NYSERDA - New York Energy Star Homes - 2012
New Jersey's Clean Energy Program - Residential New Construction - 2012
San Diego Gas & Electric Co. - SDGE3160 - SW-NCResA - RNC - 2012
NSTAR - Residential New Construction & Major Renovation - 2013
SoCal Gas - SCG3626 - SW-NCResA - RNC - 2012
PG&E - PGE21041 Residential New Construction - 2011
National Grid - MA - Residential New Construction & Major Renovation - 2012
NSTAR - Residential New Construction & Major Renovation - 2011
National Grid - MA - Residential New Construction & Major Renovation - 2011
NSTAR - Residential New Construction & Major Renovation - 2012

APPENDIX C: RESIDENTIAL GAS & ELECTRIC HVAC

NJCEP's Residential Gas and Electric HVAC (Residential HVAC) program provides prescriptive rebates for heating, cooling, and water heating equipment. This is a typical program offering that sometimes stands as one program, as in NJCEP, and sometimes is rolled up with other appliance rebates.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- Program performance is overall fairly typical. Although the NJCEP program's performance percentiles for $/kWh, $/kW, and $/therm range widely, the raw data is tightly grouped and the NJCEP values are around the middle of the pack in all instances. Moreover, those programs with significantly better results are in jurisdictions with less rigorous standards for evaluation, suggesting that their performance may be based on dubious assumptions.
- The key program assumptions, specifically heating and cooling full load hours, are reasonable, suggesting that savings claims are reasonable as well.
- Incentive levels and measure requirements align to industry-wide averages and trends, which suggests that program is well targeted.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendation:

- R14. Examine application and review processes as well as measure mix as part of upcoming process evaluation to identify any opportunities for improvement.

These conclusions and the recommendation are discussed in greater detail in the following sections.

Comparison Program Sample

Twenty-three of the twenty-five priority comparison PAs offer prescriptive rebates for either heating or cooling equipment. Data was gathered for twenty-two of the twenty-three programs (PPL is the exception):

- Six of the PAs do not separate their appliance rebates from their HVAC rebates and so were excluded from our data set.
- Two PAs, PECO and SCG, include a non-HVAC/non-water heater incentive and were included.
- Twenty priority PAs offer both heating and cooling equipment incentives, the exceptions are: Austin Energy, LIPA, and NGrid NY.

Following the benchmarking analysis described below, additional web research was completed for eight programs with offerings similar to NJCEP. The research yielded full-load hour data, which savings are based on, as well as information on incentive levels and structures. The nine PAs investigated were: Con Edison, PECO, WI Focus on Energy, NGrid MA, BGE, LIPA,

NSTAR, Com Ed, and SCG. This information was used to more accurately drill down on the differences between NJCEP offerings compared to other similar programs.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

The program performance for NJCEP's Residential HVAC program on a $-per-savings basis is around the median. The gross $/kWh figures, which had a solid sample size (n=21), showed the program right at the median (46th percentile). For $/kW, the program performed better (70th percentile), but the values were very tightly packed and a slip of only 10% in NJCEP's $/kW value would have resulted in it slipping below the 50th percentile. NJCEP's gas gross savings were more expensive than most, though the weak sample (n=9) should be regarded lightly; in particular, many of the regional programs reported net saving only, with values well in excess of those seen by NJCEP. A review of the $-per-savings bar graphs following the narrative of this subsection reveals these trends best.

Savings-per-participant were the highest among the sample (n=11) for electric measures, and by a significant margin, with 1,644 kWh saved/participant where the median is 917 kWh saved/participant. However, with the small sample size and large regional variance, this should be considered with less confidence than other results. A more realistic check comes when the key assumptions (e.g., hours of use) are checked against top PAs.

Program spending is heavily weighted toward incentives, but most Residential HVAC programs are. Since there are no contractor payments or other non-incentive payments being labeled as incentives NJCEP comes in at the 55th percentile (n=23), around the middle of the pack.

Further Research on Key Program Components

ERS performed secondary research on nine programs offering similar measures. Information on program offerings and incentives as well as key savings assumptions were gathered. This information is summarized below.

Offerings and Incentives

ERS reviewed the websites of eight PAs to identify the incentive levels and requirements associated with key measures offered by the HVAC program: central air conditioners (ACs) and gas furnaces. Table C-1 summarizes the results.

Table C-1. Summary of Central AC and Gas Furnace Incentives and Requirements

PA	NJCEP	Con Edison	PECO	WI	NGrid MA	BGE	LIPA	NSTAR	ComEd
Central AC incentive	$500	$400	$500	$250	$500	$500	$500	$500	$400
Central AC requirement EER	13	13	13	unclear	13	13	13	13	N/A
Central AC requirement SEER	17	16	16	16	16	18	16	16	16
Gas furnace incentive	$200/ $500	$600	N/A	$225	$600	$400	N/A	$600	N/A
Gas furnace requirement AFUE	95%/ 95% and E* qualified	94% w/ ECM	N/A	0.97	97% w/ ECM	92% w/ ECM	N/A	97% w/ ECM	N/A

E= ENERGY STAR*

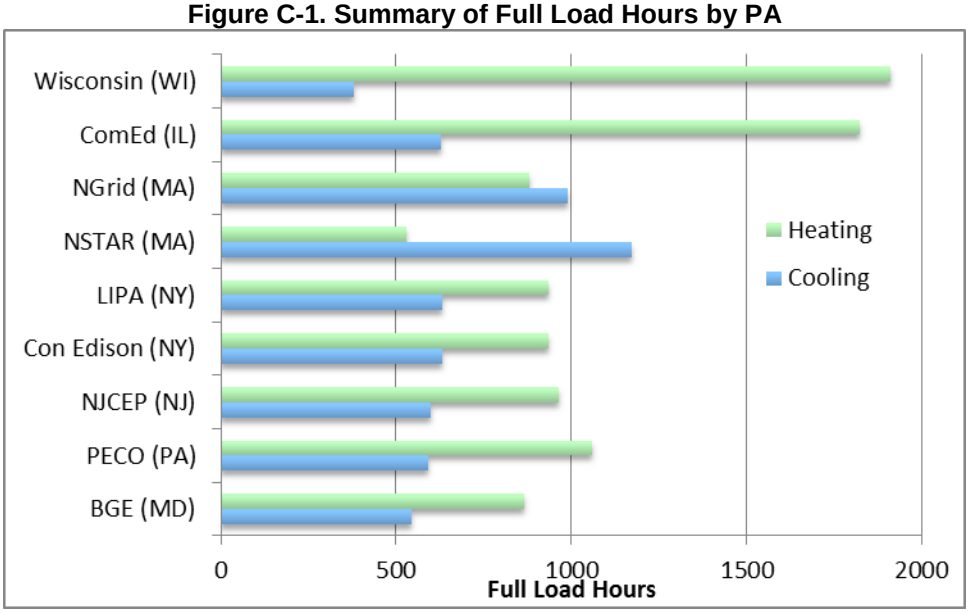
As the table above shows, NJCEP's Residential HVAC program offerings are in line with those from other PAs. Looking at the Central AC incentives, WI Focus on Energy is significantly lower than the rest, but this is expected given their relatively short cooling season. In terms of AC EER and SEER requirements, NJCEP is on-target with the other PAs, the only deviation is that NJCEP's requirement is slightly higher than seven of the other programs', although BGE's is still the most stringent. With regards to furnaces, the incentives a range a little more, with NJCEP in line with the others. The requirements also vary, but NJCEP's efficiency levels are reasonable and also include options for furnaces with and without an electrically commutated motor (ECM; ENERGY STAR furnaces include an ECM).

Although these are not the only measures offered, these measures indicate that NJCEP is offering reasonable incentive dollars in exchange for reasonable levels of efficiency.

Savings & Assumptions

Savings for these sorts of program are most commonly deemed and depend on simple formulas making use of only a few assumptions. Two key assumptions are the efficiency level (noted above to be reasonable) and the full load hours for the equipment. ERS tracked down the heating and cooling hours of use for NJCEP and the eight additional PAs identified above. The statewide efficiency protocols and technical manuals were reviewed for a number of notable peer programs, and the heating and cooling hours were graphed approximately by latitude in Figure C-1.

Figure C-1. Summary of Full Load Hours by PA



The heating and cooling full load hours in the NJ Protocols are very similar to its geographical peers in New York, Pennsylvania, and Maryland. Abnormal full load hours claims may contribute to unrealistic savings claims for HVAC programs, but this is not seen here suggesting that NJCEP's per-unit savings claims are reasonable.

Because the savings claims are reasonable and the incentive levels conform to industry norms, opportunities for program improvement, if any, will be found in other aspects of the program. **Recommendation #14:** ERS recommends examining the application and review processes, as well as measure mix, as part of the upcoming process evaluation to identify any opportunities for improvement.

Proposed Target Metrics

The analysis performed as part of this benchmarking did not reveal any obvious opportunities for improvement. The program performance is average in a program category that is highly commoditized. While there may be room for improvement in the application processing and review aspect of the program, the likelihood of a dramatic improvement is low. Moreover, setting unreasonably aggressive targets would incentivize the program to increase savings claims beyond what is reasonable or lower incentives, potentially endangering overall participation rates. Consequently, ERS proposes the target metrics shown in Table C-2.

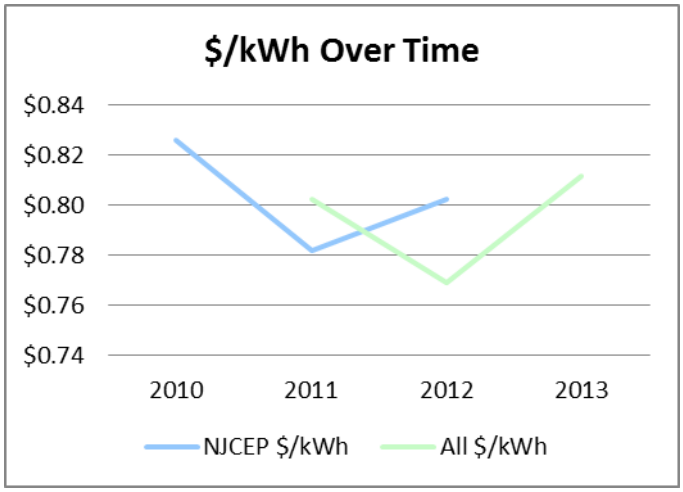
Table C-2. NJCEP Residential HVAC Target Metrics

Metric	Target
$/kWh	$0.75/kWh
$/therm	$2.50/therm

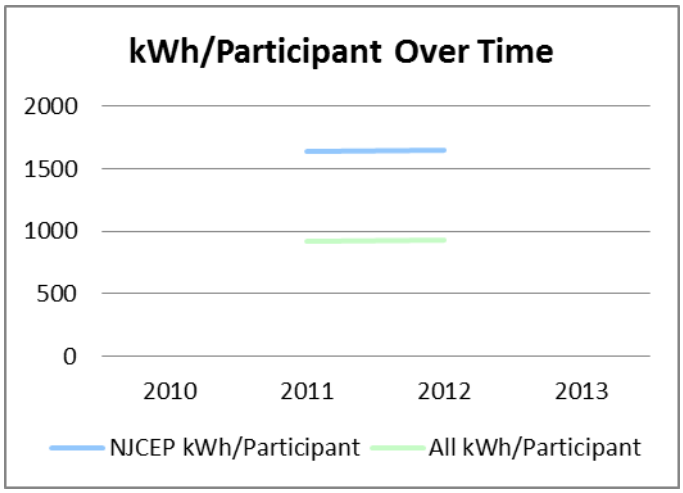
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

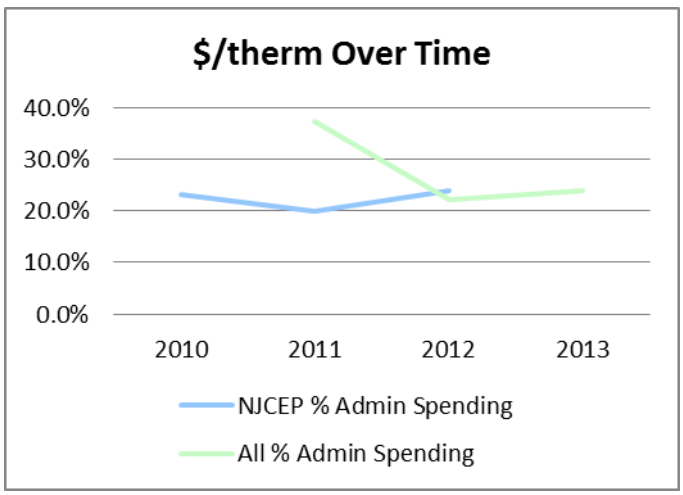
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
Res HVAC 2012	*$0.80*	*$1,443*	*$3.23*
NJCEP Percentile	*46%*	*70%*	*25%*
Sample Size	21	21	9
Std Deviation	$0.41	$1,947	$0.95
Min	$0.05	$146	$1.01
75th Percentile	$0.52	$1,412	$1.89
Average	$0.77	$2,118	$2.33
Median	$0.78	$1,602	$2.02
25th Percentile	$1.01	$2,046	$3.23
Max	$1.61	$8,500	$3.47

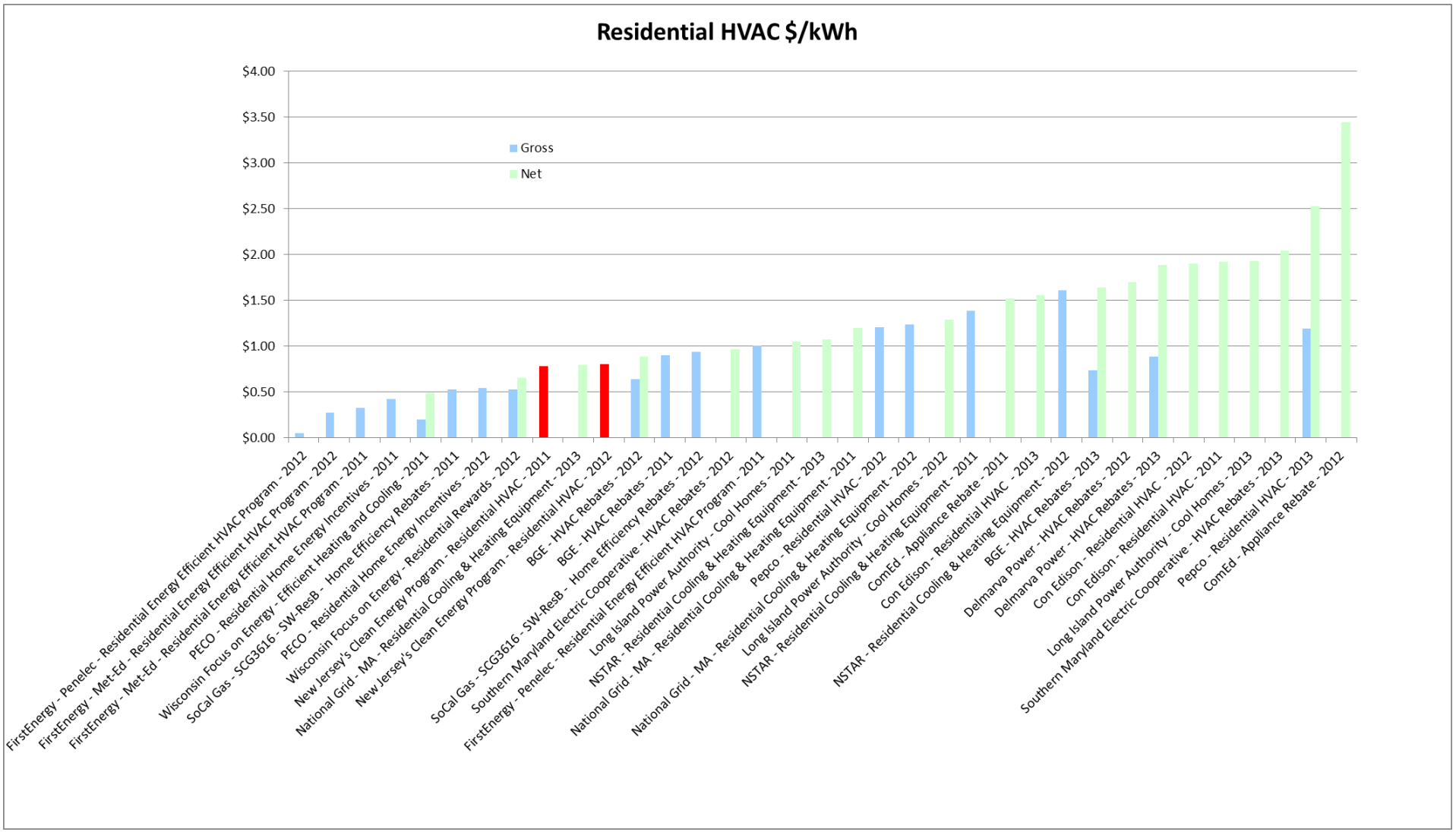


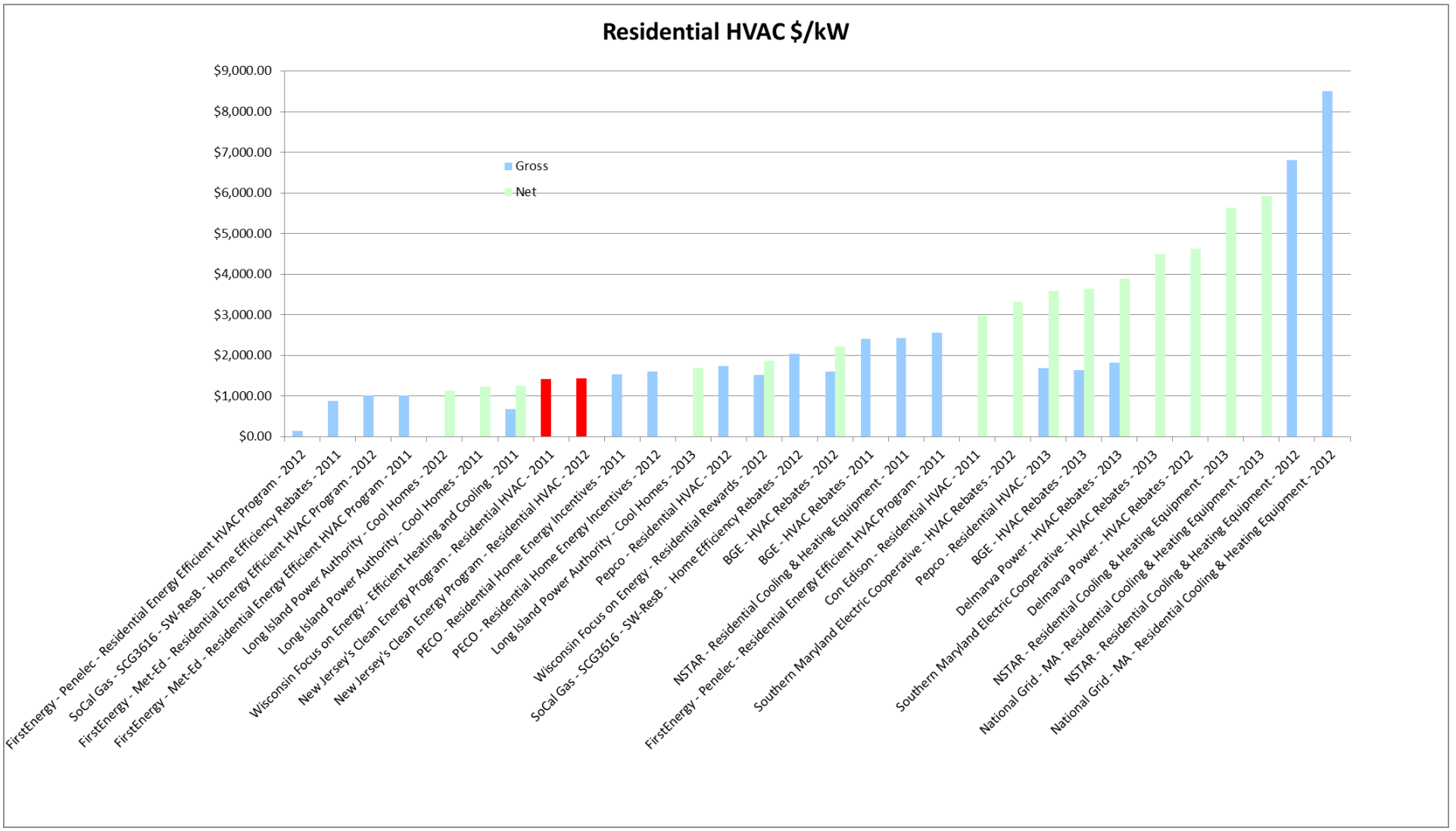
Gross Savings Per Participant			
Category	kWh/part.	kW/part.	Therm/part.
Res HVAC 2012	*1,644*	*0.9*	*407*
NJCEP Percentile	*100%*	*100%*	*N/A*
Sample Size	11	11	4
Std Deviation	439	0.3	109
Min	404	0.1	193
25th Percentile	559	0.2	N/A
Average	909	0.4	347
Median	917	0.3	N/A
75th Percentile	1,077	0.4	N/A
Max	1,644	0.9	436

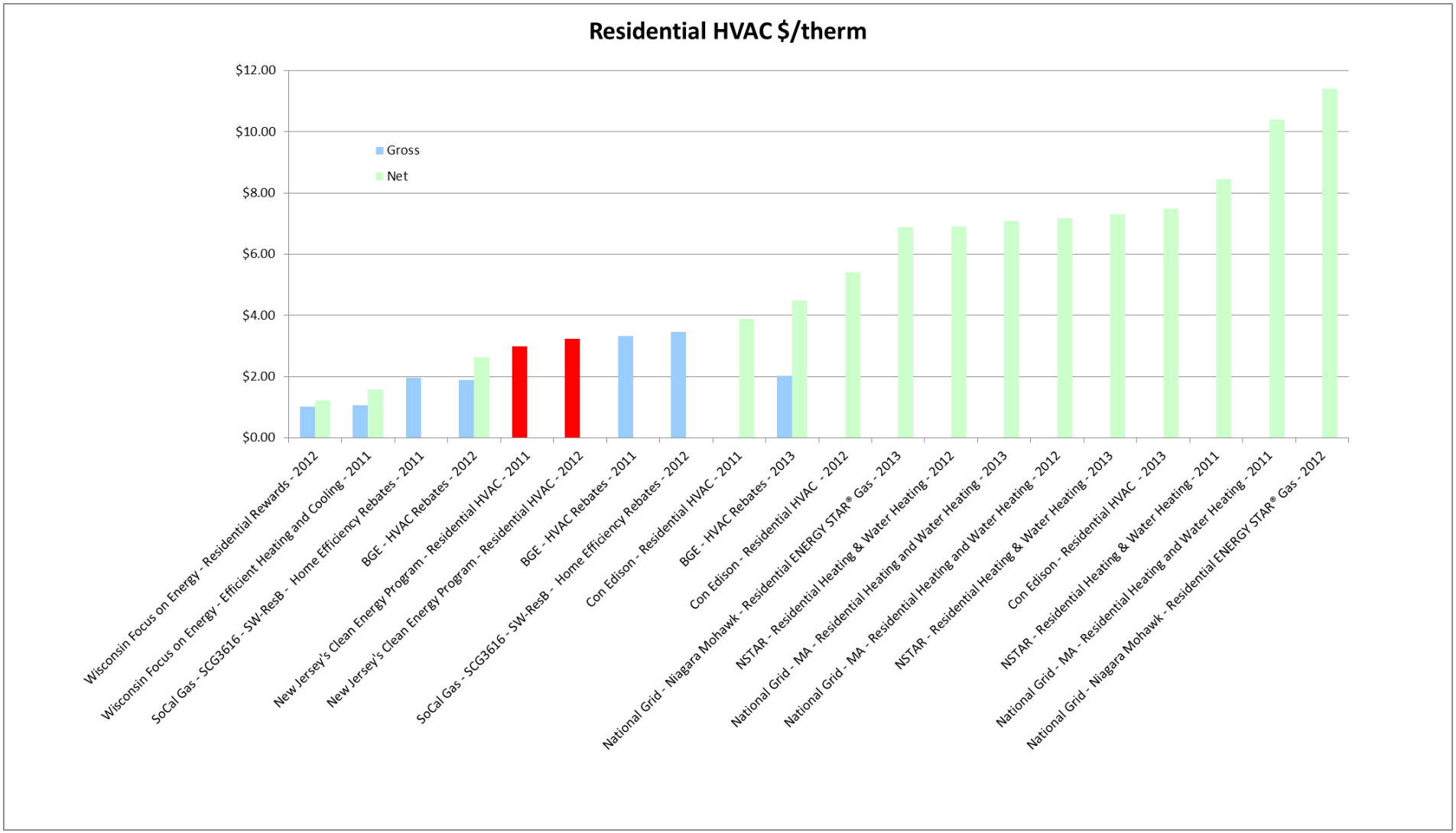


Spending Breakout	
Category	% Incentive
Res HVAC 2012	*76%*
NJCEP Percentile	*55%*
Sample Size	23
Std Deviation	18%
Min	25%
25th Percentile	55%
Average	68%
Median	72%
75th Percentile	81%
Max	88%




Residential HVAC $/kWh
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
Gross
Net
FirstEnergy - Penelec - Residential Energy Efficient HVAC Program - 2012
FirstEnergy - Met-Ed - Residential Energy Efficient HVAC Program - 2012
FirstEnergy - Met-Ed - Residential Energy Efficient HVAC Program - 2011
Wisconsin Focus on Energy - Efficient Home Energy Incentives - 2011
PECO - Residential Home Energy Incentives - 2012
SoCal Gas - SCG3616 - SW-ResB - Home Efficiency Rebates - 2011
Wisconsin Focus on Energy - Efficient Heating and Cooling - 2011
PECO - Residential Home Energy Incentives - 2011
New Jersey's Clean Energy Program - Residential Rewards - 2012
National Grid - MA - Residential Cooling & Heating Equipment - 2013
New Jersey's Clean Energy Program - Residential HVAC - 2011
BGE - HVAC Rebates - 2012
BGE - HVAC Rebates - 2011
Home Efficiency Rebates - 2012
SoCal Gas - SCG3616 - SW-ResB - Home Efficiency Rebates - 2012
Southern Maryland Electric Cooperative - HVAC Rebates - 2012
FirstEnergy - Penelec - Residential Energy Efficient HVAC Program - 2011
Long Island Power Authority - Cool Homes - 2011
NSTAR - Residential Cooling & Heating Equipment - 2013
National Grid - MA - Residential Cooling & Heating Equipment - 2011
Pepco - Residential HVAC - 2012
National Grid - MA - Residential Cooling & Heating Equipment - 2012
Long Island Power Authority - Cool Homes - 2012
NSTAR - Residential Cooling & Heating Equipment - 2011
ComEd - Appliance Rebate - 2011
NSTAR - Residential Cooling & Heating Equipment - 2012
Con Edison - Residential HVAC - 2013
BGE - HVAC Rebates - 2013
Delmarva Power - HVAC Rebates - 2012
Delmarva Power - HVAC Rebates - 2013
Con Edison - Residential HVAC - 2012
Con Edison - Residential HVAC - 2011
Long Island Power Authority - Cool Homes - 2013
Southern Maryland Electric Cooperative - HVAC Rebates - 2013
Pepco - Residential HVAC - 2013
ComEd - Appliance Rebate - 2012


Residential HVAC $/kW
$9,000.00
$8,000.00
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$0.00
Gross
Net
FirstEnergy - Penelec - Residential Energy Efficient HVAC Program - 2012
SoCal Gas - SCG3616 - SW-ResB - Home Efficiency Rebates - 2011
FirstEnergy - Met-Ed - Residential Energy Efficient HVAC Program - 2012
FirstEnergy - Met-Ed - Residential Energy Efficient HVAC Program - 2011
Long Island Power Authority - Cool Homes - 2012
Long Island Power Authority - Cool Homes - 2011
Wisconsin Focus on Energy - Efficient Heating and Cooling - 2011
New Jersey's Clean Energy Program - Residential HVAC - 2011
New Jersey's Clean Energy Program - Residential HVAC - 2012
PECO - Residential Home Energy Incentives - 2011
PECO - Residential Home Energy Incentives - 2012
Long Island Power Authority - Cool Homes - 2013
Pepco - Residential HVAC - 2012
Wisconsin Focus on Energy - Residential Rewards - 2012
SoCal Gas - SCG3616 - SW-ResB - Home Efficiency Rebates - 2012
BGE - HVAC Rebates - 2012
BGE - HVAC Rebates - 2011
NSTAR - Residential Cooling & Heating Equipment - 2011
FirstEnergy - Penelec - Residential Energy Efficient HVAC Program - 2011
Con Edison - Residential HVAC - 2011
Southern Maryland Electric Cooperative - HVAC Rebates - 2012
Pepco - Residential HVAC - 2013
BGE - HVAC Rebates - 2013
Delmarva Power - HVAC Rebates - 2013
Southern Maryland Electric Cooperative - HVAC Rebates - 2013
Delmarva Power - HVAC Rebates - 2012
NSTAR - Residential Cooling & Heating Equipment - 2013
National Grid - MA - Residential Cooling & Heating Equipment - 2013
NSTAR - Residential Cooling & Heating Equipment - 2012
National Grid - MA - Residential Cooling & Heating Equipment - 2012


Residential HVAC $/therm
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
Gross
Net
Wisconsin Focus on Energy - Residential Rewards - 2012
Wisconsin Focus on Energy - Efficient Heating and Cooling - 2011
SoCal Gas - SCG3616 - SW-ResB - Home Efficiency Rebates - 2011
BGE - HVAC Rebates - 2012
New Jersey's Clean Energy Program - Residential HVAC - 2011
New Jersey's Clean Energy Program - Residential HVAC - 2012
BGE - HVAC Rebates - 2011
SoCal Gas - SCG3616 - SW-ResB - Home Efficiency Rebates - 2012
Con Edison - Residential HVAC - 2011
BGE - HVAC Rebates - 2013
Con Edison - Residential HVAC - 2012
National Grid - Niagara Mohawk - Residential ENERGY STAR® Gas - 2013
NSTAR - Residential Heating & Water Heating - 2012
National Grid - MA - Residential Heating and Water Heating - 2013
National Grid - MA - Residential Heating and Water Heating - 2012
NSTAR - Residential Heating & Water Heating - 2013
Con Edison - Residential HVAC - 2013
NSTAR - Residential Heating & Water Heating - 2011
National Grid - MA - Residential Heating and Water Heating - 2011
National Grid - Niagara Mohawk - Residential ENERGY STAR® Gas - 2012

APPENDIX D: ENERGY EFFICIENT PRODUCTS

NJCEP's Energy Efficient Products program includes four components:

1. Appliance recycling
2. Appliance rebates
3. Upstream lighting incentives (including an online store)
4. Other components such as an emerging technologies initiative, contractor training, coop advertising, etc.

The first three components, the core offerings, are typical program offerings, but do not always come bundled together. As such, the data for this program has been disaggregated using tracking data in order to offer component-level analysis. The "other" program offerings are a relatively small part of the program and are more unique, which makes them difficult to analyze quantitatively. They have not been benchmarked.

All of the comparison PAs have at least one offering similar to the three core ones available through NJCEP's Energy Efficient Products. Eighteen of twenty-five offer all three components:

- Often they are offered and reported separately; only five of the programs offering all three do not report them separately
- Programs excluded from the quantitative analysis because the relative proportion of incentives by category is not available are: Duquesne, First Energy Met-Ed, First Energy Penelec, Efficiency Vermont, and LIPA

The following sections analyze data at the component level, including further discussion of comparison programs and their characteristics by offering type.

APPENDIX D-1: APPLIANCE RECYCLING

NJCEP's Energy Efficient Products appliance recycling program offers free pickup and recycling along with a $50/unit rebate for unwanted refrigerators and freezers. This is a common and commoditized program model throughout the country.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- The program's performance is around the middle of the pack on a $/kWh-basis, with $/kW somewhat better than average.
- Energy savings claims are on the high side, with very high demand savings claims.
- Other programs commonly structure the contract to pay less for the second unit picked up at the same location.
- There is a lack of consensus in the industry on how to approach the difference between primary and secondary refrigerators, but knowing the percentage of each being picked up can help programs gauge their performance.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R15. Restructure the contract with the implementation firm to pay less for the second unit picked up at a location recycling more than one unit.
- R16. Savings claims, in particular the demand (kW) savings, should be revisited during an upcoming evaluation to ensure they are realistic and in line with units being recycled by the program.
- R17. Differentiate between primary and secondary units during screening calls or as part of pickup. Down the road, the program could then consider claiming different savings levels based on the type of unit picked up.

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Twenty-two of the twenty-five comparison PAs, like NJCEP, offer some form of appliance recycling.

- Four of the twenty-two include air conditioning (AC) recycling as part of the program, but based on our experience, refrigerator and freezer recycling tend to vastly overshadow AC recycling in these types of programs
- Seven of the twenty-two blend appliance recycling and rebate data, these PAs have been excluded

After the completion of the benchmarking analysis, discussed below, five PAs were isolated for further analysis. These PAs included: O&R, Con Edison, SCE, WI Focus on Energy, and ComEd.

All five of these programs are refrigerator and freezer recycling programs. ERS completed interviews with each of these programs and gathered information on savings claims per-unit, on contract structure, and on the program philosophy towards secondary and primary units. This information is discussed below.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

The cost per gross energy savings appears to be typical among similar programs, falling as the median of the sample (n=23). The cost per demand savings is much better, at 87%. However, this does not account for administrative, marketing and evaluation costs, which would push NJCEP's metric below the mean.

Energy savings per participant appears to be low. This is entirely dependent on the deemed savings per unit, both for energy and power. When considering the typically low realization rates for appliance recycling programs, the savings claims made by NJCEP may be generous. The programs that report net savings have an average that is about half the savings per participant that NJCEP claims.

Data was not available for NJCEP's spending breakout on this program, but the tracking data indicates that $50 of incentives and $101 for contractor payments, in addition to an estimated additional 20% for administrative and marketing spending. As such, an estimated rate of 28% incentives does not fare well, just better than the 25th percentile (n=19).

Further Research on Key Program Components

ERS performed interviews and research with five programs offering similar measures. The information targeted pertains to contract structure and savings philosophy and levels.

Contractor Model

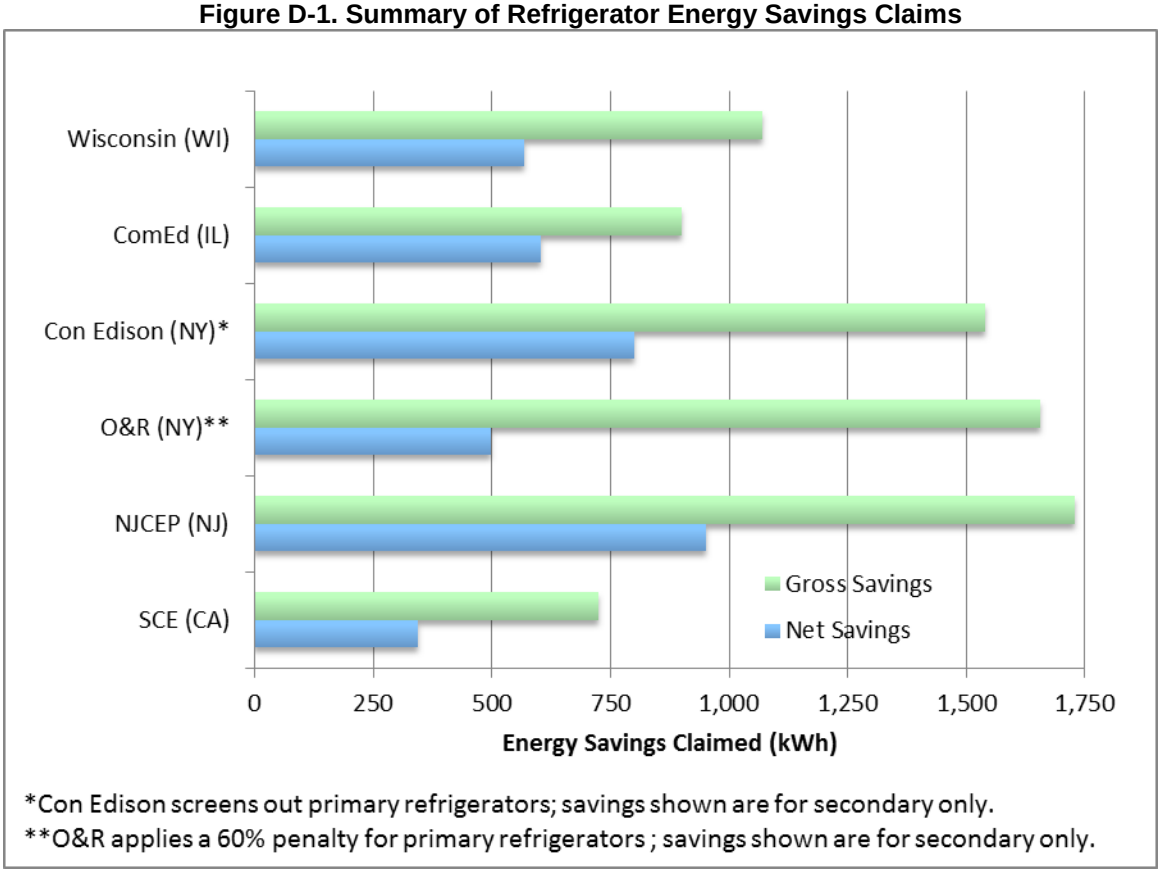
All the programs reviewed contract the refrigerator and freezer pickups to a few major implementation contractors that do this work in the country. The contractors work is basically turnkey in all cases, with a fixed price-per-unit paid when items are picked up. One thing that NJCEP does not do, but which is common among peer programs, is for the contract to stipulate a different and lower price-per-unit for subsequent units picked up at one location. That is, if a customer is recycling more than one unit, the contractor is compensated less per unit for the additional units beyond the first. After all, they have already driven to the location and need only process one application. **Recommendation #15**: ERS recommends that NJCEP adopt this approach into their contract. The results will not be significant since most pickups involve only one unit, but it could shave a percentage point or two off the total cost of the program.

Savings & Assumptions

The main driver of savings for appliance recycling program is the claimed savings per unit. Claimed savings vary depending on assumptions about the age of removed units, whether or not a primary refrigerator is claimed (which is likely to be replaced, rather than removed

completely from use), and other built-in assumptions. Claimed savings also vary widely across PAs. Figure D-1 summarizes the net and gross savings claims for recycled refrigerators.

Figure D-1. Summary of Refrigerator Energy Savings Claims



First, note that NJCEP only claims the *net* savings value; the protocols report a built-in net-to-gross factor of 55% that is used to reduce the gross savings to the net value shown. It can be seen that NJCEP has both the highest gross savings claim as well as the highest net savings claim among comparison PAs. It is unlikely that savings are significantly different from one jurisdiction to the next, but rather that timeliness of the most recent savings estimation is the larger factor. In fact, NJCEP's savings protocols reference several studies, the most recent of which is from 2007. **Recommendation #16**: ERS recommends that these values be revisited, perhaps including direct measurement of savings via an evaluation of units removed by the program. This issue extends to the demand savings, as well, which are two times as high as the next highest program reviewed.

An additional aspect of how savings are claimed is the philosophical approach to primary vs. secondary units. A resident's primary unit – that which was used in the kitchen – is almost certainly going to be replaced with a new unit, whereas it is assumed that a secondary unit – the one that was in the garage or the basement (e.g., the "beer fridge") – is going to be removed from use and not replaced. The actual savings in these two instances differ, so it can be helpful to account for them as part of program applications and processing. Among those PAs that underwent additional research, only NJCEP and SCE make no distinction. The specific use of the information by the other four PAs differs. Con Edison rejects all primary refrigerators. O&R

collects them both and claims different savings. Com Ed and Wisconsin collect both and use the information to adjust overall savings claim as part of evaluation. Table D-1 summarizes the approaches.

Table D-1. Summary of Philosophical Approach to Secondary and Primary Units

PA	NJCEP	O&R	Con Edison	SCE	Wisconsin	ComEd
Primary v. secondary philosophy	No difference between the two in implementation or in savings calculations	Yes, and claim different savings levels for each	No primary refrigerators accepted.	No difference between the two in implementation or in savings calculations	Acknowledge and understand difference, but collect all the same and savings gets adjusted in evaluation	Acknowledge and understand difference; treat them the same, but adjust savings to reflect mix of both in intake stream (by using evaluation results)

Recommendation #17: ERS recommends that NJCEP begin to collect this information as part of the screening or pickup process. This can be accomplished via many different methods, such as asking participants in which room of the house the unit spent most of the last year. A long-term strategy could be to migrate to an O&R model whereby different units get different savings, thus allowing the program to claim savings accurately while also maximizing savings.

Proposed Target Metrics

The program performance is generally average in a program category that is highly commoditized. Program performance is largely dictated by contracting cost and structures as well as the savings claims. While certain contract changes may improve the cost side of the equation, the program is in need of a savings reduction, which will actually increase the $/kWh of the program. With that in mind, ERS believes NJCEP should work to maintain performance levels while ensuring accurate savings. Consequently, ERS proposes the target metrics shown in Table D-2.

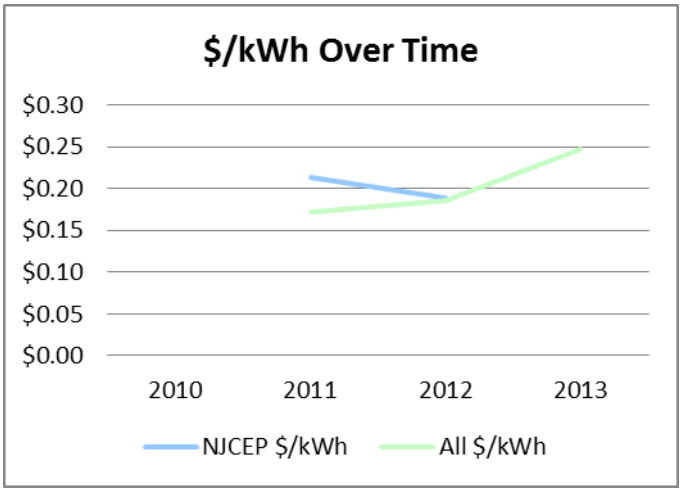
Table D-2. NJCEP Appliance Recycling Target Metrics

Metric	Target
$/kWh	$0.20/kWh
$/kW	$1,000/kW

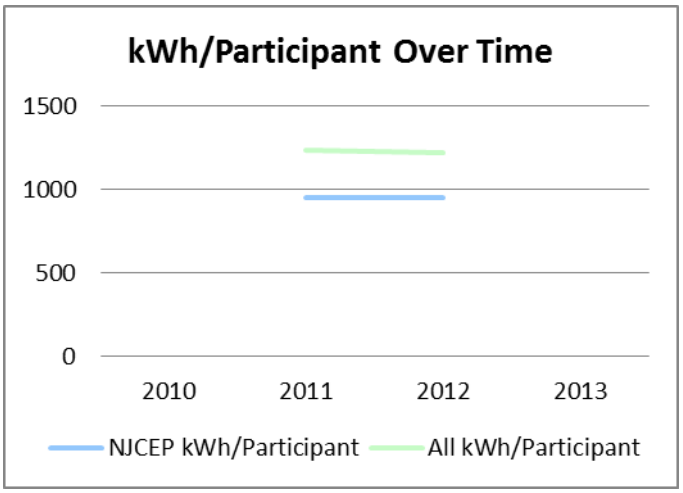
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

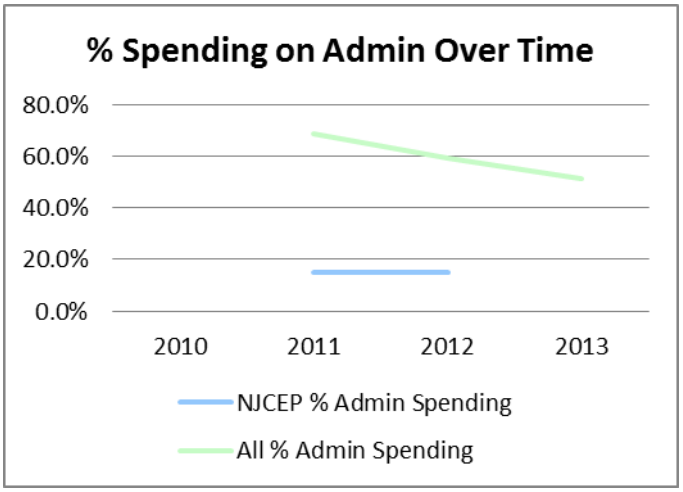
Cost per Gross Savings		
Category	$/kWh	$/kW
Appliance Recycling 2012	*$0.19*	*$677*
NJCEP Percentile	*50%*	*87%*
Sample Size	23	22
Std Deviation	$0.06	$413
Min	$0.11	$428
75th Percentile	$0.14	$795
Average	$0.19	$1,047
Median	$0.19	$893
25th Percentile	$0.24	$1,284
Max	$0.29	$1,977

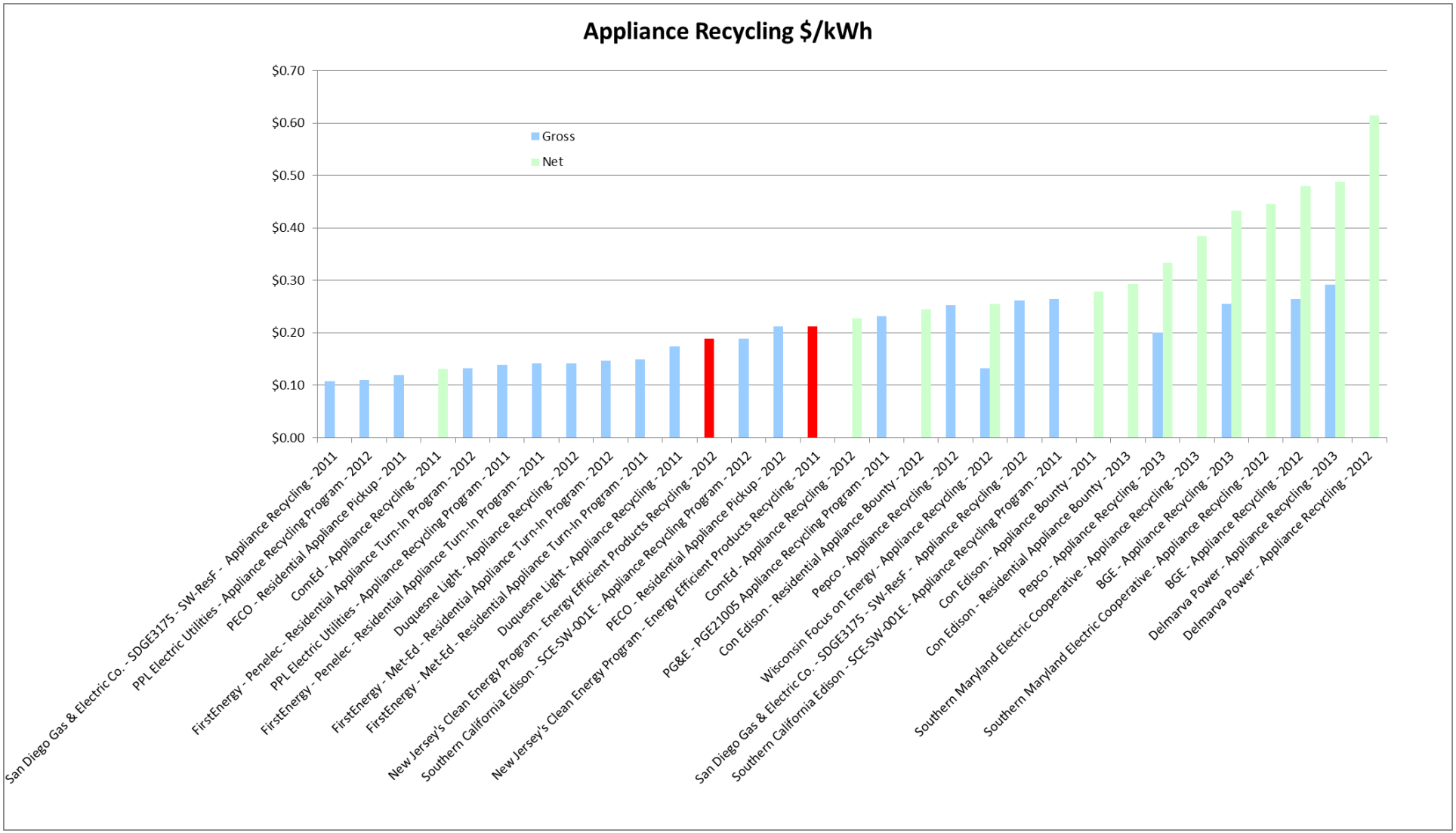


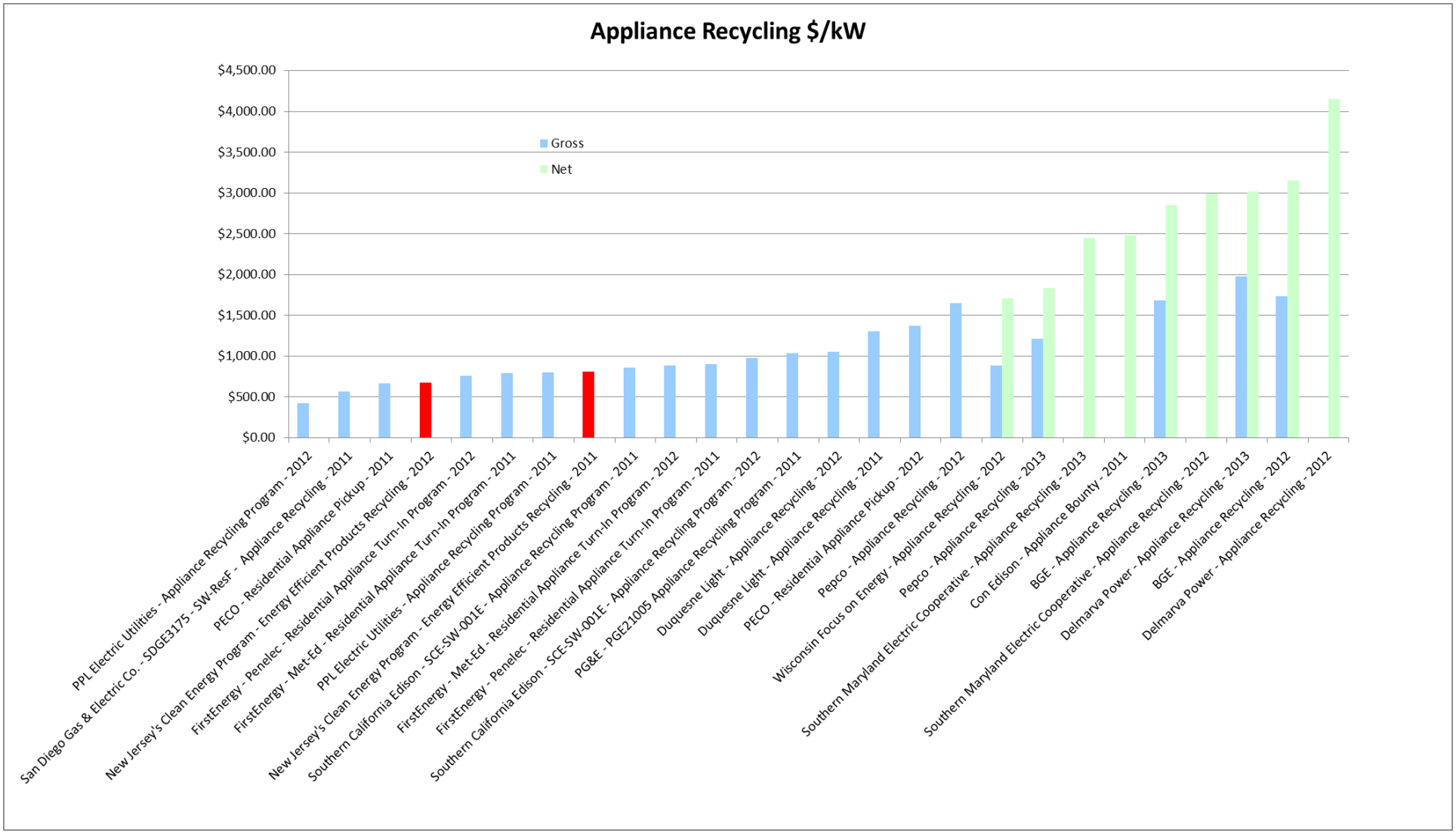
Gross Savings Per Participant		
Category	kWh/part.	kW/part.
Appliance Recycling 2012	*950*	*0.2*
NJCEP Percentile	*30%*	*75%*
Sample Size	10	10
Std Deviation	282	0.1
Min	855	0.1
25th Percentile	950	0.2
Average	1,220	0.2
Median	1,320	0.2
75th Percentile	1,438	0.2
Max	1,576	0.4



Spending Breakout	
Category	% Incentive
Appliance Recycling 2012	*N/A*
NJCEP Percentile	*N/A*
Sample Size	19
Std Deviation	21%
Min	13%
25th Percentile	25%
Average	39%
Median	30%
75th Percentile	49%
Max	85%




Appliance Recycling $/kWh
$0.70
$0.60
$0.50
$0.40
$0.30
$0.20
$0.10
$0.00
Gross
Net
San Diego Gas & Electric Co. - SDGE3175 - SW-ResF - Appliance Recycling - 2011
PPL Electric Utilities - Appliance Recycling Program - 2012
PECO - Residential Appliance Pickup - 2011
ComEd - Appliance Recycling - 2011
FirstEnergy - Penelec - Residential Appliance Turn-In Program - 2012
PPL Electric Utilities - Appliance Recycling Program - 2011
FirstEnergy - Penelec - Residential Appliance Turn-In Program - 2011
Duquesne Light - Appliance Recycling - 2012
FirstEnergy - Met-Ed - Residential Appliance Turn-In Program - 2012
FirstEnergy - Met-Ed - Residential Appliance Turn-In Program - 2011
Duquesne Light - Appliance Recycling - 2011
New Jersey's Clean Energy Program - Energy Efficient Products Recycling - 2012
Southern California Edison - SCE-SW-001E - Appliance Recycling Program - 2012
New Jersey's Clean Energy Program - Energy Efficient Products Recycling - 2011
PECO - Residential Appliance Pickup - 2012
ComEd - Appliance Recycling Program - 2011
PG&E - PGE21005 Appliance Recycling - 2012
Con Edison - Residential Appliance Bounty - 2012
Pepco - Appliance Recycling - 2012
Wisconsin Focus on Energy - Appliance Recycling - 2012
San Diego Gas & Electric Co. - SDGE3175 - SW-ResF - Appliance Recycling - 2012
Southern California Edison - SCE-SW-001E - Appliance Recycling Program - 2011
Con Edison - Appliance Bounty - 2011
Con Edison - Residential Appliance Bounty - 2013
Pepco - Appliance Recycling - 2013
Southern Maryland Electric Cooperative - Appliance Recycling - 2013
BGE - Appliance Recycling - 2013
Southern Maryland Electric Cooperative - Appliance Recycling - 2012
BGE - Appliance Recycling - 2012
Delmarva Power - Appliance Recycling - 2013
Delmarva Power - Appliance Recycling - 2012


Appliance Recycling $/kW
$4,500.00
$4,000.00
$3,500.00
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$0.00
Gross
Net
PPL Electric Utilities - Appliance Recycling Program - 2012
San Diego Gas & Electric Co. - SDGE3175 - SW-ResF - Appliance Recycling - 2011
PECO - Residential Appliance Pickup - 2011
New Jersey's Clean Energy Program - Energy Efficient Products Recycling - 2012
FirstEnergy - Penelec - Residential Appliance Turn-In Program - 2012
FirstEnergy - Met-Ed - Residential Appliance Turn-In Program - 2011
PPL Electric Utilities - Appliance Recycling Program - 2011
New Jersey's Clean Energy Program - Energy Efficient Products Recycling - 2011
Southern California Edison - SCE-SW-001E - Appliance Recycling Program - 2011
FirstEnergy - Met-Ed - Residential Appliance Turn-In Program - 2012
FirstEnergy - Penelec - Residential Appliance Turn-In Program - 2011
Southern California Edison - SCE-SW-001E - Appliance Recycling Program - 2012
PG&E - PGE21005 Appliance Recycling Program - 2011
Duquesne Light - Appliance Recycling - 2012
Duquesne Light - Appliance Recycling - 2011
PECO - Residential Appliance Pickup - 2012
Pepco - Appliance Recycling - 2012
Wisconsin Focus on Energy - Appliance Recycling - 2012
Pepco - Appliance Recycling - 2013
Southern Maryland Electric Cooperative - Appliance Recycling - 2013
Con Edison - Appliance Bounty - 2011
BGE - Appliance Recycling - 2013
Southern Maryland Electric Cooperative - Appliance Recycling - 2012
Delmarva Power - Appliance Recycling - 2013
BGE - Appliance Recycling - 2012
Delmarva Power - Appliance Recycling - 2012

APPENDIX D-2: APPLIANCE REBATES

NJCEP's Energy Efficient Products non-HVAC appliance rebate program offering provides prescriptive rebates for refrigerators and clothes washers. It is typical for programs to offer these types of incentives, though the target measures vary. Other programs include room dehumidifiers, pool pumps, and room ACs in this component. They may also blend this component with their larger HVAC rebate program or with the appliance recycling offering. Because the HVAC portion of such blended programs tend to dwarf the non-HVAC appliance rebates, ERS has excluded those from the analysis.

Conclusions

The Appliance Rebate portion of the Energy Efficient Products Program is relatively small (<4%) and the benchmarking was challenged by the inability to target appliance-only rebate programs and the challenge of splitting the NJCEP cost data appropriately. The benchmarking data is shown, but should be considered with less confidence than other conclusions. The program was not selected for further review and no recommendations are offered.

Comparison Program Sample

Twenty-one of twenty-five priority comparison PAs, similar to NJCEP, offer non-HVAC appliance rebates:

- Of those only seven offered them as a standalone non-HVAC rebate program, a similar offering to that of NJCEP's Energy Efficient Products appliance rebates.
- Data was gathered for all seven comparable programs.

Because of the small program size and the limitations of project scope, further analysis was not performed.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

Available data is too limited to draw firm conclusions regarding $/savings. However, within the limited data set, NJCEP performed very well. That said, the approach used to separate the tracking data is likely to underrepresent administrative costs associated with this program.[23]

Available data is too limited to draw any conclusions about savings per participant.

NJCEP did not report spending breakout for this program, and it cannot be determined from tracking data.

[23] The Appliance Rebate components have relatively high administrative costs (for processing of applications), while the Upstream Lighting and Appliance Recycling components have relatively low administrative costs (Upstream Lighting is a very low-overhead program model and Appliance Recycling contractor payments are classified by NJCEP as incentives).

Further Research on Key Program Components

No further research was performed.

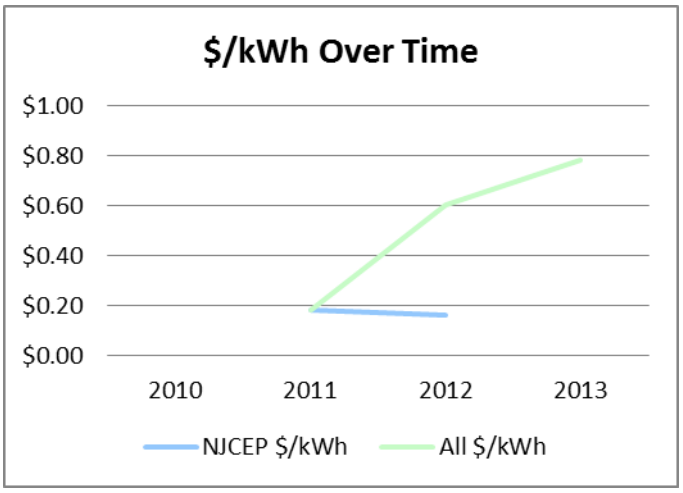
Proposed Target Metrics

No target metrics are proposed.

Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

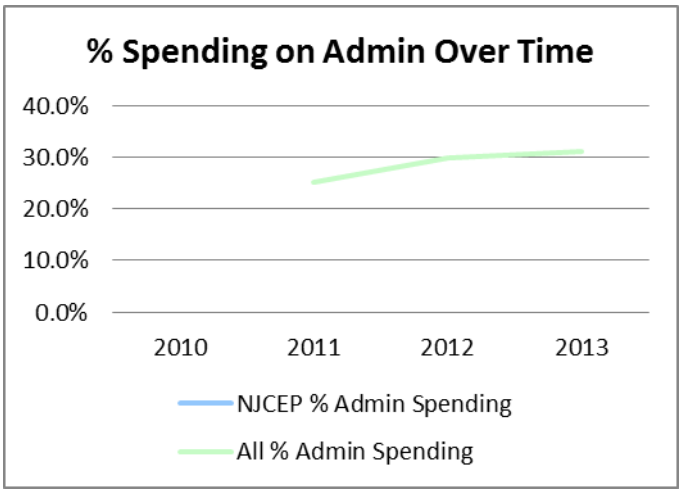
Cost per Gross Savings		
Category	$/kWh	$/kW
Appliance Rebate 2012	*$0.16*	*$1,141*
NJCEP Percentile	*100%*	*100%*
Sample Size	5	5
Std Deviation	$0.40	$2,682
Min	$0.16	$1,141
75th Percentile	$0.18	$1,367
Average	$0.59	$4,058
Median	$0.71	$4,940
25th Percentile	$0.85	$5,677
Max	$1.04	$7,162

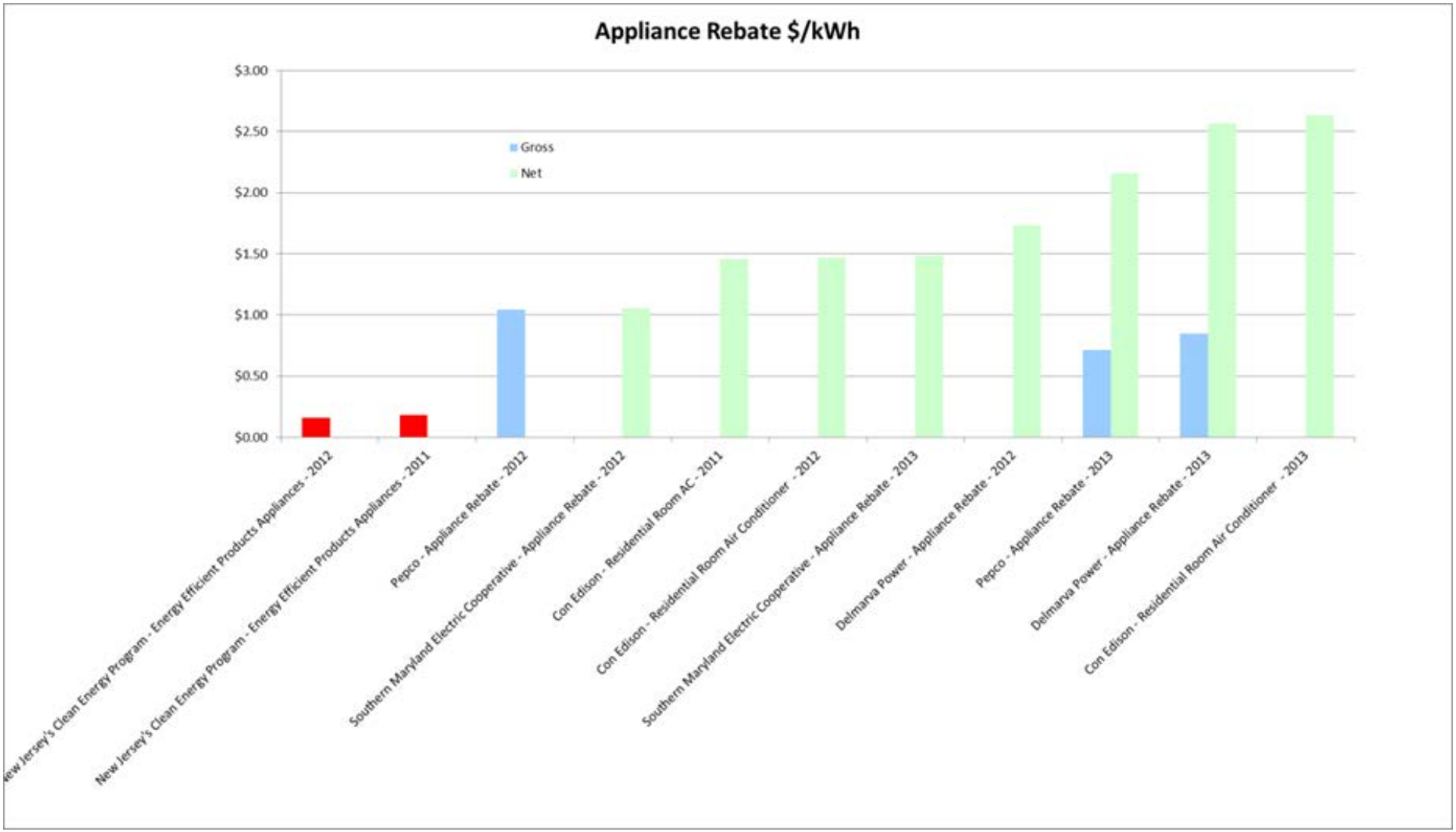


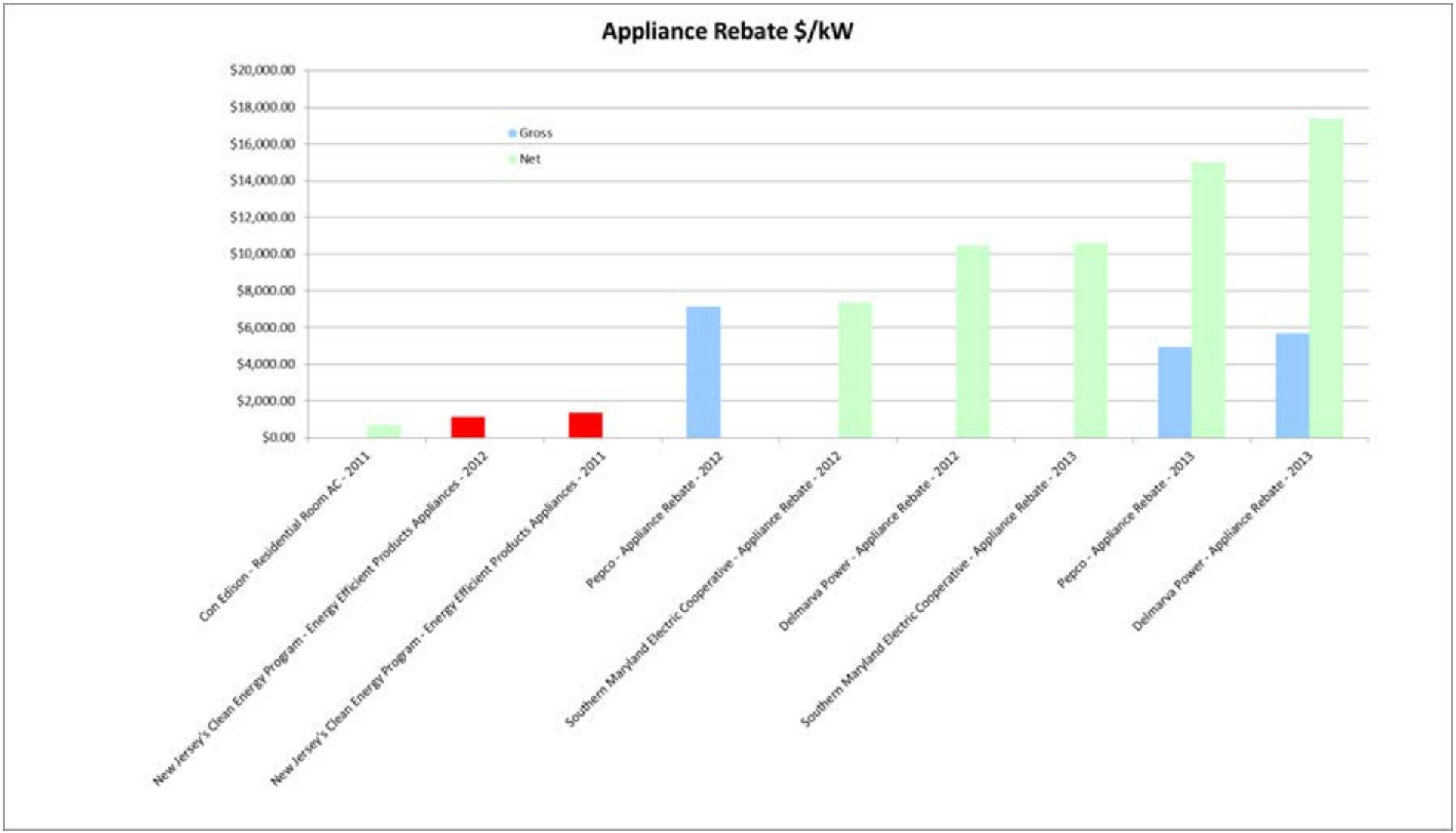
"Participant Over Time" too limited to draw conclusions

"Participant Over Time" data not available for NJCEP

Spending Breakout	
Category	% Incentive
Appliance Rebate 2012	*N/A*
NJCEP Percentile	*N/A*
Sample Size	9
Std Deviation	12%
Min	44%
25th Percentile	58%
Average	67%
Median	68%
75th Percentile	76%
Max	82%




Appliance Rebate $/kWh
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
Gross
Net
New Jersey's Clean Energy Program - Energy Efficient Products Appliances - 2012
New Jersey's Clean Energy Program - Energy Efficient Products Appliances - 2011
Pepco - Appliance Rebate - 2012
Southern Maryland Electric Cooperative - Appliance Rebate - 2012
Con Edison - Residential Room AC - 2011
Con Edison - Residential Room Air Conditioner - 2012
Southern Maryland Electric Cooperative - Appliance Rebate - 2013
Delmarva Power - Appliance Rebate - 2012
Pepco - Appliance Rebate - 2013
Delmarva Power - Appliance Rebate - 2013
Con Edison - Residential Room Air Conditioner - 2013


Appliance Rebate $/kW
$20,000.00
$18,000.00
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$0.00
Gross
Net
Con Edison - Residential Room AC - 2011
New Jersey's Clean Energy Program - Energy Efficient Products Appliances - 2012
New Jersey's Clean Energy Program - Energy Efficient Products Appliances - 2011
Pepco - Appliance Rebate - 2012
Southern Maryland Electric Cooperative - Appliance Rebate - 2012
Delmarva Power - Appliance Rebate - 2012
Southern Maryland Electric Cooperative - Appliance Rebate - 2013
Pepco - Appliance Rebate - 2013
Delmarva Power - Appliance Rebate - 2013

APPENDIX D-3: UPSTREAM LIGHTING

NJCEP's Energy Efficient Products upstream lighting program (Upstream Lighting) offering provides upstream incentives to retailers for CFLs and LEDs. A web-store also offers reduced-price lighting products. Upstream lighting initiatives, often called "point-of-sale programs", are common for residential programs across the country.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- The program performance appears strong ($/kWh was in the top quartile). However, upstream lighting programs' $/kWh depends heavily on savings-per-unit because program delivery is low cost and fairly straightforward. Thus, strong $/kWh performance tend to correlate exaggerated savings claims, as opposed to operational excellence.
- Key NJCEP savings assumptions come from studies that are many years old.
- Programs nationwide are struggling with the erosion of the incandescent baseline and are looking for ways to continue to promote and claim savings from CFLs.
- Programs nationwide are ramping up LED promotions.
- Free ridership in point-of-sale programs is high (averaging 38% among comparison PAs), and NJCEP does not take it into consideration.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R18. Accelerate promotion of LEDs.
- R19. Consider creative ways to retain CFLs through targeted promotions, in particular a geographically targeted approach.
- R20. Commission a new residential lighting study to update hours-of-use and CFL penetration estimates to develop a mixed baseline for accurate savings estimates. Regularly update the mixed baseline with periodic studies.
- R21. Perform regular impact evaluations that include FR and apply an appropriate net-to-gross estimate to program savings.

These conclusions and recommendations are discussed in greater detail in the following sections. Additionally, as noted in the executive summary and the portfolio-level results, ERS recommends that NJCEP make long-term plans on a portfolio level to replace the savings offered by this program. CFL savings will significantly diminish in the next five years and need to be made up elsewhere in the portfolio. Although this issue is specific to the EEP: Upstream Lighting program, it has portfolio-wide consequences and is treated as a portfolio-wide issue for the purposes of this report.

Comparison Program Sample

Twenty-one of twenty-five priority comparison PAs offer some form of lighting rebate similar to that offered through NJCEP's Energy Efficient Products program:

- ERS gathered data for all twenty-one programs.
- Four of the twenty-one include lighting with appliance recycling and have been excluded because appliance recycling is often a significant component of the savings.
- Two others combine appliance and lighting rebates and have been included because lighting savings tend to dwarf the savings of other program measures.
- Five include some form of online store in the program data, but online stores tend to be small in scope and have thus been included in the sample.

Following the benchmarking analysis, detailed below, additional research was conducted on five PAs: NYSERDA, PG&E, Wisconsin, ComEd, and BGE. These are nationally recognized jurisdictions from divergent geographies, which ERS hoped would provide a range of perspectives on program approach. ERS pursued information on savings assumptions, measure mix, and free ridership models.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

NJCEP appears to be one of the less expensive programs out of a strong sample (n=35) on both a $/kWh (83rd percentile) and $/kW (82nd percentile) basis. However, upstream lighting programs have very low delivery costs by their nature. As such, performance figures tend to swing as a function of savings estimates, not delivery costs; the one caveat is that the level of incentives can play a key role. As such, the benchmarking suggests that the savings assumptions (e.g., baseline wattage, hours of use, etc.) should be reviewed.

NJCEP did not report participants, and it could not be determined from available tracking data.

NJCEP did not report spending breakout for this program, and it could not be determined from available tracking data.

Further Research on Key Program Components

ERS performed further research on five peer programs, soliciting further information from upstream lighting program managers at PG&E, BGE, NYSERDA, Wisconsin, and ComEd. The information targeted pertained to measures promoted, key savings parameters, and free ridership approaches. It is summarized below.

Offerings and Incentives

Table D-3 summarizes the offerings and incentives provided by each program.

Table D-3. Summary of Program Offerings

PA	NJCEP	Wisconsin	BG&E	PG&E	ComEd	NYSERDA
Incent standard CFLs?	Yes	Yes	Yes	No	Yes	No
Incentive per bulb for standard CFLs	$0.60	~$1.25	up to $1.60	N/A	$1.17 average	N/A
Incent specialty CFLs?	Yes	Yes	Yes	Yes (hard-to-reach only)	Yes	Yes
Incentive per bulb for specialty CFLs	$1.50-$2.00	~$1.25	up to $3.00	$0.50-$1.50	$1.95 average	$1.50
Incent LEDs?	Yes	Next year	Yes	Yes	Yes	Yes
Incentive per bulb for LEDs	$1.00-$7.00	N/A (will be $3-$8)	up to $5.00	$4.00-$8.00	$2.00-$4.00	$3.00
Incent other? (please specify)	No	No	Fixtures - up to $10	Hard-to-reach areas for CFLs	"Specialty" LEDs (cans) for $4	No

Some key observations from this information include:

- Both NYSERDA and PG&E have stopped incentivizing standard CFLs entirely and other PAs indicated that this was on the horizon for their programs, as well. The halting of standard CFL promotions reflects the growing penetration of standard CFLs into the market.
- Among those still incentivizing CFLs, NJCEP had the lowest incentive. This may contribute to the strong performance of the program on a $/kWh basis.
- NJCEP's specialty CFL and LED incentives tended to mirror those of the comparison PAs. Precise allocation of spending is difficult to assess because programs tend to incentivize a bundle of measures at a range of prices.

All the program managers mentioned struggling with the increased prevalence of standard CFLs in the marketplace. This is reflected in the shift away from standard CFLs for promotions and towards the (more expensive) LEDs. **Recommendation #18:** ERS recommends that NJCEP accelerate the promotion of LEDs. Other jurisdictions have seen success in this regard, showing that the market is ready to accept this new technology in greater volumes.

At the same time, there are still significant pockets of opportunity remaining for CFLs, even as they overtake incandescents as the predominant technology. Consequently, program managers have been looking for creative ways to sustain their program's CFL promotions while still claiming accurate savings. Two examples of this include:

1. Although PG&E does not broadly promote any kind of CFL anymore, they do promote specialty CFLs in "hard-to-reach" districts. Stores with certain zip codes can still offer instant rebates for certain CFLs. PG&E has determined those zip codes and products by looking at geographic variances in CFL penetration and identifying underperforming areas. These tend to be lower income areas or areas with a large immigrant population, which may not have been exposed to previous iterations to PG&E's programs. This sort of targeting has proven successful, allowing PG&E to continue to claim some CFL savings, while ensuring they are not paying for free riders.
2. NYSERDA attempted to claim savings on CFLs by focusing only on the incremental sales that their incentives provided. NYSERDA organized retailers into control and experimental groups. Control groups did not apply the point-of-sale rebates, while the

experimental groups did. The idea was to claim savings for only the incremental volume of sales experienced between the control and experimental groups. Unfortunately, for logistics and data privacy reasons, this approach did not work, and the NYSERDA team has scrapped the plan.

Recommendation #19: ERS recommends that NJCEP consider adopting creative ways to extend the life of the CFL promotions. A geographically or demographically targeted approach like PG&E's can help deliver savings among populations that have not embraced CFLs.

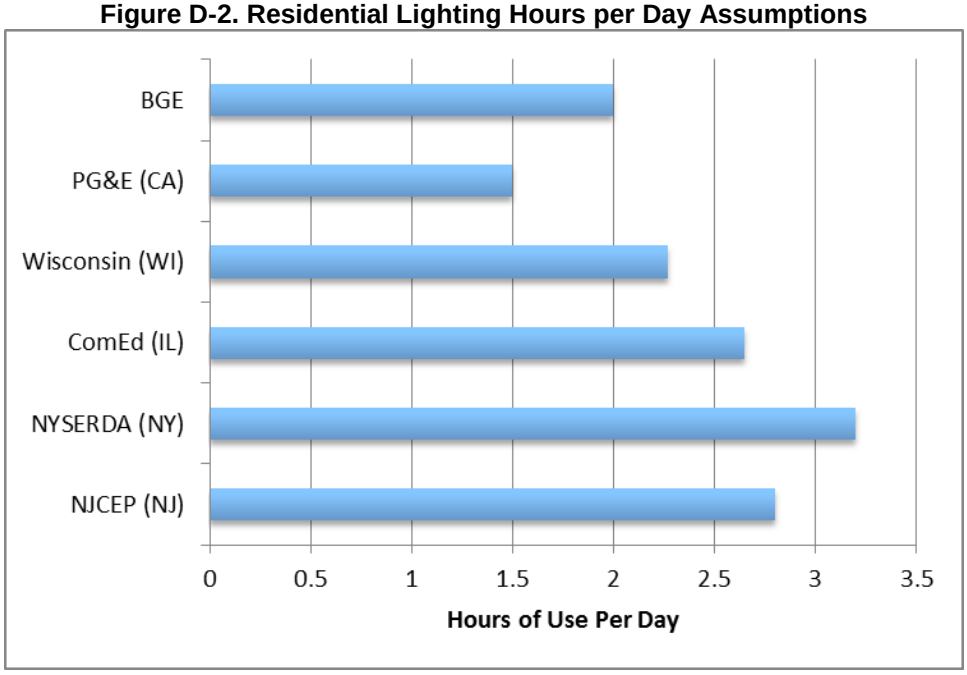
Although NJCEP may be able to extend the period of time in which it can claim savings from CFLs, ultimately the move from an incandescent baseline to a CFL baseline will have significant impacts on NJCEP savings *at the portfolio level*. EEP: Upstream Lighting represents half of all the residential portfolio savings and moving to the CFL-baseline-paradigm will slash savings potential by as much as 90%.[24] Thus, the residential portfolio will need to look elsewhere for as much as 45% of its savings. As noted in the portfolio-wide findings, ERS recommends that NJCEP make long-term plans at the portfolio level regarding how to replace savings offered by this program.

Savings & Assumptions

The first key assumption for savings in upstream lighting programs is the claimed hours per day of use for each fixture or bulb. Figure D-2 summarizes the hours of use assumptions for the comparison PAs in question.

[24] As an estimate, consider that a standard 60W incandescent bulb is typically replaced by an approximately 15W CFL bulb, for a savings of 45W. Under a CFL-to-LED paradigm, a 15W CFL bulb will ultimately be replaced by a 10W LED, for a savings of 5W or roughly 11% the savings of the previous paradigm. These are not precise figures (e.g., 60W-equivalent LEDs exist that are lower wattage than 10), but no matter how you slice it the fundamental premise is true that savings from CFL-to-LED retrofits are significantly less than those from incandescent-to-CFL retrofits.

Figure D-2. Residential Lighting Hours per Day Assumptions



NJCEP claims 2.8 hours per day, which is on the high side, but not egregious. Hours per day can vary by jurisdiction; smaller homes or apartments tend to see relatively high hours of use because families are packed into smaller and fewer spaces. The NJCEP value is from a 2009 study, which is not completely unreasonable for a "pattern of use" study on something as timeless as lighting habits. That said, the estimates should be reevaluated as part of any residential lighting study.

Another key aspect of lighting savings estimation is the baseline light bulb: what is the new bulb replacing? Table D-4 summarizes the baselines by PA.

Table D-4. Baselines and In-Service Rates

PA	NJCEP	Wisconsin	BG&E	PG&E	ComEd	NYSERDA
Baseline technology (CFL, inc., mixed?)	Incandescent	Mixed	Incandescent 62.6%/CFL 20%	50% CFL/50% Incandescent	Halogen	Incandescent
Baseline wattage (W)	~55-70 W	33-76 W (mostly 49 W)	54 W	Bulb-specific	Bulb-specific	60 W
In-service rate	83%-100%	75%-99%	88%	100% LED/67% CFL	72% (CFL) - 95% (Specialty LED)	100%

NJCEP's baseline is still 100% incandescent, which is a poor approximation of the marketplace in 2015. The baseline wattages cited in the protocols come from studies performed as long ago as 2003 and only as recently as 2009; in a market moving as quickly as the lighting market is, these studies are inadequate. Most of the comparison PAs use a "mixed baseline": a weighted average wattage that blends incandescents, CFLs, and others. NJCEP should follow suit.
Recommendation #20: ERS recommends that NJCEP commission a study of residential lighting practices in New Jersey, including CFL penetration estimates, and develop a New Jersey-specific mixed baseline. This study should also include funding to update the hours-of-use estimate used by the program. In addition, NJCEP should update the mixed baseline periodically (every 2-3 years) with new information from future studies.

Also in Table D-4 are the in-service rates of all the programs reviewed. NJCEP's values fall right in line with others.

Quality Assurance

Quality assurance for upstream lighting programs refers, primarily, to the accuracy of the savings assumptions. Those issues have been addressed, for the most part, above. However, free ridership (FR or, formally, net-to-gross ratios) is one area that NJCEP does not address, which is a major concern. Table D-5 summarizes the comparison PAs' approach to FR.

Table D-5. Summary of FR Approaches

PA	NJCEP	Wisconsin	BG&E	PG&E	ComEd	NYSERDA
Apply free-ridership screen?	No	Yes	Yes	Yes	Yes	Yes
Estimated FR?	0%	19%	31%	15% LED/46% CFL	30% LED/34% CFL	59%
When is FR applied?	N/A	Evaluation (ex post)	Evaluation (ex post)	Upfront (ex ante)	Evaluation (ex post)	Evaluation (ex post)

NJCEP is the only program that does not estimate FR for their upstream lighting program. The nature of the program is highly susceptible to free riders given that it is a blanket, instantaneous rebate for a ubiquitous household item. FR is significant, with estimates for CFL FR ranging from 19% up to 59% of all sales. **Recommendation #21**: ERS recommends that NJCEP perform regular impact evaluations – including FR – and apply an appropriate net-to-gross ratio to program savings.

Proposed Target Metrics

NJCEP is likely to see an increase in cost on a per-savings basis for the upstream lighting program as a result of increasing CFL penetration. Despite this, the program will likely remain the least costly program on a per-kWh basis in the portfolio. ERS recommends the target metrics in Table D-6, taking into account the likely erosion of savings on a per-bulb basis.

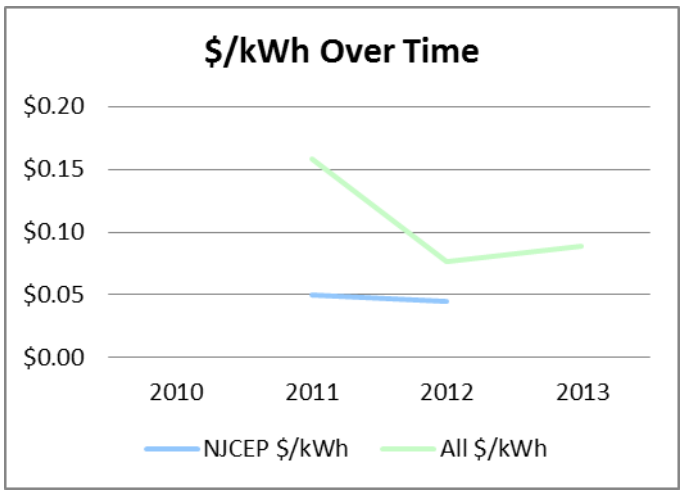
Table D-6. NJCEP Upstream Lighting Target Metrics

Metric	Target
$/kWh	$0.08/kWh
$/kW	$500/kW

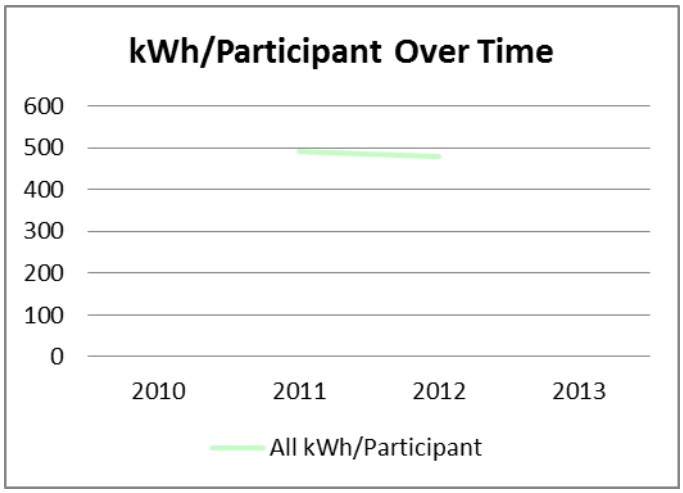
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

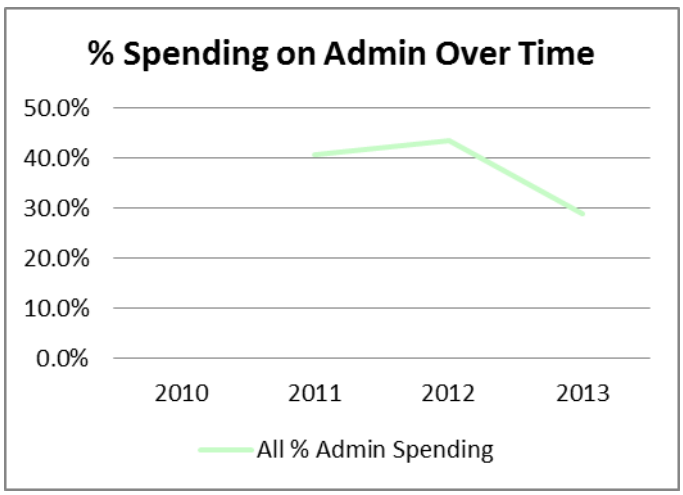
Cost per Gross Savings		
Category	$/kWh	$/kW
Upstream Lighting 2012	*$0.04*	*$359*
NJCEP Percentile	*83%*	*82%*
Sample Size	35	34
Std Deviation	$0.13	$752
Min	$0.02	$109
75th Percentile	$0.05	$418
Average	$0.11	$938
Median	$0.08	$613
25th Percentile	$0.12	$1,471
Max	$0.76	$3,255

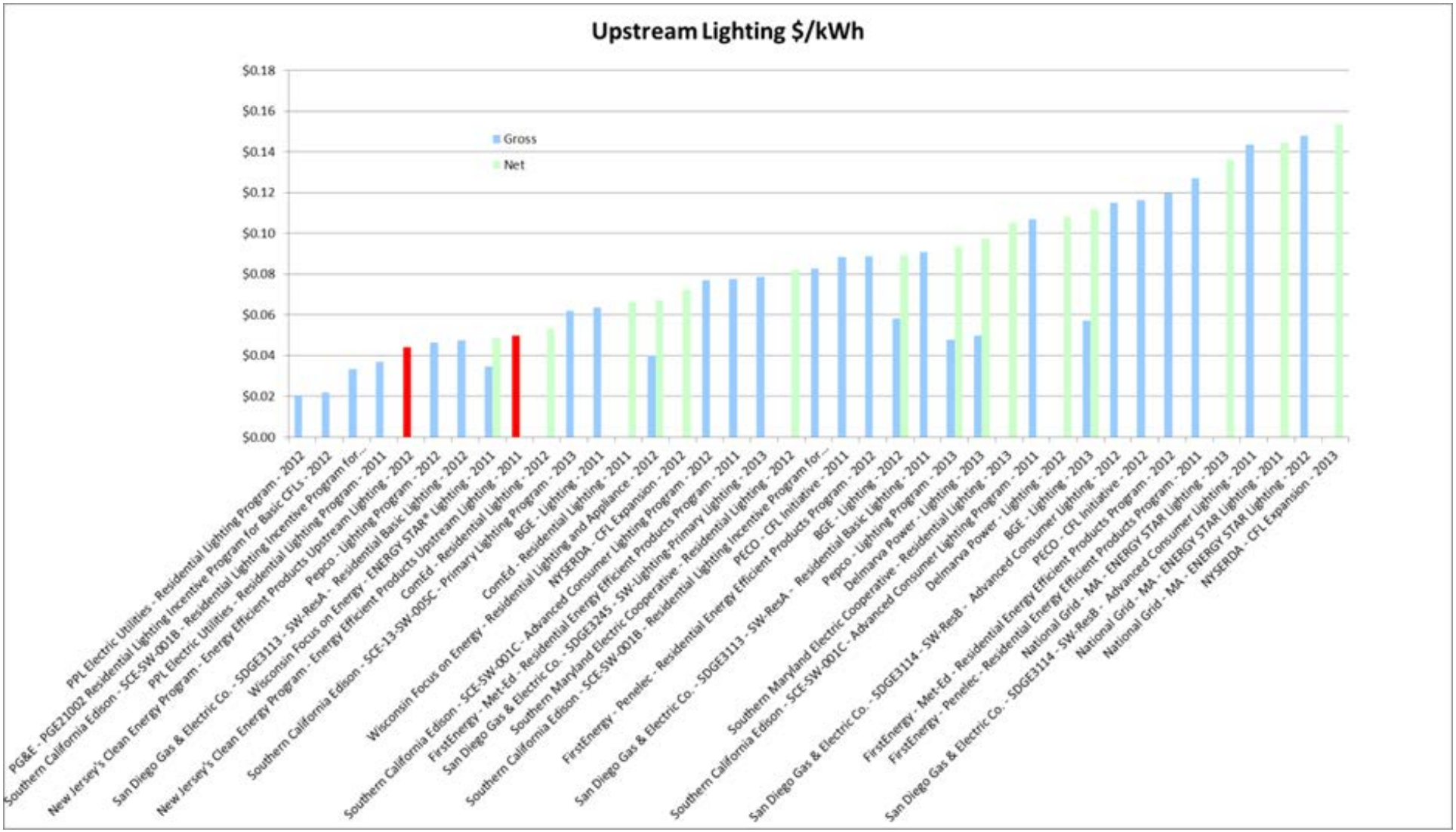


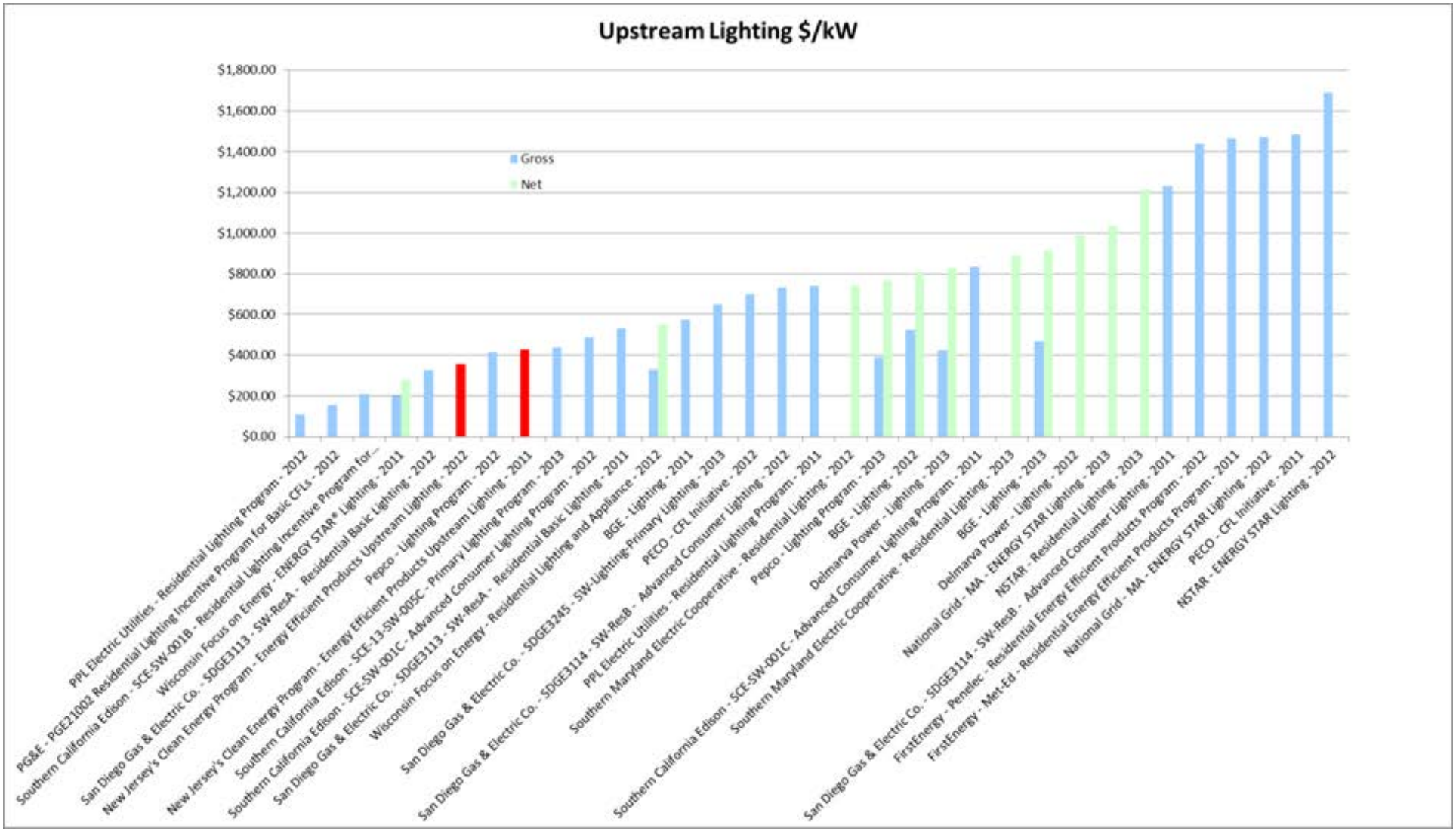
Gross Savings Per Participant		
Category	kWh/part.	kW/part.
Upstream Lighting 2012	*N/A*	*N/A*
NJCEP Percentile	*N/A*	*N/A*
Sample Size	11	10
Std Deviation	443	0.1
Min	17	0.0
25th Percentile	140	0.0
Average	440	0.1
Median	210	0.0
75th Percentile	789	0.1
Max	1,175	0.2



Spending Breakout	
Category	% Incentive
Upstream Lighting 2012	*N/A*
NJCEP Percentile	*N/A*
Sample Size	20
Std Deviation	17%
Min	28%
25th Percentile	56%
Average	62%
Median	62%
75th Percentile	76%
Max	86%




Upstream Lighting $/kWh
$0.18
$0.16
$0.14
$0.12
$0.10
$0.08
$0.06
$0.04
$0.02
$0.00
Gross
Net
PPL Electric Utilities - Residential Lighting Program - 2012
PG&E - PGE21002 Residential Lighting Incentive Program for Basic CFLs - 2012
Southern California Edison - SCE-SW-001B - Residential Lighting Incentive Program for... - 2011
New Jersey's Clean Energy Program - Energy Efficient Products Upstream Lighting - 2012
San Diego Gas & Electric Co. - SDGE3113 - SW-ResA - Residential Basic Lighting - 2012
New Jersey's Clean Energy Program - Energy Efficient Products Upstream Lighting - 2011
Southern California Edison - SCE-13-SW-005C - Primary Lighting Program - 2012
Wisconsin Focus on Energy - Residential Lighting and Appliance - 2012
Southern California Edison - SCE-SW-001C - Advanced Consumer Lighting Program - 2012
Wisconsin Focus on Energy - Residential Energy Efficient Products Program - 2011
FirstEnergy - Met-Ed - Residential Energy Efficient Products Program - 2012
Southern California Edison - SCE-SW-001B - Residential Lighting Incentive Program for... - 2011
San Diego Gas & Electric Co. - SDGE3245 - SW-Lighting-Primary Lighting - 2013
Southern Maryland Electric Cooperative - Residential Lighting Incentive Program - 2012
FirstEnergy - Penelec - Residential Energy Efficient Products Program - 2011
San Diego Gas & Electric Co. - SDGE3113 - SW-ResA - Residential Basic Lighting - 2011
Southern California Edison - SCE-SW-001C - Advanced Consumer Lighting Program - 2011
Pepco - Lighting Program - Lighting - 2012
Delmarva Power - Residential Lighting - 2013
Southern Maryland Electric Cooperative - Residential Lighting Program - 2013
Delmarva Power - Lighting - 2012
BGE - Lighting - 2012
PECO - CFL Initiative - 2012
FirstEnergy - Met-Ed - Residential Energy Efficient Products Program - 2012
San Diego Gas & Electric Co. - SDGE3114 - SW-ResB - Advanced Consumer Lighting - 2012
National Grid - MA - ENERGY STAR Lighting - 2013
FirstEnergy - Penelec - Residential Energy Efficient Products Program - 2011
National Grid - MA - Advanced Consumer Lighting - 2013
San Diego Gas & Electric Co. - SDGE3114 - SW-ResB - Advanced Consumer Lighting - 2011
National Grid - MA - ENERGY STAR Lighting - 2011
NYSERDA - CFL Expansion - 2012
National Grid - MA - ENERGY STAR Lighting - 2012
NYSERDA - CFL Expansion - 2013


Upstream Lighting $/kW
$1,800.00
$1,600.00
$1,400.00
$1,200.00
$1,000.00
$800.00
$600.00
$400.00
$200.00
$0.00
Gross
Net
PPL Electric Utilities - Residential Lighting Program - 2012
PG&E - PGE21002 Residential Lighting Incentive Program for Basic CFLs - 2012
Southern California Edison - SCE-SW-001B - Residential Lighting Incentive Program for... - 2011
San Diego Gas & Electric Co. - SDGE3113 - SW-ResA - Residential Basic Lighting - 2012
Wisconsin Focus on Energy - ENERGY STAR® Lighting - 2011
New Jersey's Clean Energy Program - Energy Efficient Products Upstream Lighting - 2012
Pepco - Lighting Program - 2012
New Jersey's Clean Energy Program - Energy Efficient Products Upstream Lighting - 2011
Southern California Edison - SCE-13-SW-005C - Primary Lighting Program - 2013
New Jersey's Clean Energy Program - Energy Efficient Products Upstream Lighting - 2012
Southern California Edison - SCE-SW-001C - Advanced Consumer Lighting Program - 2012
San Diego Gas & Electric Co. - SDGE3113 - SW-ResA - Residential Basic Lighting - 2011
Wisconsin Focus on Energy - Residential Lighting and Appliance - 2012
San Diego Gas & Electric Co. - SDGE3245 - SW-Lighting-Primary Lighting - 2013
BGE - Lighting - 2011
PECO - CFL Initiative - 2012
San Diego Gas & Electric Co. - SDGE3114 - SW-ResB - Advanced Consumer Lighting - 2012
PPL Electric Utilities - Residential Lighting Program - 2011
Southern Maryland Electric Cooperative - Residential Lighting - 2012
Pepco - Lighting Program - 2013
Southern California Edison - SCE-SW-001C - Advanced Consumer Lighting Program - 2011
BGE - Lighting - 2012
Delmarva Power - Lighting - 2013
Southern Maryland Electric Cooperative - Residential Lighting - 2013
BGE - Lighting - 2013
National Grid - MA - ENERGY STAR Lighting - 2012
Delmarva Power - Lighting - 2012
NSTAR - Residential Lighting - 2013
San Diego Gas & Electric Co. - SDGE3114 - SW-ResB - Advanced Consumer Lighting - 2011
FirstEnergy - Penelec - Residential Energy Efficient Products Program - 2012
FirstEnergy - Met-Ed - Residential Energy Efficient Products Program - 2011
National Grid - MA - ENERGY STAR Lighting - 2012
PECO - CFL Initiative - 2011
NSTAR - ENERGY STAR Lighting - 2012

APPENDIX E: COMMERCIAL NEW CONSTRUCTION

NJCEP's Commercial New Construction (NC) program is NJCEP's broad-based NC and major renovation offering. It is composed primarily of prescriptive measures, but does offer a custom track. Deep, design-based savings projects are re-directed to the Pay for Performance program. These three components – prescriptive, custom, and deep/design-based savings – are typical offerings, but can be reported separately or as a bundle.

Conclusions

NJCEP's Commercial NC program has operational characteristics similar to the analogous retrofit program and is a comparatively small program. Moreover, the program appears to be performing well, with both the $/kWh and $/kW values in the top quartile with meaningful comparison samples (both samples greater than twenty data points). As such, the program was not slated for further review following the initial benchmark (discussed below), and ERS has no recommendations.

Comparison Program Sample

Although all PAs offer new construction incentives, ERS has data for twelve programs that, like NJCEP, are either exclusively prescriptive or are primarily prescriptive with a custom track, which excludes:

- Six programs that include prescriptive and savings-by-design tracks in one program package (NYSERDA, Pepco, PECO, NSTAR, NGrid MA, and Vermont)
- Five that are exclusively design-based, without a prescriptive component (CA utilities and ComEd)
- One that is sector-based (Duquesne) and one that did not have data (PPL)

Because of the strong benchmarking results and the similarity of the program to its retrofit counterpart, ERS did not pursue further research in this area.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

Generally speaking this program is a strong performer in the portfolio. The gross savings per dollar spent is very good; $0.18/kWh and $34.60/kW are both in the top quartile of a meaningful sample (n=25 and n=24, respectively). Many programs reported net therm savings only, so the gross sample is small, but the bar graph for $/therm shows that all the net savings of other programs are more expensive than NJCEP on a $/therm basis.

NJCEP's kWh/participant was around the median, while the kW/participant was at the 75th percentile. ERS does not have a good explanation for the discrepancy, other than to say the samples were more modest (n=16 and 15, respectively). Overall, the savings per participant are fairly strong considering the emphasis on the pay-for-performance option.

The percent of spending on incentives is right in the middle (53rd percentile) of a strong sample (n=31), with 68% of budget spent on incentives. This suggests some room for improvement on operational efficiency, but there are no red flags.

Further Research on Key Program Components

No further research was performed.

Proposed Target Metrics

The NJCEP Commercial NC program has performed well on a cost-per-savings basis in its recent history. The program team should continue to maintain those levels of excellence. ERS proposes the target metrics shown in Table E-1.

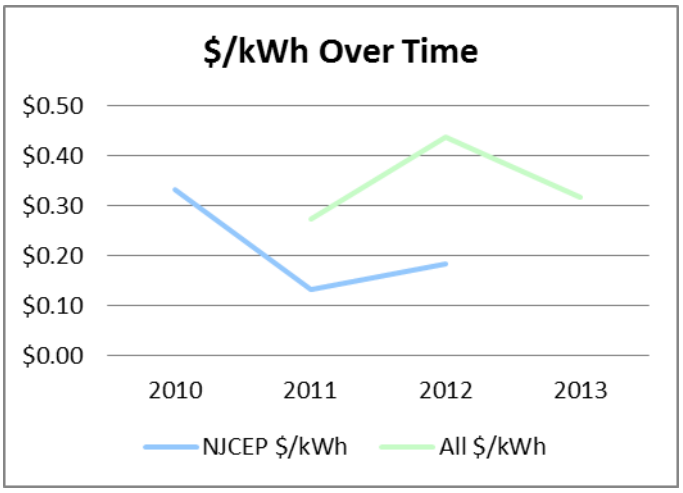
Table E-1. NJCEP Commercial NC Target Metrics

Metric	Target
$/kWh	$0.15/kWh
$/therm	$2.00/therm

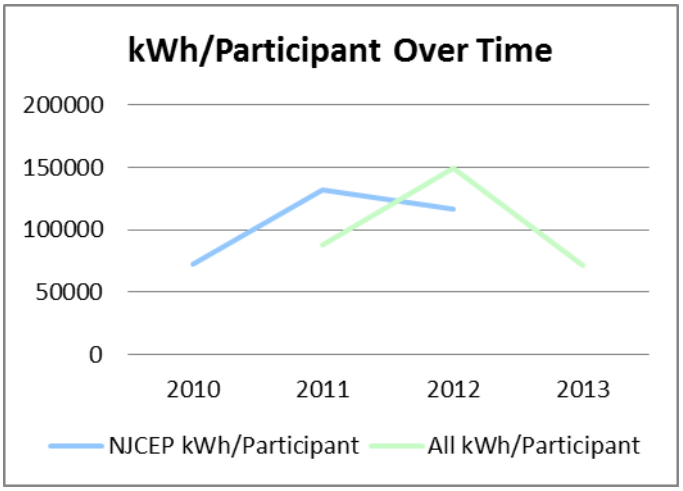
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

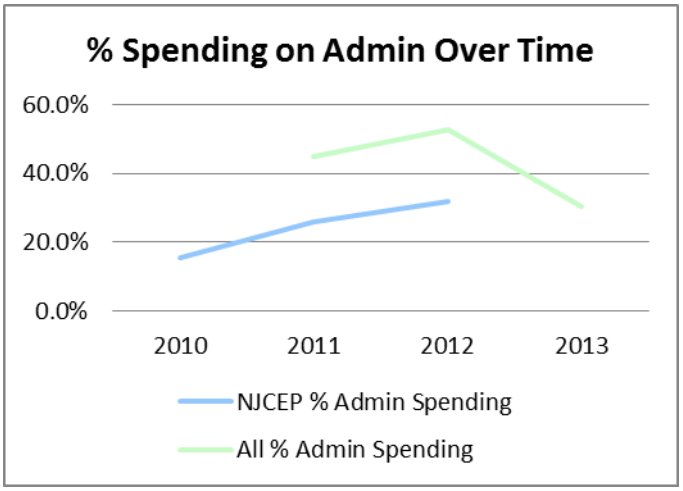
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
Com. NC 2012	*$0.18*	*$621*	*$1.79*
NJCEP Percentile	*75%*	*83%*	*50%*
Sample Size	25	24	3
Std Deviation	$0.57	$4,126	$0.94
Min	$0.05	$182	$1.13
75th Percentile	$0.18	$837	N/A
Average	$0.39	$2,283	$1.97
Median	$0.25	$1,332	N/A
25th Percentile	$0.30	$2,055	N/A
Max	$3.03	$21,060	$2.99

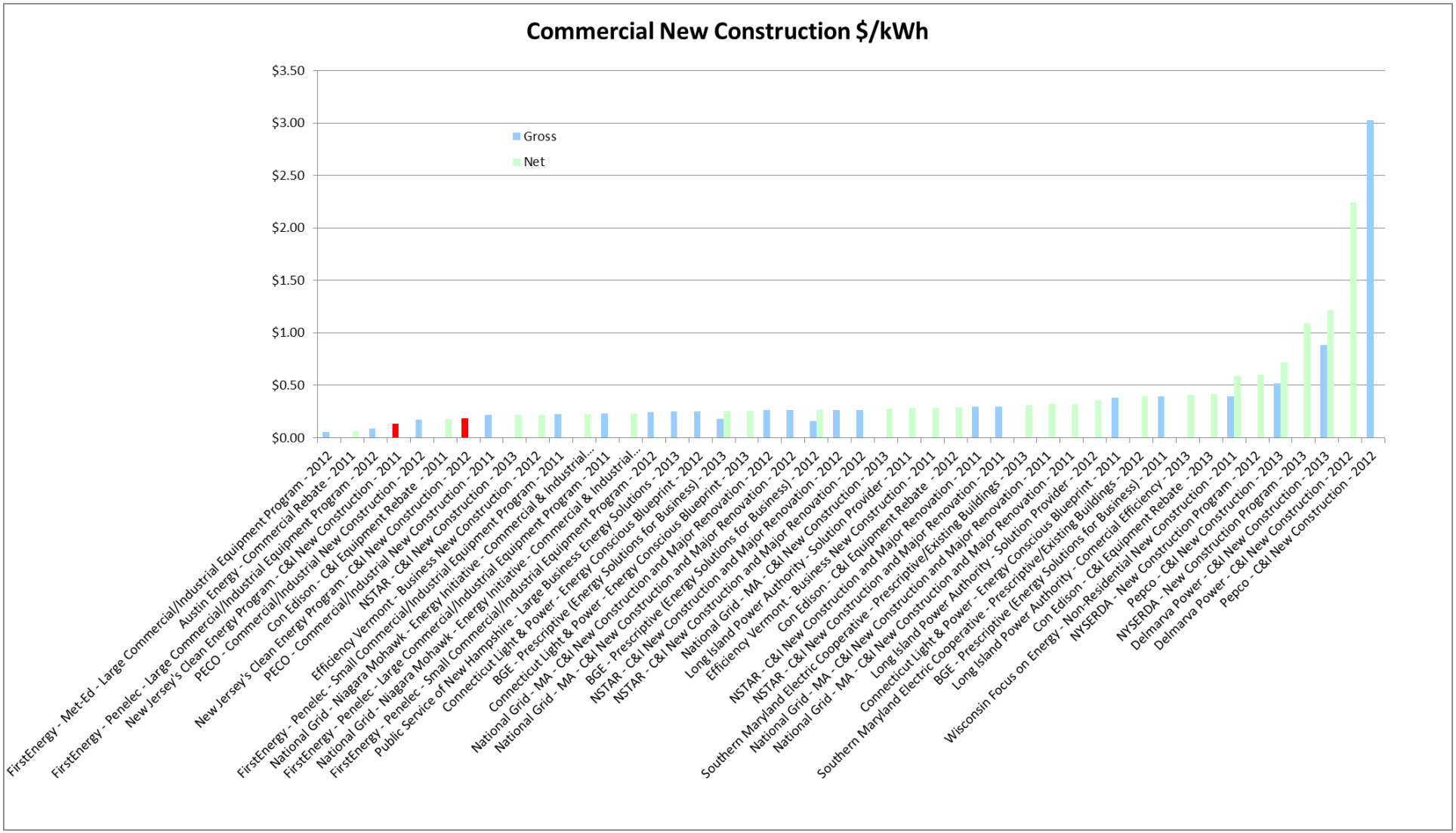


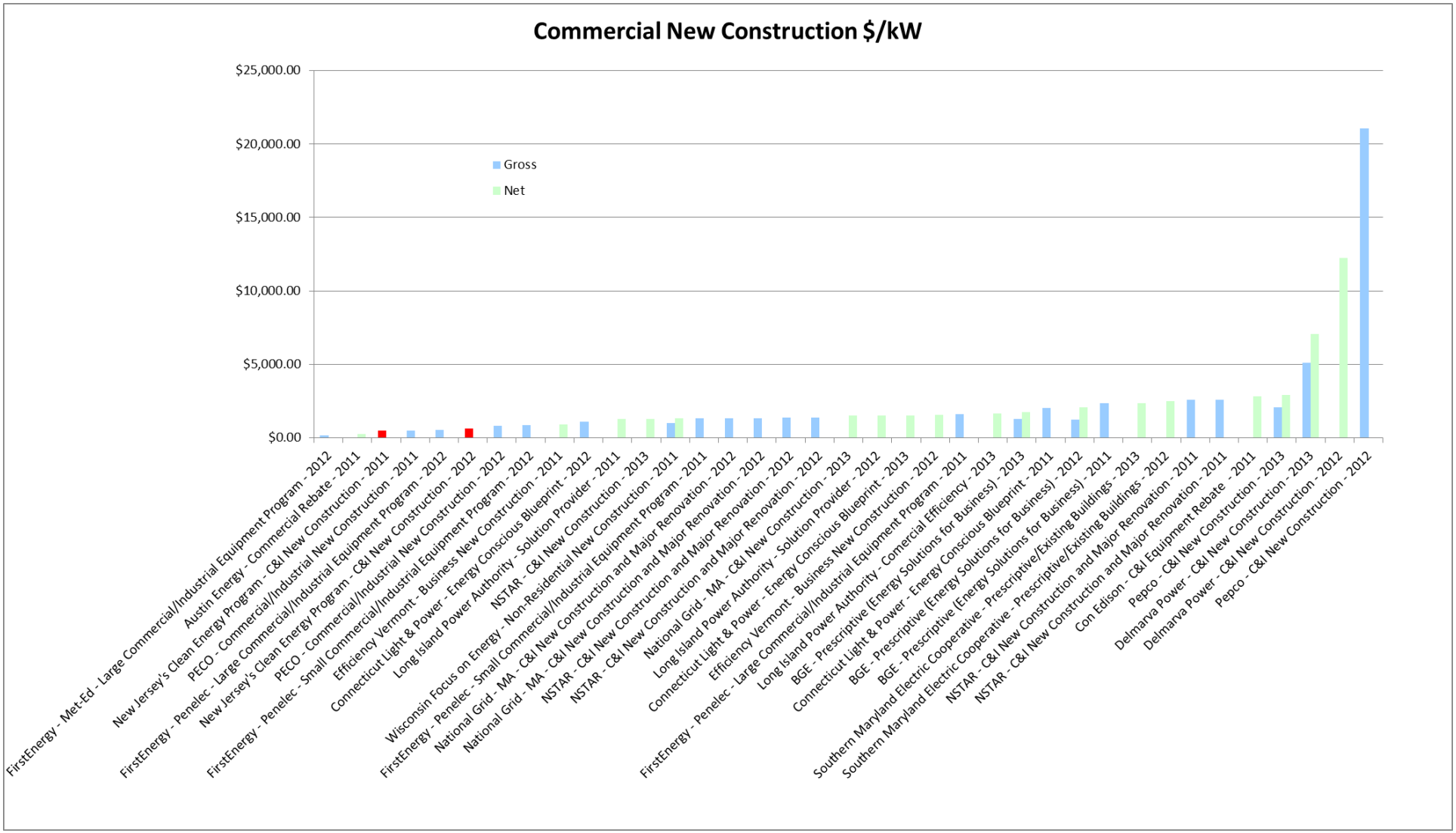
Gross Savings per Participant			
Category	kWh/part.	kW/part.	Therm/part.
Com. NC 2012	*116,505*	*34.6*	*12031*
NJCEP Percentile	*47%*	*75%*	*N/A*
Sample Size	16	15	6
Std Deviation	90,326	25.4	5,016
Min	12,645	2.1	0
25th Percentile	64,136	11.7	0
Average	125,479	27.4	2,984
Median	119,965	16.8	0
75th Percentile	163,161	35.4	4,406
Max	362,968	104.9	12,031

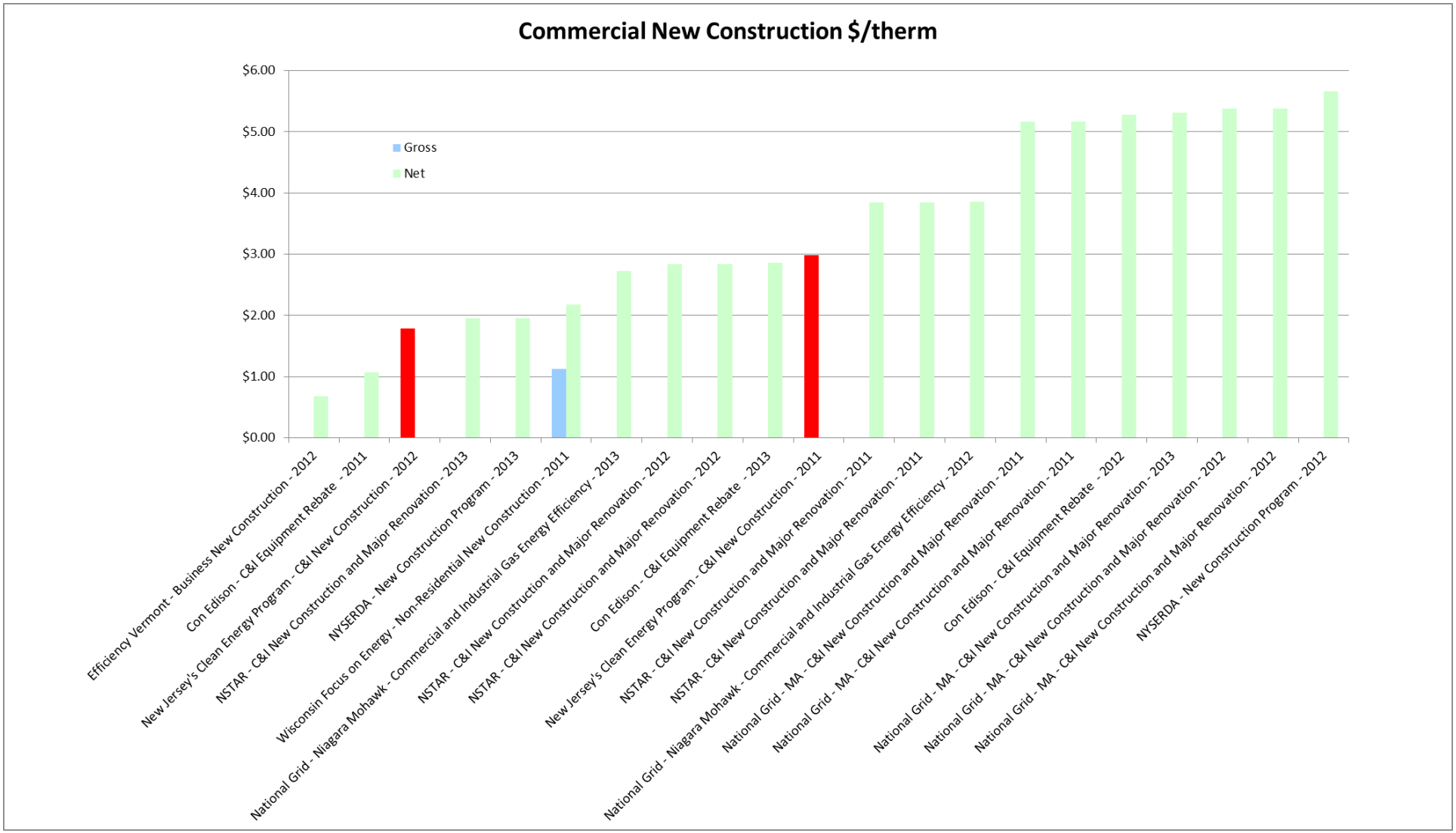


Spending Breakout	
Category	% Incentive
Com. NC 2012	*68%*
NJCEP Percentile	*53%*
Sample Size	31
Std Deviation	32%
Min	5%
25th Percentile	20%
Average	53%
Median	65%
75th Percentile	75%
Max	112%




Commercial New Construction $/kWh
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
Gross
Net
FirstEnergy - Met-Ed - Large Commercial/Industrial Equipment Program - 2012
Austin Energy - Commercial Rebate - 2011
FirstEnergy - Penelec - Large Commercial/Industrial Equipment Program - 2012
New Jersey's Clean Energy Program - C&I New Construction - 2011
PECO - Commercial/Industrial New Construction - 2012
Con Edison - C&I Equipment Rebate - 2011
New Jersey's Clean Energy Program - C&I New Construction - 2012
NSTAR - C&I New Construction - 2011
Efficiency Vermont - Business New Construction - 2012
FirstEnergy - Penelec - Small Commercial/Industrial Equipment Program - 2011
National Grid - Niagara Mohawk - Energy Initiative - Commercial & Industrial...
FirstEnergy - Penelec - Large Commercial/Industrial Equipment Program - 2011
National Grid - Niagara Mohawk - Energy Initiative - Commercial & Industrial...
FirstEnergy - Penelec - Small Commercial/Industrial Equipment Program - 2011
Public Service of New Hampshire - Large Business Energy Solutions - 2013
Connecticut Light & Power - Energy Conscious Blueprint - 2012
BGE - Prescriptive (Energy Solutions for Business) - 2013
National Grid - MA - C&I New Construction and Major Renovation - 2012
Connecticut Light & Power - Energy Conscious Blueprint - 2013
National Grid - MA - C&I New Construction and Major Renovation - 2011
BGE - Prescriptive (Energy Solutions for Business) - 2012
NSTAR - C&I New Construction and Major Renovation - 2012
NSTAR - C&I New Construction and Major Renovation - 2013
National Grid - MA - C&I New Construction and Major Renovation - 2012
Long Island Power Authority - Solution Provider - 2011
Efficiency Vermont - Business New Construction - 2011
Con Edison - C&I Equipment Rebate - 2012
NSTAR - C&I New Construction and Major Renovation - 2011
Southern Maryland Electric Cooperative - Prescriptive/Existing Buildings - 2013
National Grid - MA - C&I New Construction and Major Renovation - 2011
Long Island Power Authority - Solution Provider - 2012
Connecticut Light & Power - Energy Conscious Blueprint - 2011
Southern Maryland Electric Cooperative - Prescriptive/Existing Buildings - 2012
BGE - Prescriptive (Energy Solutions for Business) - 2011
Con Edison - C&I Equipment Rebate - 2013
Con Edison - Non-Residential New Construction - 2011
NYSERDA - New Construction Program - 2012
Pepco - C&I New Construction Program - 2013
Delmarva Power - C&I New Construction Program - 2013
Delmarva Power - C&I New Construction - 2012
Pepco - C&I New Construction - 2012


Commercial New Construction $/kW
$25,000.00
$20,000.00
$15,000.00
$10,000.00
$5,000.00
$0.00
Gross
Net
FirstEnergy - Met-Ed - Large Commercial/Industrial Equipment Program - 2012
Austin Energy - Commercial Rebate - 2011
New Jersey's Clean Energy Program - C&I New Construction - 2011
FirstEnergy - Penelec - Large Commercial/Industrial New Construction - 2011
PECO - Commercial/Industrial Equipment Program - 2012
New Jersey's Clean Energy Program - C&I New Construction - 2012
FirstEnergy - Penelec - Small Commercial/Industrial Equipment Program - 2012
PECO - Commercial/Industrial New Construction - 2012
Efficiency Vermont - Business New Construction - 2011
Connecticut Light & Power - Energy Conscious Blueprint - 2012
Long Island Power Authority - Solution Provider - 2011
NSTAR - C&I New Construction - 2013
Wisconsin Focus on Energy - Non-Residential New Construction - 2011
FirstEnergy - Penelec - Small Commercial/Industrial Equipment Program - 2011
National Grid - MA - C&I New Construction and Major Renovation - 2012
National Grid - MA - C&I New Construction and Major Renovation - 2012
NSTAR - C&I New Construction and Major Renovation - 2012
National Grid - MA - C&I New Construction and Major Renovation - 2012
Long Island Power Authority - Solution Provider - 2012
Connecticut Light & Power - Energy Conscious Blueprint - 2013
Efficiency Vermont - Business New Construction - 2012
FirstEnergy - Penelec - Large Commercial/Industrial Equipment Program - 2011
Long Island Power Authority - Comercial Efficiency - 2013
BGE - Prescriptive (Energy Solutions for Business) - 2012
Connecticut Light & Power - Energy Conscious Blueprint - 2011
BGE - Prescriptive (Energy Solutions for Business) - 2011
Southern Maryland Electric Cooperative - Prescriptive/Existing Buildings - 2013
Southern Maryland Electric Cooperative - Prescriptive/Existing Buildings - 2012
NSTAR - C&I New Construction and Major Renovation - 2011
Con Edison - C&I Equipment Rebate - 2011
Pepco - C&I New Construction - 2013
Delmarva Power - C&I New Construction - 2012
Delmarva Power - C&I New Construction - 2013
Pepco - C&I New Construction - 2012
NSTAR - C&I New Construction - 2012


Commercial New Construction $/therm
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Gross
Net
Efficiency Vermont - Business New Construction - 2012
Con Edison - C&I Equipment Rebate - 2011
New Jersey's Clean Energy Program - C&I New Construction - 2012
NSTAR - C&I New Construction and Major Renovation - 2013
NYSERDA - New Construction Program - 2013
Wisconsin Focus on Energy - Non-Residential New Construction - 2011
National Grid - Niagara Mohawk - Commercial and Industrial Gas Energy Efficiency - 2013
NSTAR - C&I New Construction and Major Renovation - 2012
NSTAR - C&I New Construction and Major Renovation - 2012
Con Edison - C&I Equipment Rebate - 2013
NSTAR - C&I New Construction - 2011
New Jersey's Clean Energy Program - C&I New Construction - 2012
NSTAR - C&I New Construction and Major Renovation - 2011
NSTAR - C&I New Construction and Major Renovation - 2011
National Grid - Niagara Mohawk - Commercial and Industrial Gas Energy Efficiency - 2012
National Grid - MA - C&I New Construction and Major Renovation - 2011
National Grid - MA - C&I New Construction and Major Renovation - 2011
Con Edison - C&I Equipment Rebate - 2012
National Grid - MA - C&I New Construction and Major Renovation - 2013
National Grid - MA - C&I New Construction and Major Renovation - 2012
National Grid - MA - C&I New Construction and Major Renovation - 2012
NYSERDA - New Construction Program - 2012

APPENDIX F: COMMERCIAL RETROFIT

NJCEP's Commercial Retrofit program is a broad-based offering for existing buildings. It is composed primarily of prescriptive measures, but does offer a custom track. This is a common combination of program offerings, though some report custom and prescriptive separately; in those cases, ERS excluded the custom-only component, since the NJCEP offering is primarily prescriptive.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- The program appears to be a solid to strong performer, with some variability in key metrics. The $/savings metrics have generally been in the top quartile the last few years, the most notable exception being the 2012 $/kWh figure which came in at the median.
- The savings/participant values are somewhat low, but this may be more attributable to portfolio construction (specifically the pay-for-performance program) and not a fault of the Commercial Retrofit program specifically.
- Overall, savings assumptions are reasonable, though lighting assumptions may be leading to underestimated savings while HVAC assumptions may be leading to overestimated savings.
- Incentive levels are in line with comparable programs.
- NJCEP's inspection rates are the highest among programs that ERS interviewed.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R22. Revise key savings assumptions as part of any upcoming evaluation.
- R23. Consider reducing inspection rates to roughly half of current levels.

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Twenty-three of the twenty-five priority PAs have an offering targeting commercial retrofits that, similar to NJCEP's offering, is either exclusively or primarily prescriptive. ERS gathered data for all twenty-three comparable programs.

Following the benchmarking analysis, ERS performed further research on select programs: PG&E, Con Edison, NGrid MA, CL&P, and Wisconsin. First, ERS gathered representative incentive levels, technical requirements, and savings assumptions to determine the reasonableness of NJCEP's offerings and savings. Additionally, ERS was able to solicit further information from the program managers of NGrid MA, Con Edison, and Wisconsin on key aspects of their program: measure mix, the treatment of custom projects, their approach to

project-specific savings, and their M&V procedures. Finally, ERS interviewed NJCEP to gather the same information for comparison purposes.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

NJCEP's cost per $/kWh value is right on the sample average at $0.19 (n=52), whereas the cost per-kW and per-therm are substantially better (less $/savings) than the sample average (n=51 and n=26, respectively). Interestingly, the 2012 $/kWh was much worse relative to the sample than the $/kWh from 2011, which fell in the top quartile. With the exception of the 2012 $/kWh figure, the program has had relatively low $/savings throughout its recent history. Variability is expected, so despite the $/kWh figure from 2012, ERS is inclined to view this program as a relatively strong performer on $/savings basis. One thing to note is that in the most recent program year, NJCEP phased out T12 baselines; this will undoubtedly hurt program $/kWh. A similar trend is playing out nationwide, and commercial retrofit program costs have crept upward in recent years.

The savings per participant are moderate to low, with kWh/participant in the 19th percentile and kW/participant right at the median. ERS believes that this is likely a consequence of the portfolio structure. The primary alternatives to this program for retrofit projects are the Pay-for-Performance Retrofit and Large Energy Users programs. Both of these programs are relatively unique and attract only large projects, which may skew the selection of projects being handled by this program to the small side. Given that the program is working off of the smallest projects in the portfolio, the program's $/savings performance becomes more impressive considering the loss of economies of scale.

NJCEP's budgeting weighs heavily towards incentives for reasons of accounting, not program approach. Meaningful judgments cannot be made on the basis of this data because NJCEP's budgeting is so atypical. However, budget breakdown figures are shown for comparison programs for reference.

Further Research on Key Program Components

ERS performed further research on five peer programs: PG&E, Con Edison, NGrid MA, CL&P, and Wisconsin. The information targeted pertained to measure incentives, measure requirements, and key savings parameters. In addition, further information on program approaches to custom projects, savings calculations, and M&V was gathered for Con Edison, NGrid MA, and Wisconsin. All of this information is summarized below.

Offerings and Incentives

First, ERS solicited information from peer programs regarding their philosophical approach to custom projects. Only four responded, but there was a consistent preference –similar to NJCEP's – towards driving customers into the prescriptive aspect of the program. NGrid MA, Con Edison, and NJCEP all require customers to go the prescriptive route if a prescriptive measure that matches their project, while Wisconsin strongly encourages customers to go

prescriptive. ERS does know, however, of programs outside of those who responded to this line of questioning, that offer the option to go custom to more customers. NYSERDA and all of the California programs operate this way. Thus, NJCEP's approach to its custom offering is common, but it is not the only approach. This is discussed more as part of the broader discussion on nonresidential portfolio design.

Second, a deeper look into the incentive requirements and offerings of NJCEP's Commercial Retrofit program reveals that within the relatively small sample for further analysis, New Jersey's program is on-par with other comparable programs. ERS examined a handful of common measures incentivized by most PAs; that information is summarized in Table F-1.

Table F-1. Summary of Incentives and Requirements for Key Measures

PA	NJCEP	CL&P	PG&E	NGrid MA	Con Edison	WI
Unitary AC/split system (10 tons): $/ton	$73	$50	N/A	N/A	$60	$55
Unitary AC/split system (10 tons): EER	12	12	N/A	N/A	12	meet AHRI requirements
Gas hot water boiler (1,000 Mbtuh): $/Mbtuh	$2	unclear	$2	$8	$3	$1
Gas hot water boiler (1,000 Mbtuh): AFUE	0.85	N/A	N/A	0.90	0.85	0.85
Wall mounted occupancy sensor: $/sensor	$20	N/A	N/A	$30	$50	$8
HPT8 replacing Standard (32W) T8: $/fixure (1-4 lamps, 4')	$10	$15	$1-1.50	$15	$10	$3-$7
25 HP VFD for chilled water pump; $/hp	$60	$132	N/A	$186	$60	$50

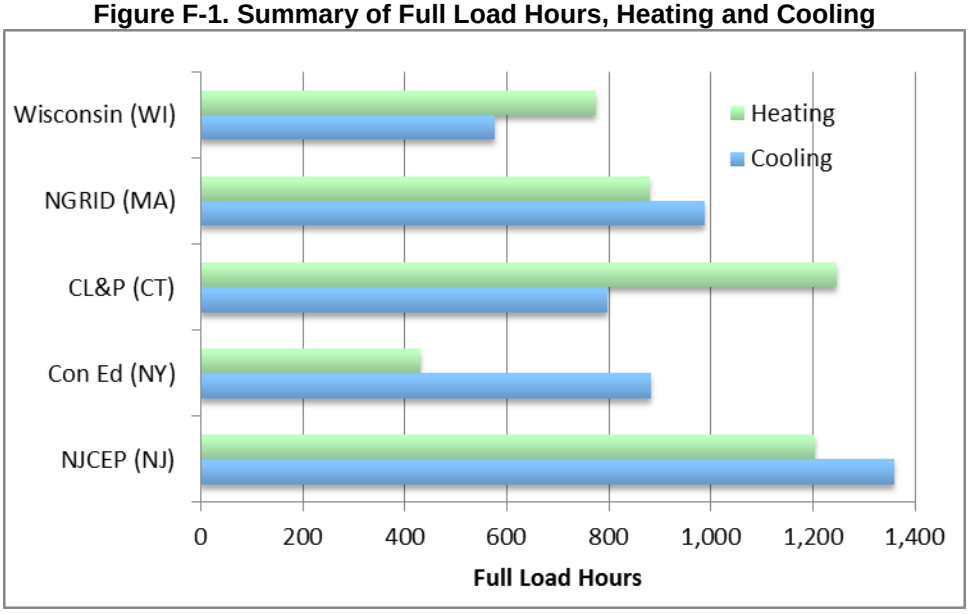
NJCEP's incentive levels and requirements are in the middle of the pack. The only notable exception is the incentive offered for the Unitary AC/ split system. New Jersey offers $73 per ton, whereas the other programs (n=3) offer substantially lower incentives, around $50-$60 per ton. However, this information suggests that the program's measures are appropriate, both in what is required and in how it is incentivized.

Savings & Assumptions

ERS reviewed key savings assumptions to determine if inflated savings were contributing to the program's strong $/savings figures. Key figures for this are heating and cooling full load hours (FLH) for HVAC measures and lighting run hours and coincidence factor for lighting. These drive the majority of a program's savings.

Figure F-1 summarizes the FLH values.

Figure F-1. Summary of Full Load Hours, Heating and Cooling



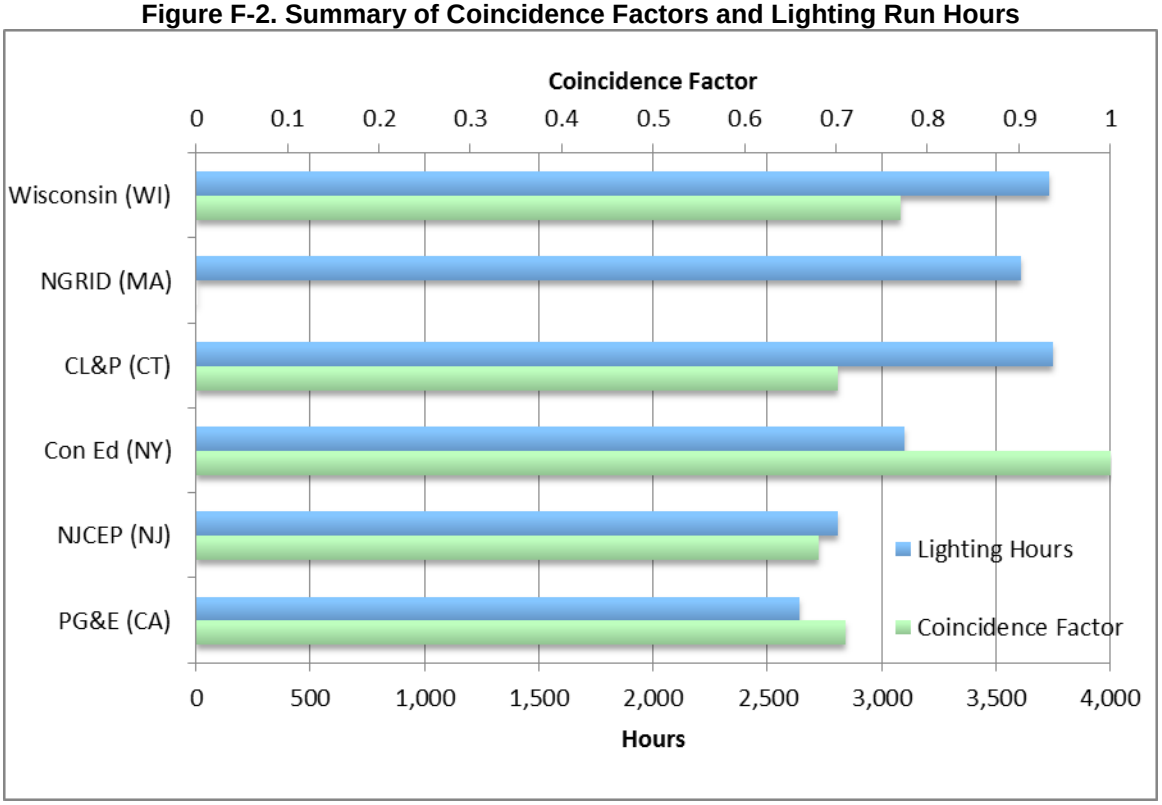
NJ Protocols assign a higher cooling full load hours than peer programs, but they are a warmer state than each of the others in the comparison, so it is not necessarily inappropriate. That said, it is probably worth review.

Heating hours are not an explicit part of the calculations in the NJCEP protocols. Instead, NJCEP makes use of heating degree days. ERS used a basic engineering analysis to convert the heating degree day value in the protocol into a FLH value.[25] The estimated FLH hours are on the high side, particularly when you consider that NJCEP is in a warmer climate than the comparison programs.

Figure F-2 summarizes the coincidence factors, which determine kW savings, and run hours for lighting projects.

[25] ERS used a degree-day base of 65°F (a common engineering estimate) and an average temperature differential of 14°F (from the protocols) to reverse engineer a run hours estimate.

Figure F-2. Summary of Coincidence Factors and Lighting Run Hours



Coincidence factor is the amount of demand reduction that occurs during peak load hours, and is expressed as a percentage of total difference in watts between the baseline and measure conditions. NJCEP's values tend to be on the low side, though, particularly with regards to run hours.

Overall, this review suggests that NJCEP's savings assumptions are within reason, but are somewhat high in the case of HVAC EFLH and somewhat low in the case of lighting assumptions. Neither areas represent a red flag, but both would be worth review as part of an impact evaluation. **Recommendation #22**: ERS recommends that any future evaluation review these savings assumptions.

Quality Assurance

NJCEP's approach to measurement and verification is inspection-based. Those PMs that provided information beyond savings assumptions said that they, too, do not require any in-field M&V to verify savings assumptions except in extreme cases. All the programs focused on simply verifying installations on some percentage of projects in order to combat fraud. Table F-2 summarizes their responses.

Table F-2. Summary of Inspection/Quality Control Approaches

PA	NJCEP	National Grid MA	Con Edison	Wisconsin
Inspection/QC approach	Inspect all applications over $25,000 and 30%-80% of all others based on technology (e.g., lighting is 30% while VFDs are 80%)	Pre & post inspections on almost all large projects (> $100,000 incentive or 500,000kW); small and prescriptive projects ~ 10% inspection rate	100% of projects have post inspection. This is a marketing technique to get new applications for other equipment.	Inspect all applications over $25,000 and 10% of all other projects

Like NGrid MA and Wisconsin, NJCEP performs inspections on all "large" projects, with Wisconsin and NJCEP defining that as a project with an incentive over $25,000 and NGrid MA defining that as over $100,000. Both NGrid MA and Wisconsin only inspect about 10% of "small" projects, which is a commonly targeted threshold. NJCEP, on the other hand, inspects between 30% and 80% of all projects, based on technology. This level of inspection may not be necessary. While Con Edison does inspect all of its projects, this is done for strategic marketing purposes; ERS also knows that this approach is under review. **Recommendation #23:** ERS recommends that NJCEP reduce the percentage of projects receiving inspections in an effort to bring down costs.

Proposed Target Metrics

The NJCEP Commercial Retrofit program has performed well on a cost-per-savings basis in its recent history. The program team should continue to maintain those levels of excellence. On the electric side, achieving the low $/kWh figures shown through the 2010-2012 period will likely be challenging as T12 fixtures are phased out as a baseline. As such, ERS proposes the target metrics shown in Table F-3, which reflect a higher than $/kWh figure than has been achieved in the past.

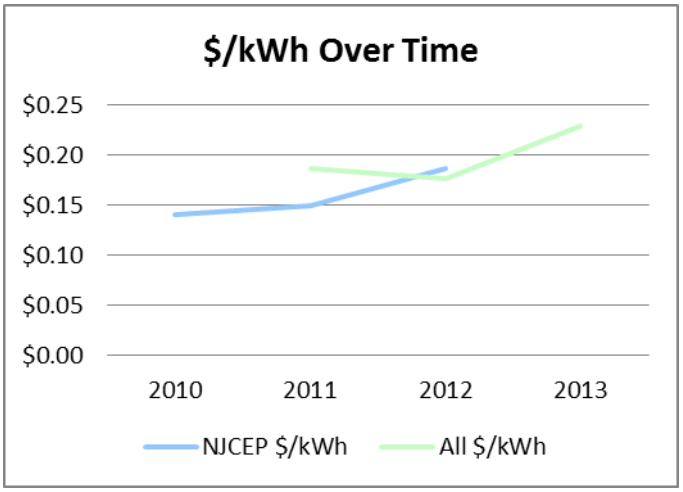
Table F-3. NJCEP Commercial Retrofit Target Metrics

Metric	Target
$/kWh	$0.20/kWh
$/therm	$1.00/therm

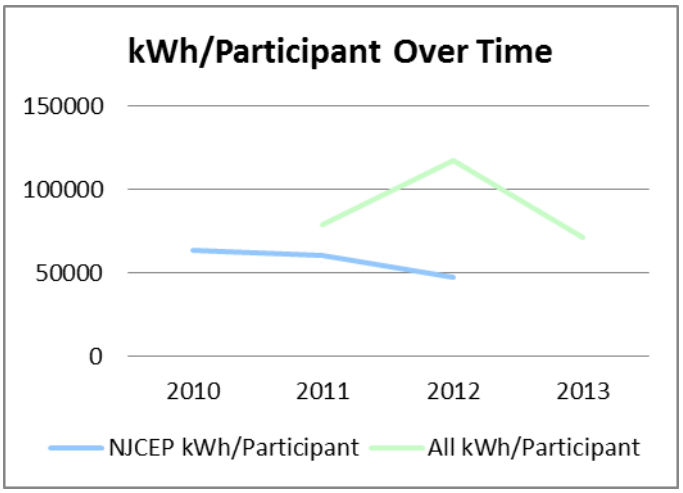
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

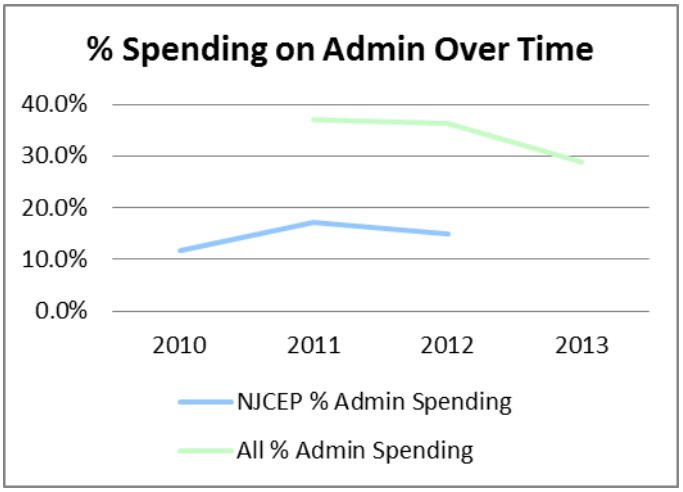
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
Comm. Retrofit 2012	*$0.19*	*$623*	*$0.70*
NJCEP Percentile	*45%*	*70%*	*84%*
Sample Size	52	51	26
Std Deviation	$0.09	$622	$4.68
Min	$0.05	$120	$0.28
75th Percentile	$0.14	$587	$1.10
Average	$0.19	$1,040	$3.71
Median	$0.18	$880	$2.28
25th Percentile	$0.23	$1,320	$3.98
Max	$0.53	$2,766	$19.56

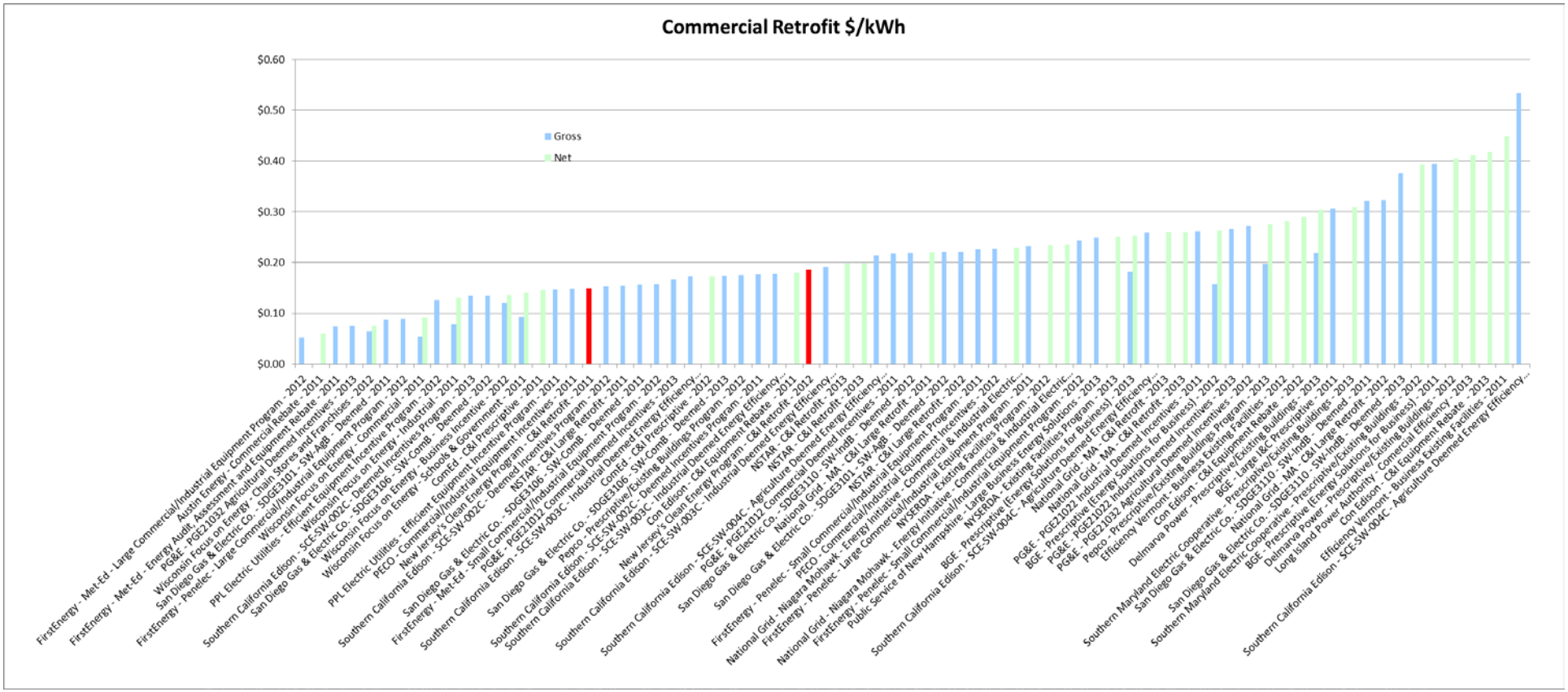


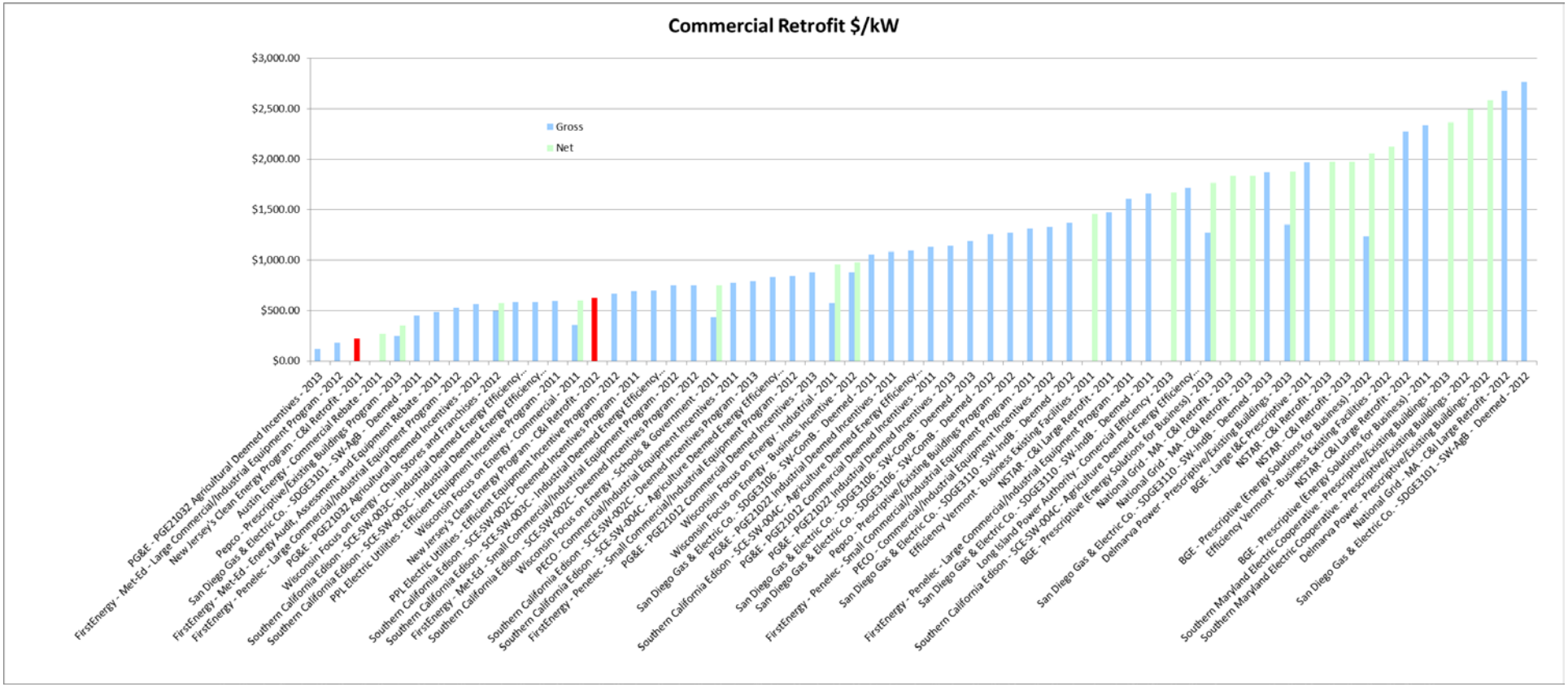
Gross Savings Per Participant			
Category	kWh/part.	kW/part.	Therm/part.
Comm. Retrofit 2012	*48,775*	*14.6*	*12933*
NJCEP Percentile	*20%*	*50%*	*N/A*
Sample Size	16	15	2
Std Deviation	91,201	25.3	4,726
Min	10,964	2.1	12,933
25th Percentile	55,353	10.3	N/A
Average	105,129	21.6	16,275
Median	68,751	14.6	N/A
75th Percentile	131,691	19.0	N/A
Max	362,968	104.9	19,617

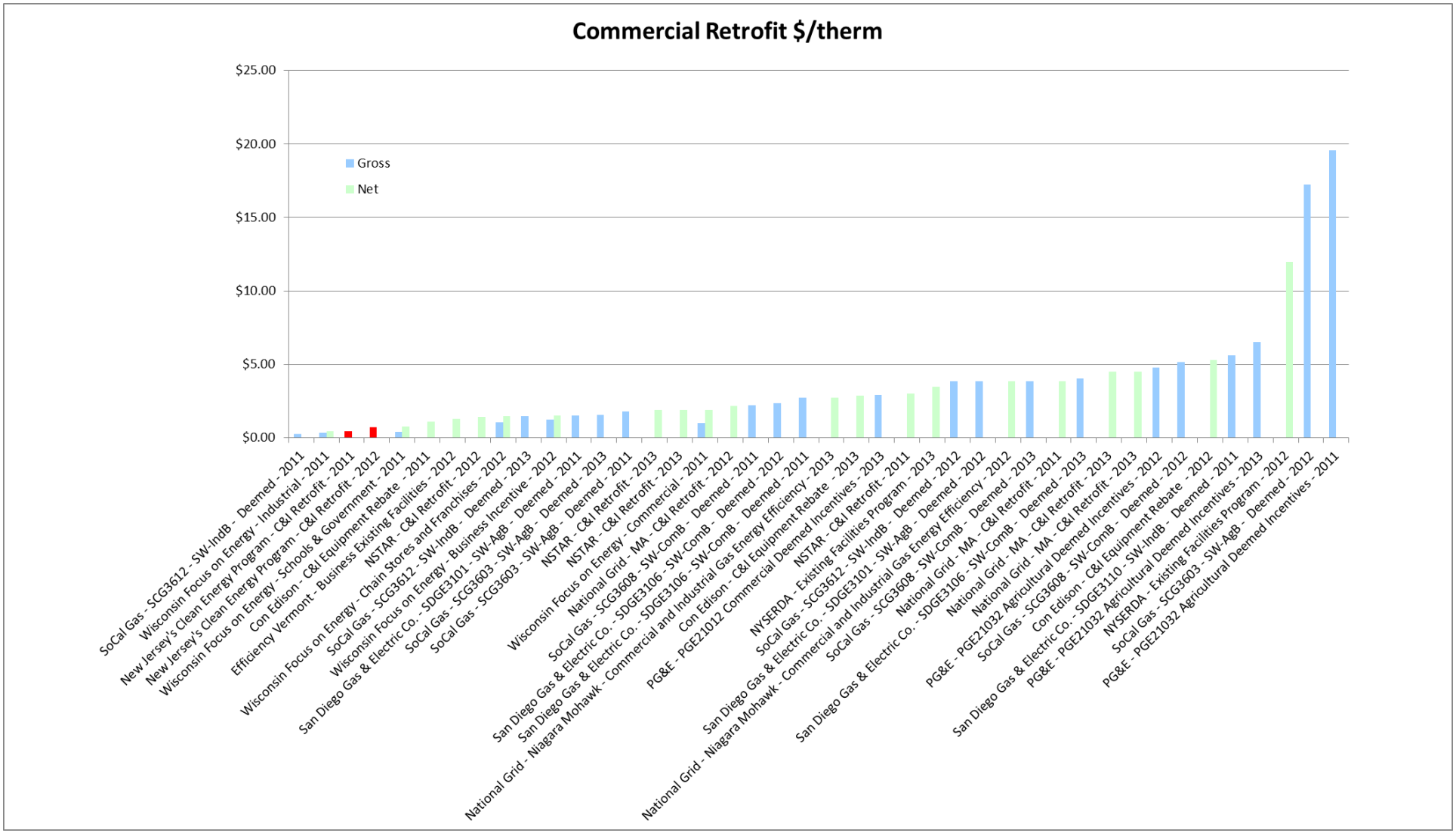


Spending Breakout	
Category	% Incentive
Comm. Retrofit 2012	*85%*
NJCEP Percentile	*96%*
Sample Size	32
Std Deviation	17%
Min	19%
25th Percentile	56%
Average	65%
Median	69%
75th Percentile	77%
Max	90%




Commercial Retrofit $/kWh
$0.60
$0.50
$0.40
$0.30
$0.20
$0.10
$0.00
Gross
Net


Commercial Retrofit $/kW
$3,000.00
$2,500.00
$2,000.00
$1,500.00
$1,000.00
$500.00
$0.00
Gross
Net
PG&E - PGE21032 Agricultural Deemed Incentives - 2013
FirstEnergy - Met-Ed - Large Commercial/Industrial Equipment Program - 2012
New Jersey's Clean Energy Program - C&I Retrofit - 2011
Austin Energy - Commercial Rebate - 2011
Pepco - Prescriptive/Existing Building Program - 2013
San Diego Gas & Electric Co. - SDGE3101 - SW-AgB - Deemed - 2011
FirstEnergy - Met-Ed - Energy Audit, Assessment and Equipment Rebate - 2011
FirstEnergy - Penelec - Large Commercial/Industrial Equipment Program - 2012
PG&E - PGE21032 Agricultural Deemed Incentives - 2012
Wisconsin Focus on Energy - Chain Stores and Franchises - 2012
Southern California Edison - SCE-SW-003C - Industrial Deemed Energy Efficiency...
PPL Electric Utilities - Efficient Equipment Incentive Program - 2011
Wisconsin Focus on Energy Program - Commercial - 2011
New Jersey's Clean Energy Program - C&I Retrofit - 2012
PPL Electric Utilities - Efficient Equipment Incentive Program - 2012
Southern California Edison - SCE-SW-002C - Deemed Incentives Program - 2012
Southern California Edison - SCE-SW-003C - Industrial Deemed Energy Efficiency...
Wisconsin Focus on Energy - Schools & Government - 2011
PPL Electric Utilities - Efficient Equipment Incentives Program - 2013
Southern California Edison - SCE-SW-002C - Deemed Incentives Program - 2011
Southern California Edison - SCE-SW-003C - Industrial Deemed Energy Efficiency...
Wisconsin Focus on Energy - Schools & Government - 2012
Southern California Edison - SCE-SW-002C - Industrial Equipment Program - 2012
FirstEnergy - Met-Ed - Small Commercial/Industrial Deemed Incentives - 2011
Southern California Edison - SCE-SW-002C - Deemed Incentives Program - 2011
Wisconsin Focus on Energy - Commercial/Industrial Equipment Program - 2012
PECO - Commercial/Industrial Equipment Program - 2012
Southern California Edison - SCE-SW-004C - Deemed Incentives Program - 2012
Southern California Edison - SCE-SW-002C - Deemed Incentives Program - 2013
FirstEnergy - Penelec - Small Commercial/Industrial Deemed Energy Efficiency...
PG&E - PGE21012 Commercial Deemed Incentives - 2013
Wisconsin Focus on Energy - Business Incentive - 2012
San Diego Gas & Electric Co. - SDGE3106 - SW-ComB - Deemed - 2011
Southern California Edison - SCE-SW-004C - Agriculture Deemed Energy Efficiency...
PG&E - PGE21022 Industrial Deemed Incentives - 2013
PG&E - PGE21012 Commercial Deemed Incentives - 2012
San Diego Gas & Electric Co. - SDGE3106 - SW-ComB - Deemed - 2012
PG&E - PGE21022 Industrial Deemed Incentives - 2011
PG&E - PGE21012 Commercial Deemed Incentives - 2011
San Diego Gas & Electric Co. - SDGE3106 - SW-ComB - Deemed - 2013
Pepco - Prescriptive/Existing Buildings Program - 2012
FirstEnergy - Penelec - Small Commercial/Industrial Equipment Program - 2011
PECO - Commercial/Industrial Equipment Program - 2011
San Diego Gas & Electric Co. - SDGE3110 - SW-IndB - Deemed - 2011
Efficiency Vermont - Business Existing Facilities - 2012
NSTAR - C&I Large Retrofit - 2011
FirstEnergy - Penelec - Large Commercial/Industrial Equipment Program - 2012
San Diego Gas & Electric Co. - SDGE3110 - SW-IndB - Deemed - 2012
Long Island Power Authority - Comercial Efficiency - 2013
Southern California Edison - SCE-SW-004C - Agriculture Deemed Energy Efficiency...
National Grid - MA - C&I Retrofit - 2013
San Diego Gas & Electric Co. - SDGE3110 - SW-IndB - Deemed - 2013
Delmarva Power - Prescriptive/Existing Buildings - 2013
BGE - Large I&C Prescriptive - 2011
NSTAR - C&I Retrofit - 2013
BGE - Prescriptive (Energy Solutions for Business) - 2013
Efficiency Vermont - Business Existing Facilities - 2012
Southern Maryland Electric Cooperative - Prescriptive/Existing Buildings - 2011
NSTAR - C&I Large Retrofit - 2012
Southern Maryland Electric Cooperative - Prescriptive/Existing Buildings - 2012
Delmarva Power - Prescriptive/Existing Buildings - 2012
National Grid - MA - C&I Large Retrofit - 2012
San Diego Gas & Electric Co. - SDGE3101 - SW-AgB - Deemed - 2012


Commercial Retrofit $/therm
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
Gross
Net
SoCal Gas - SCG3612 - SW-IndB - Deemed - 2011
Wisconsin Focus on Energy - Industrial - 2011
New Jersey's Clean Energy Program - C&I Retrofit - 2011
New Jersey's Clean Energy Program - C&I Retrofit - 2012
Wisconsin Focus on Energy - Schools & Government - 2011
Efficiency Vermont - Business Existing Facilities - 2011
Con Edison - C&I Equipment Rebate - 2012
Wisconsin Focus on Energy - Chain Stores and Franchises - 2012
NSTAR - C&I Retrofit - 2012
SoCal Gas - SCG3612 - SW-IndB - Deemed - 2013
Wisconsin Focus on Energy - Business Incentive - 2012
San Diego Gas & Electric Co. - SDGE3101 - SW-AgB - Deemed - 2013
SoCal Gas - SCG3603 - SW-AgB - Deemed - 2011
SoCal Gas - SCG3603 - SW-AgB - Deemed - 2013
NSTAR - C&I Retrofit - 2011
NSTAR - C&I Retrofit - 2013
Wisconsin Focus on Energy - Commercial - 2011
National Grid - MA - C&I Retrofit - 2012
SoCal Gas - SCG3608 - SW-ComB - Deemed - 2011
San Diego Gas & Electric Co. - SDGE3106 - SW-ComB - Deemed - 2012
San Diego Gas & Electric Co. - SDGE3106 - SW-ComB - Deemed - 2011
National Grid - Commercial and Industrial Gas Energy Efficiency - 2013
Con Edison - C&I Equipment Rebate - 2013
PG&E - PGE21012 Commercial Deemed Incentives - 2013
NSTAR - C&I Retrofit - 2011
NYSERDA - Existing Facilities Program - 2013
SoCal Gas - SCG3612 - SW-IndB - Deemed - 2012
San Diego Gas & Electric Co. - SDGE3101 - SW-AgB - Deemed - 2012
National Grid - Commercial and Industrial Gas Energy Efficiency - 2012
National Grid - Niagara Mohawk - Commercial and Industrial Gas Energy Efficiency - 2012
National Grid - MA - C&I Retrofit - 2011
San Diego Gas & Electric Co. - SDGE3106 - SW-ComB - Deemed - 2013
National Grid - MA - C&I Retrofit - 2013
SoCal Gas - SCG3608 - SW-ComB - Deemed - 2013
National Grid - MA - C&I Retrofit - 2012
PG&E - PGE21032 Agricultural Deemed Incentives - 2012
SoCal Gas - SCG3608 - SW-ComB - Deemed - 2012
Con Edison - C&I Equipment Rebate - 2012
San Diego Gas & Electric Co. - SDGE3110 - SW-IndB - Deemed - 2012
PG&E - PGE21032 Agricultural Deemed Incentives - 2011
NYSERDA - Existing Facilities Program - 2012
SoCal Gas - SCG3603 - SW-AgB - Deemed - 2012
PG&E - PGE21032 Agricultural Deemed Incentives - 2011

APPENDIX G: PAY FOR PERFORMANCE NEW CONSTRUCTION

NJCEP's Pay for Performance (P4P) New Construction (NC) program is whole-building savings program that requires participants to achieve at least 15% savings relative to code. It is comparable to what other PAs term "Savings-by-Design" although the NJCEP program takes a less active role in shaping design decisions through technical assistance. This makes it somewhere in between a true Savings-by-Design program and a standalone custom program with savings minimums.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- Program incentives are much higher than peer programs.
- The $/square-foot approach to incentives is abnormal, with most peer programs utilizing a $/savings approach to incentives.
- The program's quality assurance approach is relatively light touch, compared to peer programs' more rigorous review approaches.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R24. Reduce incentive levels by roughly one half to better align with industry averages.
- R25. Convert the incentive approach to $/savings (as opposed to the current $/square-foot approach).
- R26. Increase quality assurance rigor if migrating to a $/savings approach.

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Of the twenty-five PAs, only six offer a program with Savings-by-Design or deep savings features such as technical assistance or deep savings targets that are comparable to NJCEP's P4P New Construction program:

- Six of the twenty-five PAs offer a program with Savings-by-Design or deep savings features such as technical assistance or deep savings targets
- Two other programs offer custom programs on a standalone basis (BGE and SMECo)
- The remaining programs either did not offer such programs or they were bundled with prescriptive rebates, which would complicate the analysis

The bundling of most programs left the sample on the small side, but it was sufficient to provide some comparison.

Following the benchmarking analysis described below, additional research was completed on four of the PAs with comparable programs. Of these four, two, PG&E and SDG&E, offer

Savings-by-Design programs, and two, Vermont and ComEd, offer programs with deep savings features. Incentive approaches of these programs were reviewed in order to compare them with NJCEP's approach.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

Actual spending and savings were not available for either 2011 or 2012 for NJCEP, so in lieu of that committed spending and savings were used, which may be more optimistic than actual gross savings once those projects are finalized. Many projects come into the pipeline, but never materialize.

One important point of note for the benchmark is that the program exhibited high variability across all metrics. This reflects the relatively small number of projects that the program sees each year. For example, in 2011, the program had the worst $/kW in the sample, but in 2012 it was second best. This fact, combined with the relatively small sample of comparison PAs, suggests these benchmark results should be considered with less confidence than other results.

Those caveats aside, the program does not perform great, which it should since the results are certainly worse when you use actual spending and savings values. In particular, the $/kWh values are poor, with both 2011 and 2012 in the lowest quartile. This is unsurprising when the later results on incentive approach are considered.

There are too few reported values for participant data to make any conclusions.

NJCEP did not report spending breakouts on committed spending, and it was not determined from available tracking data. Since customers pay for their own technical assistance (which is cost-shared for other programs), it can be assumed that administrative spending is low compared to peer programs.

Further Research on Key Program Components

ERS reviewed the incentive models of PG&E, SDG&E, Vermont, and ComEd. Additionally, the NJCEP quality assurance was investigated. Those features are discussed below.

Offerings and Incentives

The NJCEP incentive model is significantly different than peer programs. NJCEP awards incentives based on the square footage of the space built, which are tiered based on the percent of savings. Most programs reward incentive based directly on energy saved, rather than using a proxy like square footage. This may be somewhat more complex, but its effect on the incentive earned is significant.

To demonstrate the effect, four example projects were assumed. CBECS 2012,[26] EPA Portfolio Manager[27], and Pacific Northwest National Laboratory's Utility Estimator Tool[28] were used to establish a baseline energy use intensity (EUI) and square footage for code compliant buildings in each state. Four common building types were modeled, which feature a wide range of EUI, each at EUI reductions of 5%, 15%, and 25% better than code compliance. As seen in Figure G-1, in most circumstances the incentive awarded by NJCEP is far greater than what would have been given for the same EUI reduction from code, and thus approximately the same energy saved in kWh or therms. The only case in which the cost per square foot structure is competitive is in hospitals, which have an unusually high EUI because of their dense energy usage.

Figure G-1. Estimated Incentives for Key Building Types at Specific EUI Reductions

Table G-1 summarizes how each of the PAs modeled calculate their incentives.

[26] CBECS 2012 square footage by building type.
http://www.eia.gov/consumption/commercial/reports/2012/preliminary/summary.xlsx
[27] Portfolio Manager (CBECS 2012) report on EUI by building types.
https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf
[28] Pacific Northwest National Laboratory Utility Estimator Tool. https://www.energycodes.gov/resource-center/utility-savings-estimators

Table G-1. Summary of Incentive Approaches

Program Administrator	Minimum Savings	Incentive Structure Unit	Tier Bounds (Tier 1, Tier 2, etc.)	Rates (Tier 1, Tier 2, etc.)
NJCEP (NJ)	Energy use 15% below code	per square foot	15-17%, 18-20%, >20%	$1.45/sqft, $1.55/sqft, $1.75/sqft
Efficiency Vermont (VT)	Energy Use 20% below code	per kWh and per therm saved, negotiated, systems approach also available	20-30% savings, 40-50% savings, 60-75% savings	negotiated incentive rate
ComEd (IL)	None	per kWh and per therm saved, negotiated	up to 5,000,000 kWh, above 5,000,000 kWh	$0.10/kWh, $0.05/kWh and $0.50/therm
PG&E (CA)	Energy Use 10% below code	per kWh for whole building approach, or per kWh and/or therm for separate systems	10-30%, 30-40%, above 40%	sliding scale from $0.133/kWh to $0.40/kWh, $0.40/kWh, $0.53/kWh
SDG&E (CA)	Energy Use 10% below code	per kWh for whole building approach, or per kWh and/or therm for separate systems	10-30%, 30-40%, above 40%	sliding scale from $0.10/kWh to $0.30/kWh, $0.30/kWh, $0.40/kWh

Another key difference between NJCEP and its peer programs is its dissuasion of deep project savings. NJCEP incentive per unit savings decreases as the project savings increase. In other words, the incentive rewarded is regressive, and the most $/savings projects are those that just make the Tier 1 savings. This establishes a low bar and discourages deep savings. Contrast this with the Savings-by-Design programs run by the California PAs, which act the opposite. Their incentive per unit savings increases for deeper project savings. This encourages applicants to save more and more. A third, more straightforward model is in place at ComEd, which uses a single tier. It does not prefer more or less savings to reach targets, and therefore influences the size of the project the least. Vermont's incentives are entirely custom and dependent on the project; there are no guidelines or published values. This is not advisable as it makes marketing the program very difficult, and decreases transparency.

Recommendation #24: In sum, ERS recommends that NJCEP lower the incentives overall. This could be accomplished while maintaining the square-footage approach. **Recommendation #25:** However, ERS also recommends that NJCEP get rid of the square-footage-based incentives. They do not effectively incentivize maximal savings and are prone to gaming since different building types experience different levels of energy density.

Quality Assurance

NJCEP's approach to savings review for this program is relatively low rigor. The program does not directly involve itself with modeling, instead limiting program review to a desk review of the model based on as-built conditions. There is no performance period or in-field M&V. This more hands off approach makes sense given that the participants do not have a large incentive

to push their savings estimates at the margin – after all, their incentive check is based on square footage not savings. However, other programs tend to involve themselves more in the planning and modeling of projects and also often perform some kind of performance validation.
Recommendation #26: ERS recommends that *if* the program convert to a $/savings approach to incentives that NJCEP review and revise the quality assurance protocols to ensure appropriate checks on participant savings claims.

Proposed Target Metrics

The NJCEP P4P New Construction program is overpaying and needs to recalibrate to a lower cost-per-savings target. As such, ERS proposes the target metrics shown in Table G-2.

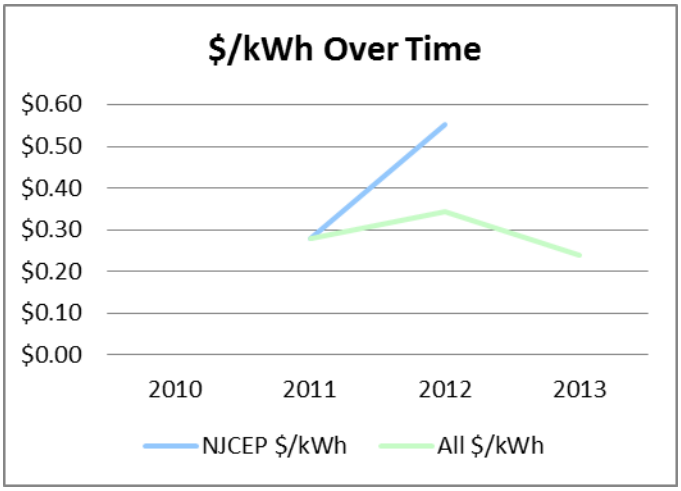
Table G-2. NJCEP Commercial Retrofit Target Metrics

Metric	Target
$/kWh	$0.25/kWh
$/therm	$0.75/therm

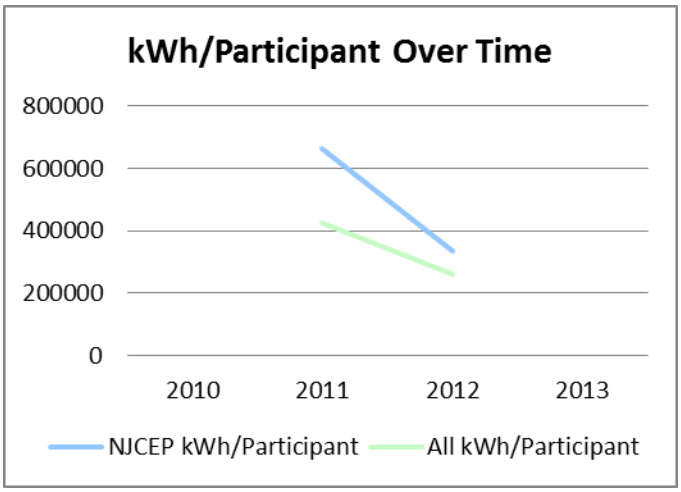
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

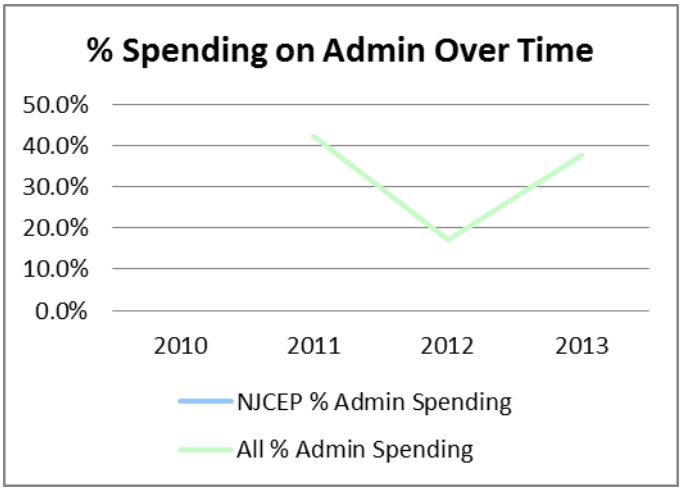
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
P4P New Const. 2012	*$0.72*	*$837*	*$0.34*
NJCEP Percentile	*0%*	*92%*	*100%*
Sample Size	14	14	7
Std Deviation	$0.13	$573	$3.93
Min	$0.10	$414	$0.34
75th Percentile	$0.25	$1,025	$0.74
Average	$0.31	$1,305	$2.22
Median	$0.29	$1,294	$0.84
25th Percentile	$0.31	$1,376	$0.88
Max	$0.72	$2,886	$11.11

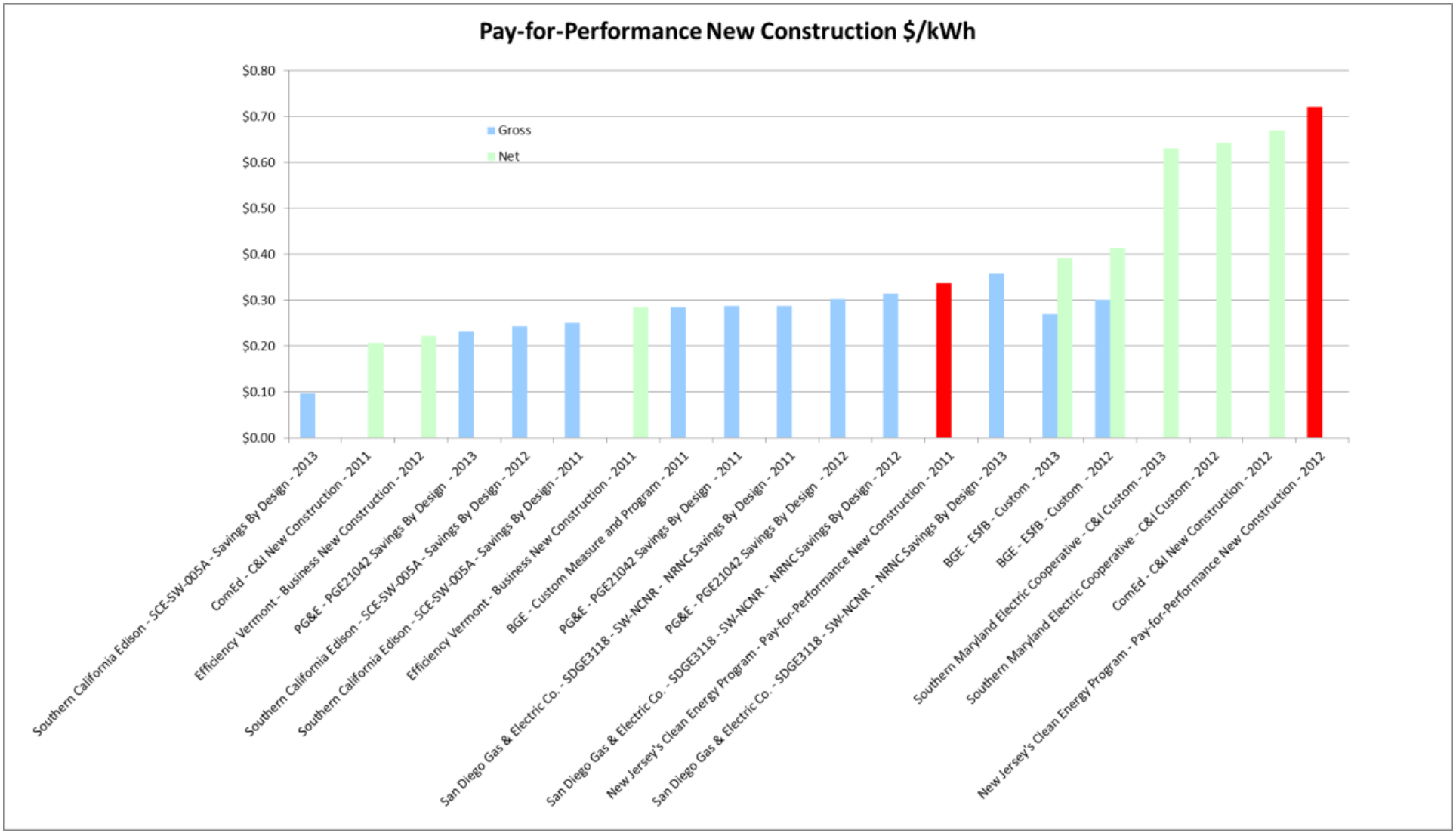


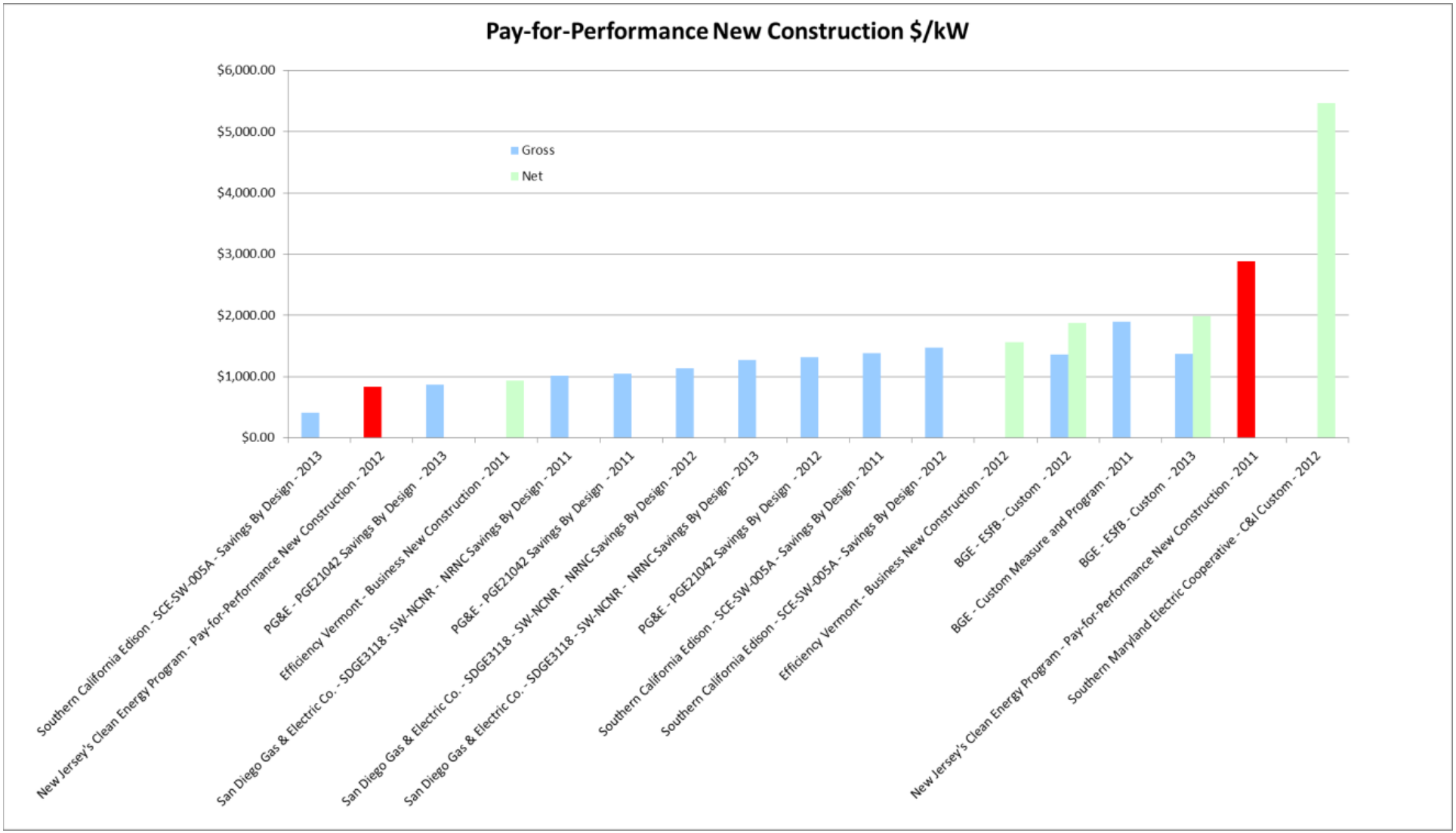
Gross Savings Per Participant			
Category	kWh/part.	kW/part.	Therm/part.
P4P New Const. 2012	*452,431*	*389.0*	*9598*
NJCEP Percentile	*67%*	*100%*	*N/A*
Sample Size	4	4	3
Std Deviation	255,788	170.5	4,825
Min	187,892	28.3	233
25th Percentile	N/A	N/A	N/A
Average	387,853	135.7	4,244
Median	N/A	N/A	N/A
75th Percentile	N/A	N/A	N/A
Max	722,906	389.0	9,598

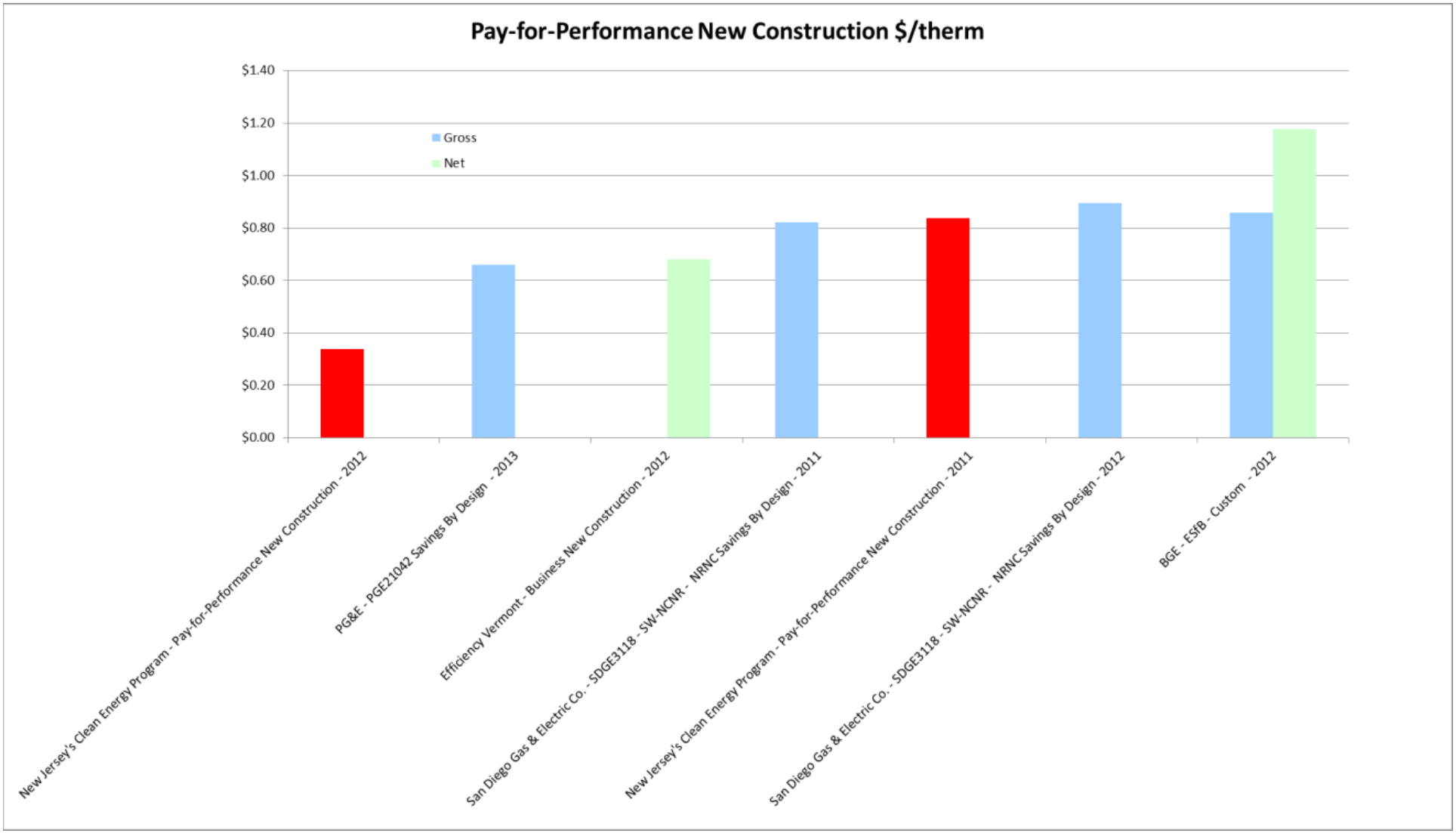


Spending Breakout	
Category	% Incentive
P4P New Const. 2012	*N/A*
NJCEP Percentile	*N/A*
Sample Size	5
Std Deviation	22%
Min	39%
25th Percentile	42%
Average	65%
Median	76%
75th Percentile	83%
Max	83%




Pay-for-Performance New Construction $/kWh
$0.80
$0.70
$0.60
$0.50
$0.40
$0.30
$0.20
$0.10
$0.00
Gross
Net
Southern California Edison - SCE-SW-005A - Savings By Design - 2013
ComEd - C&I New Construction - 2011
Efficiency Vermont - Business New Construction - 2012
PG&E - PGE21042 Savings By Design - 2013
Southern California Edison - SCE-SW-005A - Savings By Design - 2012
Southern California Edison - SCE-SW-005A - Savings By Design - 2011
Efficiency Vermont - Business New Construction - 2011
BGE - Custom Measure and Program - 2011
PG&E - PGE21042 Savings By Design - 2011
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2011
PG&E - PGE21042 Savings By Design - 2012
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2012
New Jersey's Clean Energy Program - Pay-for-Performance New Construction - 2011
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2013
BGE - ESfB - Custom - 2013
BGE - ESfB - Custom - 2012
Southern Maryland Electric Cooperative - C&I Custom - 2013
Southern Maryland Electric Cooperative - C&I Custom - 2012
ComEd - C&I New Construction - 2012
New Jersey's Clean Energy Program - Pay-for-Performance New Construction - 2012


Pay-for-Performance New Construction $/kW
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$0.00
Gross
Net
Southern California Edison - SCE-SW-005A - Savings By Design - 2013
New Jersey's Clean Energy Program - Pay-for-Performance New Construction - 2012
PG&E - PGE21042 Savings By Design - 2013
Efficiency Vermont - Business New Construction - 2011
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2011
PG&E - PGE21042 Savings By Design - 2011
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2012
PG&E - PGE21042 Savings By Design - 2013
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2012
PG&E - PGE21042 Savings By Design - 2012
Southern California Edison - SCE-SW-005A - Savings By Design - 2011
Southern California Edison - SCE-SW-005A - Savings By Design - 2012
Efficiency Vermont - Business New Construction - 2012
BGE - ESfB - Custom - 2012
BGE - Custom Measure and Program - 2011
BGE - ESfB - Custom - 2013
New Jersey's Clean Energy Program - Pay-for-Performance New Construction - 2011
Southern Maryland Electric Cooperative - C&I Custom - 2012


Pay-for-Performance New Construction $/therm
$1.40
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
Gross
Net
New Jersey's Clean Energy Program - Pay-for-Performance New Construction - 2012
PG&E - PGE21042 Savings By Design - 2013
Efficiency Vermont - Business New Construction - 2012
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2011
New Jersey's Clean Energy Program - Pay-for-Performance New Construction - 2011
San Diego Gas & Electric Co. - SDGE3118 - SW-NCNR - NRNC Savings By Design - 2012
BGE - ESfB - Custom - 2012

APPENDIX H: PAY FOR PERFORMANCE RETROFIT

NJCEP's Pay for Performance (P4P) Retrofit program is whole-building savings program that requires participants to achieve at least 15% savings relative to existing performance. The program requires participants to employ a technical assistance provider to help them develop a master plan that will achieve the targeted reduction. This type of program is atypical as most programs do not require such deep savings.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS came to the following conclusions:

- The program's $/savings are high compared to other non-prescriptive programs, but so are the savings/participant. This should be expected of a deep savings program that goes beyond the low hanging fruit.
- This is a unique program, with no true comparables in the comparison set.

Because of the lack of comparison programs, ERS did not subject the program to further review following the initial benchmark (discussed below), and ERS has no tactical recommendations.

Comparison Program Sample

Only three of the twenty-five comparison PAs offer programs that include deep savings features such as multi-measure requirements or percent-savings targets comparable to NJCEP's P4P Retrofit program:

- The three PAs with deep savings features are CL&P, Con Edison, and BGE
  - CL&P offers 33% higher incentives in exchange for pursuing at least two types of measures, but the program's data is combined with its prescriptive rebates and thus cannot be used for comparison
  - BGE offers a "comprehensive systems" track that raises the incentive cap in exchange for pursuing multiple measures simultaneously, but data for this is mixed with its generic custom program
  - Con Edison recently dismantled the deep savings portion of its electric custom program, which previously offered increasing $/kWh as savings increased as a percentage of load (although, unlike NJCEP, incentives began at 0% of load)
- An additional ten programs offer a standalone custom program, which provides a useful comparison as it is the primary substitute for deep savings program

To be clear, no program offers a savings minimum like NJCEP, which won't even accept the project unless it projects to save 15% of total energy. Thus this comparison data set is more representative of the primary alternative to NJCEP's P4P Retrofit program, as opposed to programs that operate in exactly the same way.

With so few comparables, no further lines of investigation beyond the benchmarking were pursued.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

The cost per gross energy saved is very poor, $0.33/kWh, within the strong sample group (n=36). Those closest on a $/kWh basis to NJCEP tend to be those serving expensive-to-serve markets such as agricultural or industrial markets. BGE, with its deep savings measures, is also around the same cost.

The other metrics, $/kW and $/therm, are somewhat better, coming in around the median. The $/kW value has shown some variability, with the 2011 value just shy of $2,000/kW, which would have been in the worst quartile. Nonetheless, it should be expected that this program would perform somewhat better on a $/kW basis than a $/kWh basis because it is a deep savings program. Participants should be expected to go beyond lighting and into cooling equipment, which will often return a greater value in demand savings than in energy savings.

As for the $/therm figure, it is possibly inflated due to the way spending was split between electric and gas for this program for this analysis. ERS used a program-reported estimate of spending by fuel (i.e., 94% electric and 6% gas) to distribute the spending; even a slight increase in estimated spending on gas measures (e.g., going from 6% of budget to 7% of budget) would have a disproportionate effect. Thus, the gas benchmark should be considered with less confidence than other conclusions. Note that the effect will be much smaller on the electric side (e.g., going from 94% to 93%) and thus those results are more solid.

Savings per participant is higher than most comparable programs, falling in the 86th percentile for gross energy and gross demand savings. While the sample is small (n=8), this result is intuitive. No other programs have a minimum savings threshold in the way that NJCEP does. By requiring 15% savings, the program should expect significant savings per project.

NJCEP's budgeting weighs heavily towards incentives for reasons of accounting not program approach. Meaningful judgments cannot be made on the basis of this data because NJCEP's budgeting is so atypical. However, budget breakdown figures are shown for comparison programs for reference.

Further Research on Key Program Components

No further research was performed.

Proposed Target Metrics

The NJCEP P4P Retrofit program is more expensive than the typical program, but also achieves a deeper level of savings. As such, so long as NJCEP decides to make this strategic tradeoff, the target metrics will be relatively high. ERS recommends the targets in Table H-1.

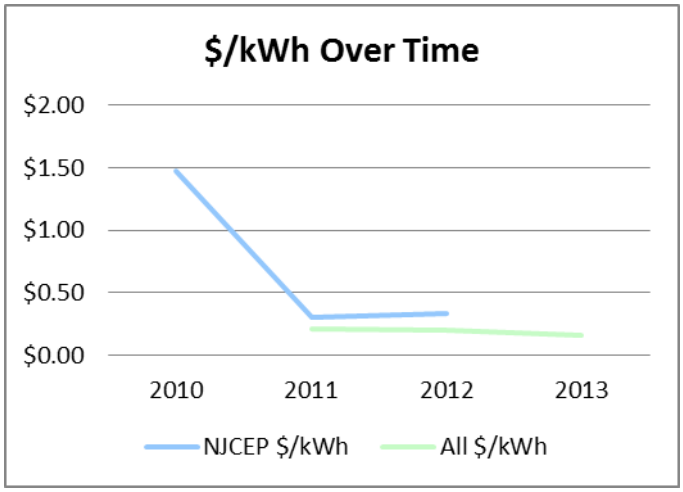
Table H-1. NJCEP P4P Retrofit Target Metrics

Metric	Target
$/kWh	$0.30/kWh
$/therm	$3.00/therm

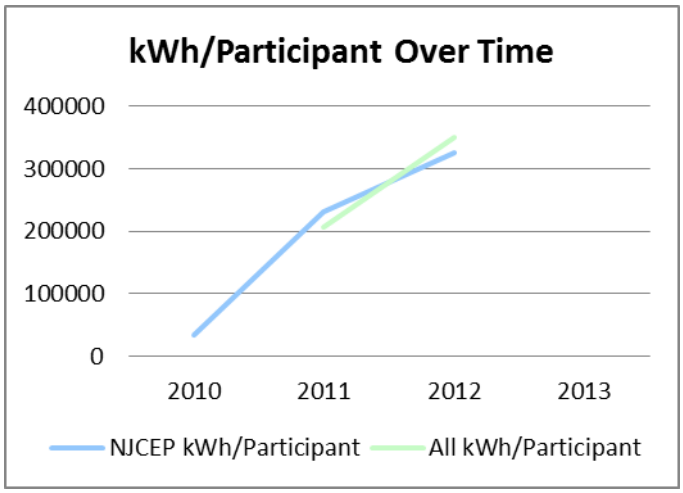
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

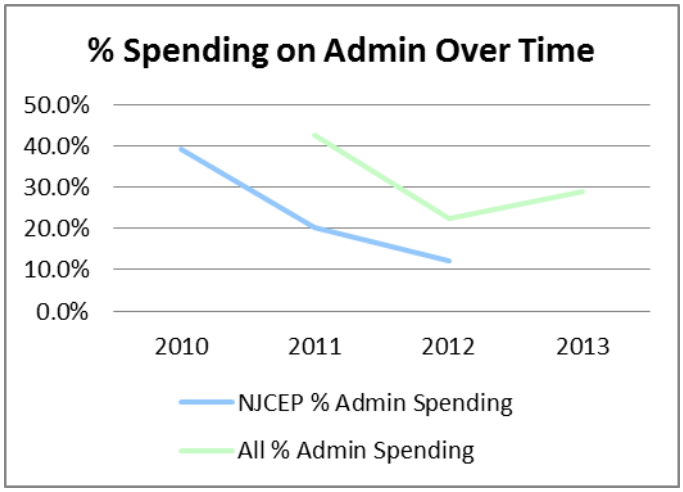
Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
P4P Retrofit 2012	*$0.33*	*$1,249*	*$2.08*
NJCEP Percentile	*4%*	*57%*	*46%*
Sample Size	36	36	23
Std Deviation	$0.08	$652	$1.16
Min	$0.08	$462	$0.56
75th Percentile	$0.12	$946	$1.46
Average	$0.19	$1,404	$2.22
Median	$0.19	$1,339	$1.91
25th Percentile	$0.25	$1,609	$2.82
Max	$0.39	$3,826	$4.59

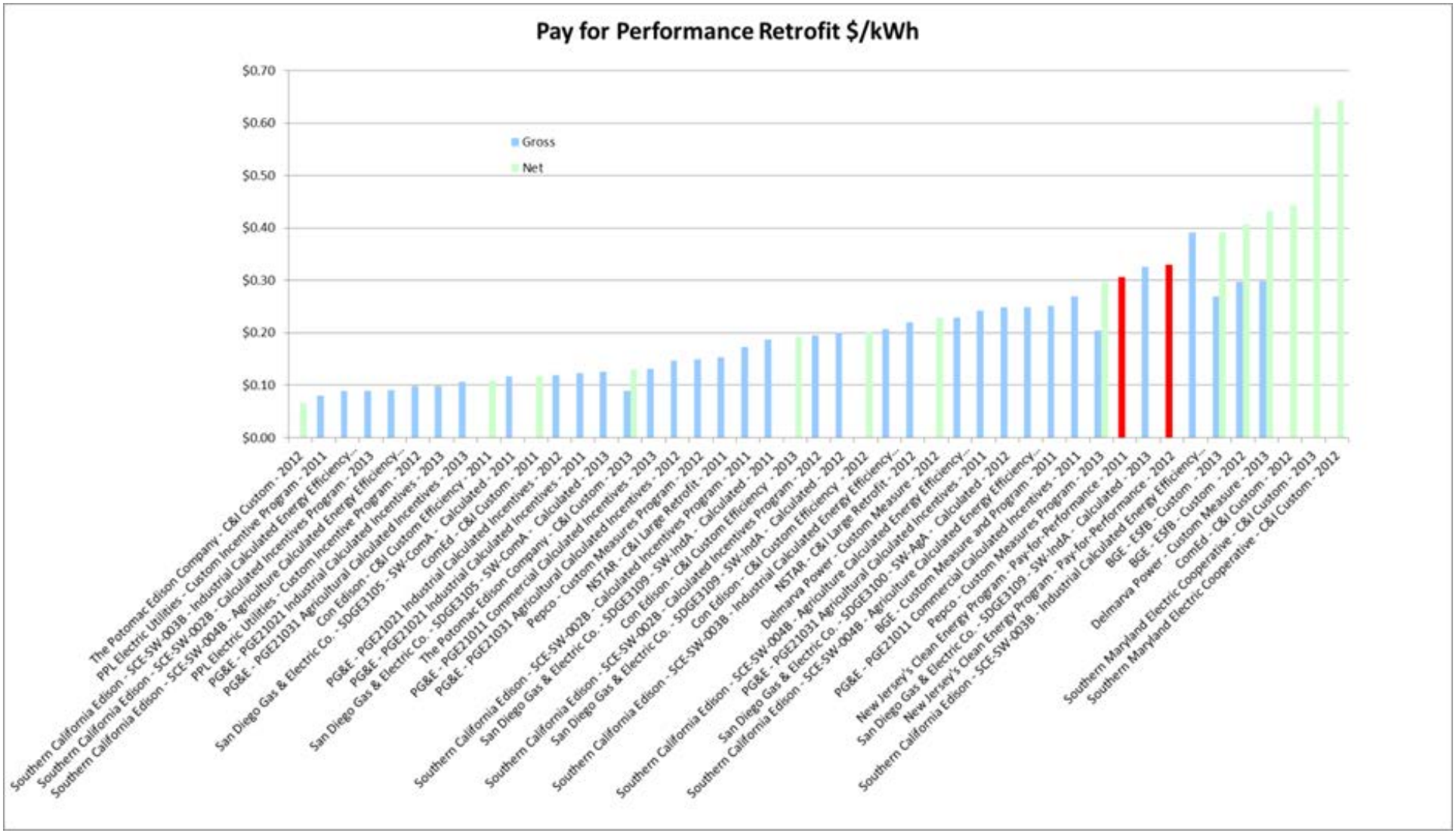


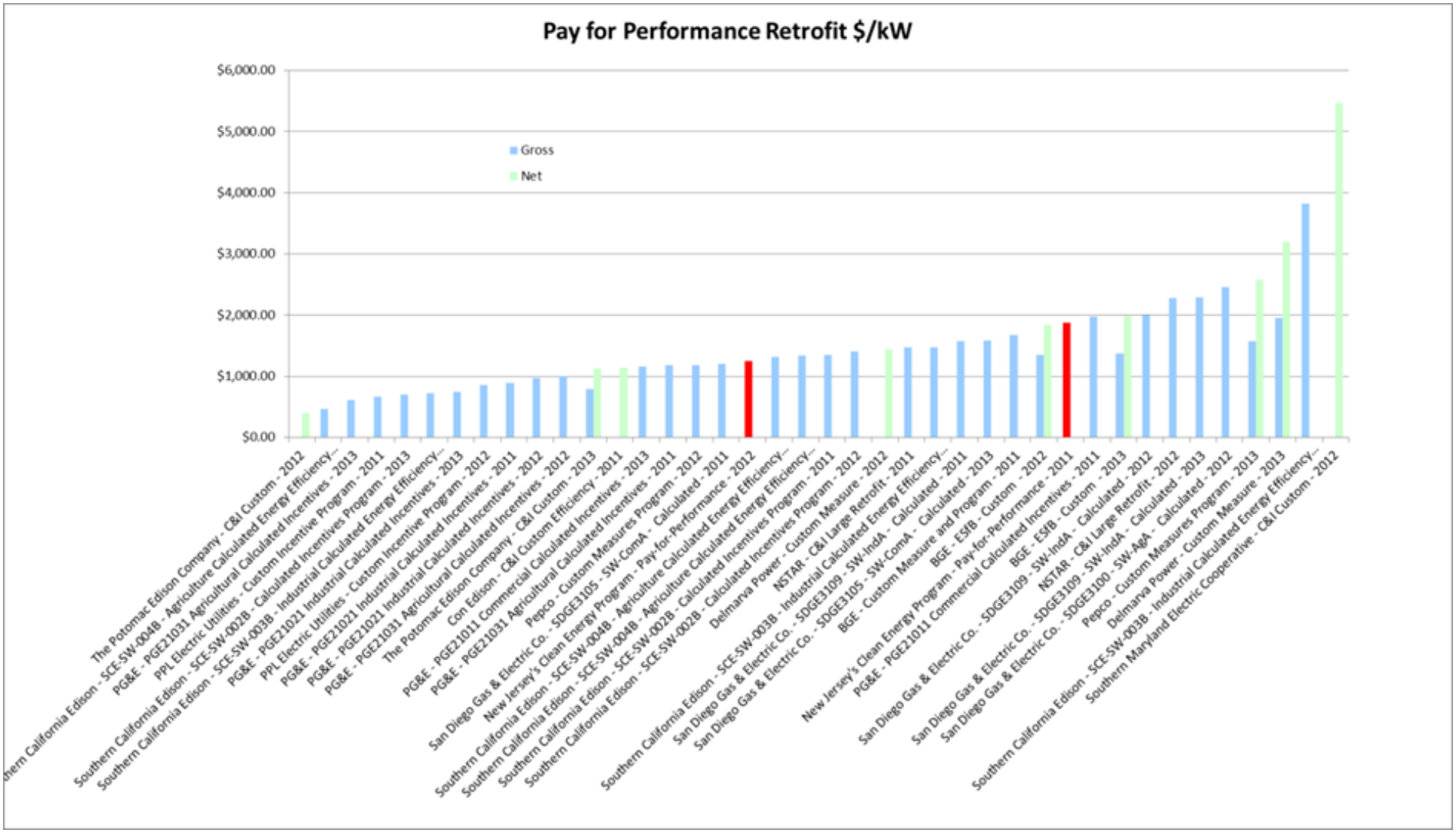
Gross Savings Per Participant			
Category	kWh/part.	kW/part.	Therm/part.
P4P Retrofit 2012	*324,486*	*85.8*	*3284*
NJCEP Percentile	*86%*	*86%*	*N/A*
Sample Size	8	8	2
Std Deviation	238,804	31.4	2,157
Min	174,544	16.9	233
25th Percentile	186,870	22.6	N/A
Average	295,566	44.3	1,759
Median	194,674	32.9	N/A
75th Percentile	253,756	52.5	N/A
Max	874,277	100.1	3,284

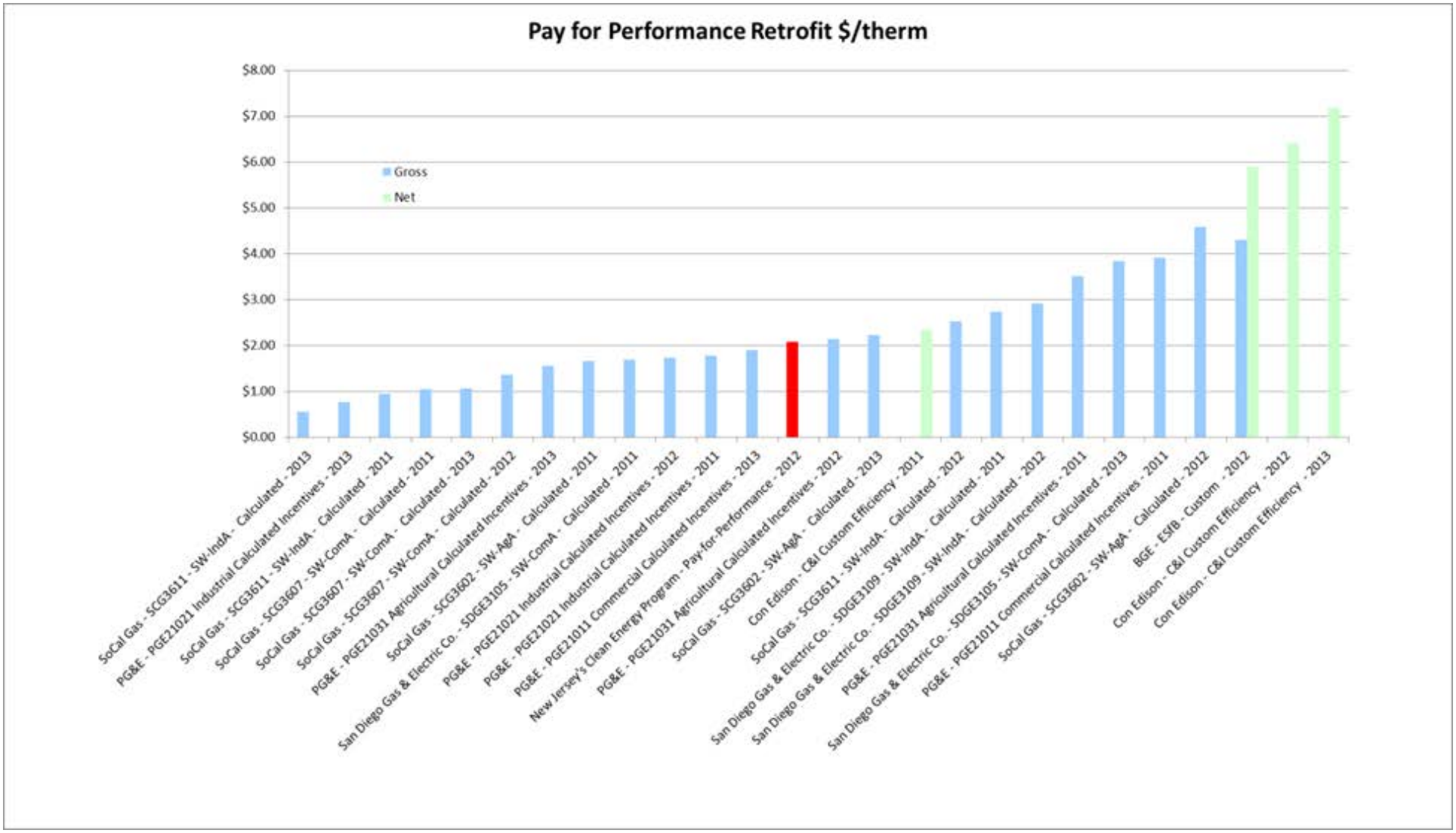


Spending Breakout	
Category	% Incentive
P4P Retrofit 2012	*88%*
NJCEP Percentile	*100%*
Sample Size	15
Std Deviation	16%
Min	42%
25th Percentile	55%
Average	68%
Median	70%
75th Percentile	83%
Max	88%




Pay for Performance Retrofit $/kWh
$0.70
$0.60
$0.50
$0.40
$0.30
$0.20
$0.10
$0.00
Gross
Net
The Potomac Edison Company - C&I Custom - 2012
PPL Electric Utilities - Custom Incentive Program - 2011
Southern California Edison - SCE-SW-003B - Industrial Calculated Energy Efficiency -
Southern California Edison - SCE-SW-002B - Calculated Incentives Program - 2013
Southern California Edison - SCE-SW-004B - Agriculture Calculated Energy Efficiency -
PPL Electric Utilities - Custom Incentive Program - 2012
PG&E - PGE21021 Industrial Calculated Incentives - 2013
PG&E - PGE21031 Agricultural Calculated Incentives - 2011
San Diego Gas & Electric Co. - SDGE3105 - C&I Custom Efficiency - 2011
Con Edison - C&I Custom - 2011
ComEd - C&I Custom - 2011
PG&E - PGE21021 Industrial Calculated Incentives - 2012
PG&E - PGE21021 Industrial Calculated Incentives - 2011
San Diego Gas & Electric Co. - SDGE3105 - SW-ComA - Calculated - 2011
The Potomac Edison Company - C&I Custom - 2013
PG&E - PGE21011 Commercial Calculated Incentives - 2013
PG&E - PGE21031 Agricultural Calculated Incentives - 2012
Pepco - Custom Measures Program - 2012
NSTAR - C&I Large Retrofit - 2011
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated Incentives Program - 2011
Con Edison - C&I Custom Efficiency - 2013
Southern California Edison - SCE-SW-002B - Calculated Incentives Program - 2012
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated - 2011
Con Edison - C&I Custom Efficiency - 2012
Southern California Edison - SCE-SW-003B - Industrial Calculated Energy Efficiency - 2012
NSTAR - C&I Large Retrofit - 2012
Delmarva Power - Custom Measure - 2012
Southern California Edison - SCE-SW-004B - Agriculture Calculated Energy Efficiency -
PG&E - PGE21031 Agricultural Calculated Incentives - 2011
San Diego Gas & Electric Co. - SDGE3100 - SW-AgA - Calculated - 2012
Southern California Edison - SCE-SW-004B - Agriculture Calculated Energy Efficiency -
PG&E - PGE21011 Commercial Calculated Incentives - 2012
BGE - Custom Measure and Program - 2011
Pepco - Custom Measures Program - 2013
New Jersey's Clean Energy Program - Pay-for-Performance - 2011
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated - 2012
New Jersey's Clean Energy Program - Pay-for-Performance - 2013
Southern California Edison - SCE-SW-003B - Industrial Calculated Energy Efficiency - 2012
BGE - ESfB - Custom - 2013
Delmarva Power - Custom Measure - 2012
Southern Maryland Electric Cooperative - C&I Custom - 2013
ComEd - C&I Custom Measure - 2013
Southern Maryland Electric Cooperative - C&I Custom - 2012
Southern California Edison - SCE-SW-003B - Industrial Calculated Energy Efficiency - 2013


Pay for Performance Retrofit $/kW
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$0.00
Gross
Net
The Potomac Edison Company - C&I Custom - 2012
Southern California Edison - SCE-SW-004B - Agriculture Calculated Energy Efficiency...
PG&E - PGE21031 Agricultural Calculated Incentives - 2013
PPL Electric Utilities - Custom Incentive Program - 2011
Southern California Edison - SCE-SW-002B - Industrial Calculated Incentives Program - 2013
Southern California Edison - SCE-SW-003B - Industrial Calculated Energy Efficiency...
PG&E - PGE21021 Industrial Calculated Incentives - 2012
PPL Electric Utilities - Custom Incentive Program - 2012
PG&E - PGE21021 Industrial Calculated Incentives - 2011
PG&E - PGE21031 Agricultural Calculated Incentives - 2012
The Potomac Edison Company - C&I Custom Efficiency - 2013
Con Edison - C&I Custom Efficiency - 2011
PG&E - PGE21011 Commercial Calculated Incentives - 2013
Pepco - Custom Measures Program - 2012
PG&E - PGE21031 Agricultural Calculated - 2011
San Diego Gas & Electric Co. - SDGE3105 - SW-ComA - Calculated - 2012
New Jersey's Clean Energy Program - Pay-for-Performance - 2012
Southern California Edison - SCE-SW-004B - Agriculture Calculated Energy Efficiency...
Southern California Edison - SCE-SW-002B - Calculated Incentives Program - 2011
Southern California Edison - SCE-SW-004B - Agriculture Calculated Incentives Program - 2012
Delmarva Power - Custom Measure - 2012
NSTAR - C&I Large Retrofit - 2011
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated Energy Efficiency...
BGE - ESfB - Custom Measure and Program - 2011
Southern California Edison - SCE-SW-003B - Industrial Calculated - 2011
San Diego Gas & Electric Co. - SDGE3109 - SW-ComA - Calculated - 2013
San Diego Gas & Electric Co. - SDGE3105 - SW-IndA - Calculated - 2012
BGE - Custom Measure and Program - 2012
BGE - ESfB - Custom - 2012
New Jersey's Clean Energy Program - Pay-for-Performance - 2011
PG&E - PGE21011 Commercial Calculated Incentives - 2011
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated - 2013
BGE - ESfB - Custom - 2013
NSTAR - C&I Large Retrofit - 2012
San Diego Gas & Electric Co. - SDGE3100 - SW-IndA - Calculated - 2012
San Diego Gas & Electric Co. - SDGE3100 - SW-AgA - Calculated - 2013
Pepco - Custom Measures Program - 2013
Delmarva Power - Custom Measure - 2013
Southern California Edison - SCE-SW-003B - Industrial Calculated Energy Efficiency...
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated - 2012
Southern Maryland Electric Cooperative - C&I Custom - 2012


Pay for Performance Retrofit $/therm
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Gross
Net
SoCal Gas - SCG3611 - SW-IndA - Calculated - 2013
PG&E - PGE21021 Industrial Calculated Incentives - 2013
SoCal Gas - SCG3611 - SW-IndA - Calculated - 2011
SoCal Gas - SCG3607 - SW-ComA - Calculated - 2011
SoCal Gas - SCG3607 - SW-ComA - Calculated - 2013
SoCal Gas - SCG3607 - SW-ComA - Calculated - 2012
PG&E - PGE21031 Agricultural Calculated Incentives - 2013
SoCal Gas - SCG3607 - SW-ComA - Calculated - 2011
SoCal Gas - SCG3602 - SW-AgA - Calculated - 2011
San Diego Gas & Electric Co. - SDGE3105 - SW-ComA - Calculated - 2011
SoCal Gas - SCG3602 - SW-AgA - Calculated - 2012
PG&E - PGE21021 Industrial Calculated Incentives - 2011
PG&E - PGE21021 Industrial Calculated Incentives - 2013
PG&E - PGE21011 Commercial Calculated Incentives - 2012
New Jersey's Clean Energy Program - Pay-for-Performance - 2012
PG&E - PGE21031 Agricultural Calculated Incentives - 2012
SoCal Gas - SCG3602 - SW-AgA - Calculated - 2013
Con Edison - C&I Custom Efficiency - 2011
SoCal Gas - SCG3611 - SW-IndA - Calculated - 2012
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated - 2011
San Diego Gas & Electric Co. - SDGE3109 - SW-IndA - Calculated - 2012
PG&E - PGE21031 Agricultural Calculated Incentives - 2011
San Diego Gas & Electric Co. - SDGE3105 - SW-ComA - Calculated - 2013
PG&E - PGE21011 Commercial Calculated Incentives - 2011
SoCal Gas - SCG3602 - SW-AgA - Calculated - 2012
BGE - ESIB - Custom - 2012
Con Edison - C&I Custom Efficiency - 2012
Con Edison - C&I Custom Efficiency - 2013

APPENDIX I: SMALL BUSINESS DIRECT INSTALL (SBDI)

NJCEP's Small Business Direct Install (SBDI) program follows a relatively widespread model for reaching this segment. The program provides free audits and offers to install, with a significant cost share, recommended measures. These programs are targeted to small commercial customers as defined by a maximum monthly kW demand. The measure mix for these types of programs varies, but is nearly always lighting dominated.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS makes the following conclusions:

- The program is relatively expensive among its peers on a $/kWh basis, but also achieves higher average savings/participant.
- NJCEP's program is unique in its emphasis on HVAC-related measures, which is a strategic choice that does lead to the higher average $/kWh and deeper savings mentioned above.
- Key program parameters – cost-share and peak kW maximum – are reasonable and in line with industry standard practice, though other PAs are trying new approaches that may be worth a look.
- The NJCEP assumed hours of use for lighting projects are reasonable.
- There is a trend in industry towards greater and greater use of turnkey contractor models.
- NJCEP's inspection rates are relatively high compared to those PAs selected for further review.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R27: Examine implementing a 0% cost-share model to increase sales conversion rate and expand participants and market penetration.
- R28: Investigate subcontractor attitudes towards measure prices as part of the process evaluation. Greater-than-needed incentives are common in SBDI programs and may be contributing to poor $/savings results with this program.
- R29: Consider re-orienting the contractor model to a turnkey approach, which reduces costs and increases control and quality. Note that it is challenging to follow this approach while also emphasizing HVAC-related measures; contractors generally do not do both the lighting and HVAC measures on a turnkey basis.
- R30: Review inspection processes as part of the process evaluation. Reasonable quality assurance may be attainable with a lower inspection rate. Overall inspection rates can come down even as greater quality assurance efforts are targeted at larger or riskier projects.

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Due to the prevalence of the program model which NJCEP's SBDI program follows, nineteen of twenty-five comparison PAs were identified to have comparable SBDI programs. Data was available for sixteen of these.

Following the benchmarking analysis of the sixteen programs, additional interviews and research were completed on four segment-leading PAs: Con Edison, NGrid NY, CL&P, and SCE. Information on measure mix, contractor model, and quality assurance processes were gained during the conversations with each PA. Data on customer cost-share, maximum peak kW demand, and lighting full-load hours were investigated through the additional research.

Benchmarking Discussion

The full benchmarking results for this program are shown at the completion of this section's narrative. This Benchmarking Discussion subsection refers to those graphics and tables.

The cost per gross energy saved is poor, coming in at $0.50/kWh, the 15th percentile for the moderately sized sample group (n=21). However, cost per demand savings is at the 52nd percentile. This gap between energy and demand savings is likely due to a more unique measure mix that relies on HVAC and other non-lighting measures, which tend to be more expensive, but also tend to offer large demand savings relative to their energy savings.

NJCEP's gross energy savings per participant is very high, albeit among a small sample (n=9), and the highest for demand savings per participant (n=8). Again, this is probably related to higher emphasis on non-lighting measures, with subcontractor instructions requiring implementation of all cost effective measures. This is a strength of the program, but does also leads to a higher cost.

NJCEP's budgeting weighs heavily towards incentives for reasons of accounting not program approach. Meaningful judgments cannot be made on the basis of this data because NJCEP's budgeting is so atypical. However, budget breakdown figures are shown for comparison programs for reference.

Further Research on Key Program Components

ERS gathered information from Con Edison, NGrid NY, CL&P, and SCE on their SBDI programs. Information on their program requirements, measure mixes, contractor model, savings assumptions, and quality assurance is presented here.

Offerings and Incentives

ERS tracked down customer cost share targets and maximum peak demand eligibility requirements for key programs. Those are summarized in Table I-1.

Table I-1. Summary of Cost Share and Peak Demand Eligibility

Program Administrator	Customer Cost Share	Maximum Eligible Monthly Peak Demand (kW)
NGRID (NY)	30%	100
Con Edison (NY)	30%	100
CL&P (CT)	50%-65%, measure dependant	200
NJCEP (NJ)	30%	200
SCE (CA)	0%	200
PG&E (CA)	0%	200

NJCEP's incentives are reasonable within the peer group of SBDI programs. A 30% cost share is typical among programs, although there are also a number of programs including programs by Southern California Edison, Pacific Gas & Electric, and elsewhere which are a 0% customer cost share – the measures are free.

In conversations with the leading PAs, the customer cost share is often a defining metric in understanding their program's performance. It affects how effectively the program can be marketed, the sales conversion rate, and the cost effectiveness of each measure and the program as a whole. The trend on a macroscopic scale is reducing the customer cost share, ideally to 0%. Both SCE and PG&E have programs that are 100% free to customers. Con Edison is experimenting with the 0% cost share model for targeted savings "blitzes", and may consider implementing it more broadly in the future. There is some evidence that sales conversation rates increase enough to offset the increased cost of the measures. In some territories, part of the program cost has been subsidized by third-parties, which can also help in making up this gap. **Recommendation #27**: ERS recommends that NJCEP study this, perhaps by launching a pilot, to see how the market reacts and to track changes in sales conversions.

Another major component of participation is the peak demand cap that determines what customers are eligible for the program. Barring other circumstances, the general trend of SBDI programs is to increase their demand cap to reach more customers. It is often the case that generic Commercial & Industrial programs do not target small customers that might be on the cusp of SBDI eligibility, a gap that can be filled by raising the demand cap. NJCEP's cap is reasonable and towards the high end. It should stay as is.

Finally, ERS attempted to obtain price lists from comparison PAs in order to measure the appropriateness of the prices on which incentives are based. The comparison PAs did could not release this sensitive information, but ERS did hear that it is not uncommon for PAs to find that their prices are too high. A signal that this is happening can be found when subcontractors are bidding lower prices to customers in order to win jobs; that is, they are accepting a less-than-full portion of the customer cost share from the customer, while accepting the full incentive. **Recommendation #28**: ERS recommends that the upcoming process evaluation determine whether underbidding is occurring and that NJCEP adjust prices accordingly if it is.

Contractor Model

NJCEP's contractor model is to have territory-specific "primary contractors". These five primary contractors can and do subcontract on the open market. While it is common and reasonable to use territory-defined contractors, it appears to be less common to successfully have open market subcontracting within the high-performing PAs interviewed. Table I-2 summarizes the approaches of four comparison PAs.

Table I-2. Summary of Contractor Model Approaches

Jurisdiction	NJCEP (NJ)	Con Edison (NY)	NGrid (NY)	CL&P (CT)	SCE (CA)
Contractor model	5 territory-specific primary contractors who subcontract on the open market	1 primary contractor with territorially-assigned subcontractors; partially turnkey and looking to increase turnkey percentage.	3 territory-specific turnkey contractors, plus 1 refrigeration contractor that does the whole territory. "Customer Directed Option" also available	Approx 20 primary contractors with no territory or technology assignments, no subcontractors. 3 year RFP cycle to join, no open market	3 territory-specific contractors; 2 of them are turnkey, the third subcontracts on the open market

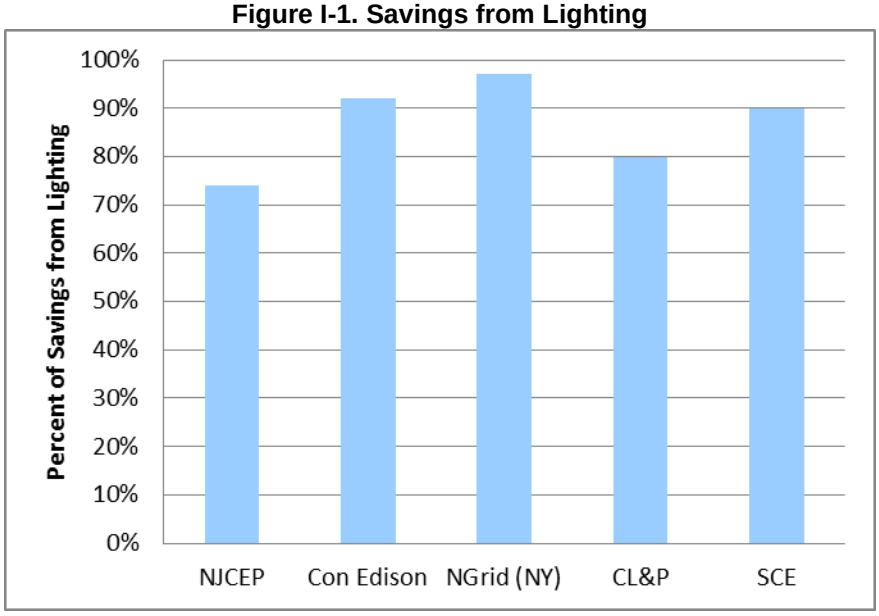
Southern California Edison is the only one who has any open market subcontracting, and that is only under one of their three primary contractors. The other two are turnkey contractors, who audit and install all in-house. Con Edison, NGrid NY, and CL&P all vet and contract with all of the installers working under the program. This allows for opportunities for co-branded marking if desired, and can reduce confusion and competition between subcontractors. CL&P uses all primary contractors, and all have free range throughout the state, rather than staying territorially constrained.

Overall, the trend is away from open market subcontracting and towards turnkey contractors. SCE openly said they prefer the turnkey model. Con Edison's primary contractor executes projects on a turnkey basis for part of the territory and subcontracts the rest; the cost is lower for turnkey, and Con Edison has requested they slowly build up their turnkey ability to take on the whole territory. NJCEP's approach, using open market subcontracting, increases costs (which in turn leads to the demand for higher incentives) and reduces the ability of the program to control quality, marketing, and installation. Additionally, a turnkey contractor simplifies the customer interaction to just one point of reference, rather than complicating their experience with multiple companies. **Recommendation #29**: ERS recommends NJCEP explore moving their contractor model in the direction of turnkey contracting. While the emphasis on HVAC does provide some challenges here, the model used by NGrid NY whereby they have turnkey contractors for lighting and 1 roaming refrigeration contractor does offer some guidance for how NJCEP could pull off the approach.

Savings & Assumptions

NJCEP's approach to savings is unique. The program emphasizes non-lighting measures by requiring that all viable non-lighting measures be installed. Figure I-1 shows the percentage of savings from each of the comparison programs that is from lighting.

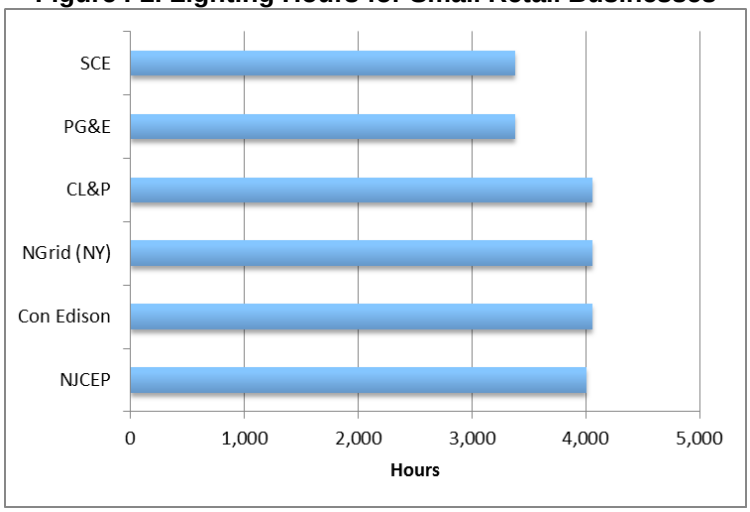
Figure I-1. Savings from Lighting



NJCEP's program has the largest amount of savings from non-lighting measures. ERS believes that the vast majority of SBDI programs get at least 90% of their savings from lighting. CL&P and NJCEP are outliers, with NJCEP being the greatest outlier. This is a strategic choice: non-lighting measures are more expensive, but garner greater demand savings relative to lighting. Importantly, with SBDI programs, you often only get one shot with that customer. Wringing the maximal savings at the time of interacting is advisable, and ERS believes that NJCEP should maintain this focus.

That said, the NJCEP SBDI program is still approximately three-fourths lighting measures, which makes lighting hours a very important factor to consider when examining SBDI program savings claims. The NJ Protocols claim 4,004 hours for a small retail retrofit. ERS compared that value to other programs to ensure it was reasonable. Figure I-2 shows that summary.

Figure I-2. Lighting Hours for Small Retail Businesses



ERS believes the assumed hours to be reasonable.

Quality Assurance

NJCEP's inspection procedure is significant for a program that targets prescriptive, repeatable measures. Table I-3 summarizes the inspection approaches of the peer PAs.

Table I-3. Summary of Inspection Approach

Jurisdiction	NJCEP (NJ)	Con Edison (NY)	NGrid (NY)	CL&P (CT)	SCE (CA)
Inspection approach	100% desk review; 25% pre- and post-inspections; 100% inspections for first 9 months of cycle and anything atypical	10% post-inspection by utility; IC does 100% post-inspection of subcontracted jobs	10% post inspection by a third-party vendor	100% desk review; 25% pre-inspection, 30% post-inspection	6% pre-inspection; 10% post-inspection; 100% post-inspection for measures over $10,000

NJCEP's 25% pre- and post- inspection rate is a on the high given the nature of the measures. The most competitive programs have post inspection rates, around 10%, and pre-inspections at or below that level. If there are concerns about the quality of submission from particular primary contractors or subcontractors, a policy of increasing or reducing the inspection rate for individual contractors based on the submittal quality might help to encourage honest and accurate applications. It should be attainable to achieve acceptable quality assurance standards with inspection rates below 25%. **Recommendation #30**: ERS recommends that NJCEP review their inspection policy, looking for ways to reduce it while still maintaining targeted inspections that encourage accurate and honest accounting by contractors.

Proposed Target Metrics

The strength of the Direct Install program now is its deep savings per participant, a worthwhile strategy in this segment as it is unlikely to ever have multiple projects at a given site. This comes at a cost in the $/kWh metric, but other changes – such as to the contractor model and or inspection approach – could reduce cost while maintaining the deep savings. With that in mind, ERS proposes the metrics shown in Table I-4.

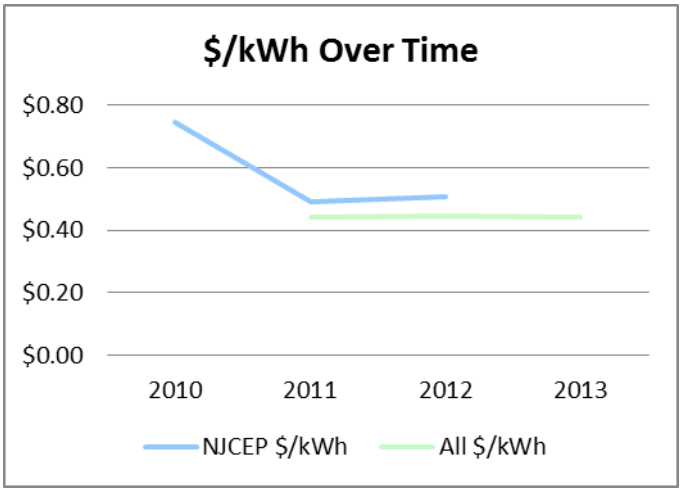
Table I-4. NJCEP SBDI Target Metrics

Metric	Target
$/kWh	$0.45/kWh
$/kW	$2,000/kW

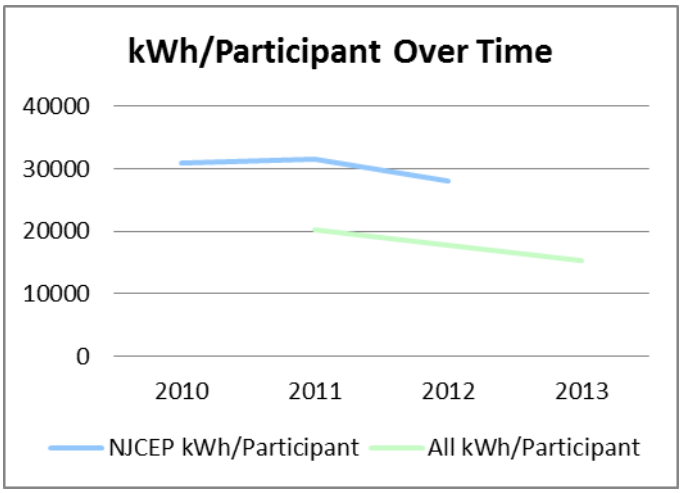
Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

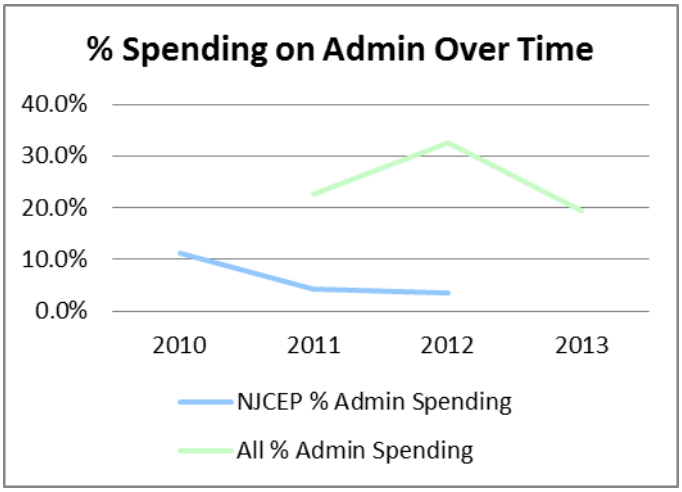
Cost per Gross Savings Category	$/kWh	$/kW
SBDI 2012	*$0.50*	*$2,173*
NJCEP Percentile	*15%*	*52%*
Sample Size	21	20
Std Deviation	$0.18	$934
Min	$0.05	$185
75th Percentile	$0.38	$1,635
Average	$0.44	$2,158
Median	$0.41	$2,227
25th Percentile	$0.48	$2,534
Max	$0.86	$4,530

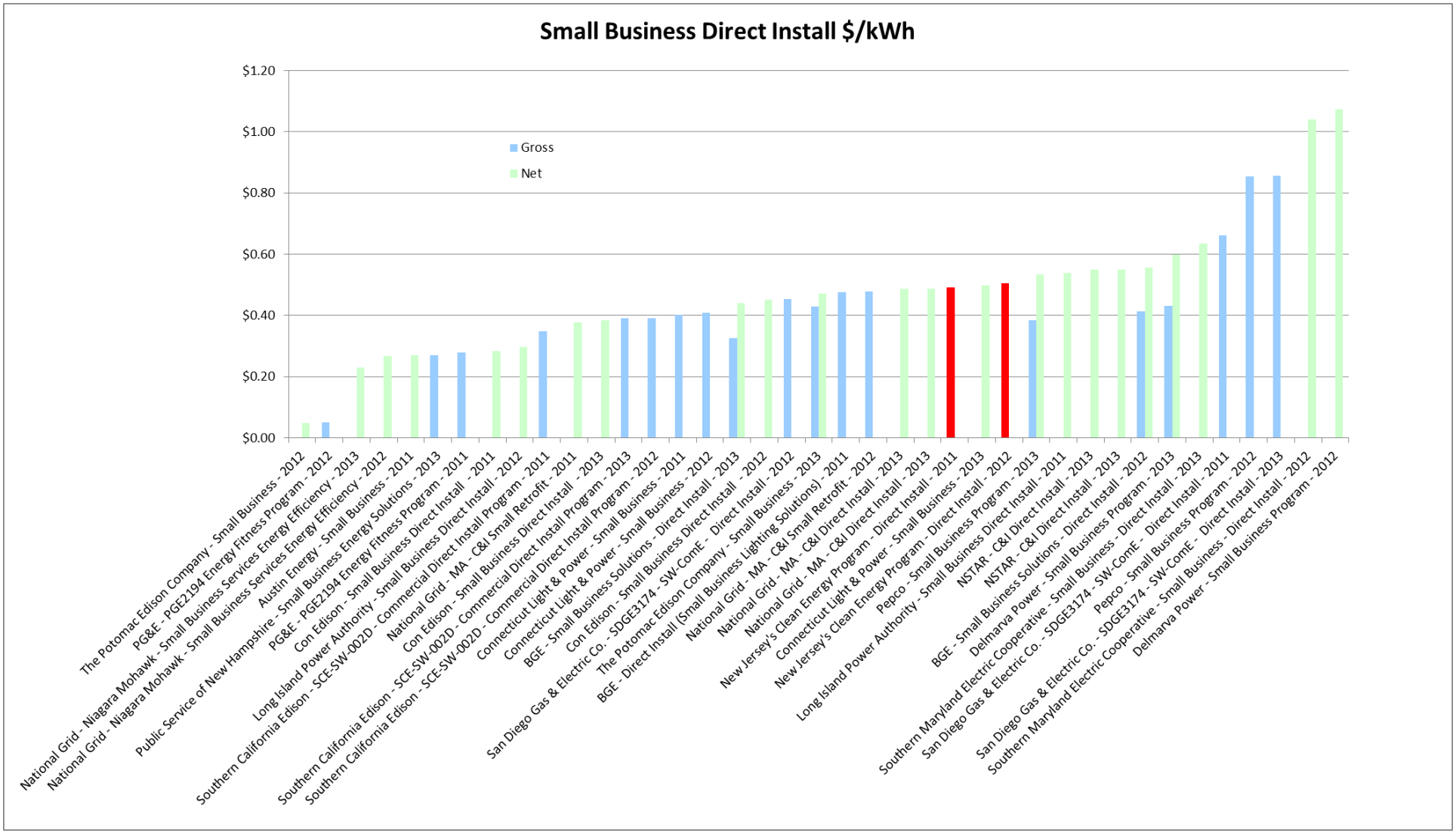


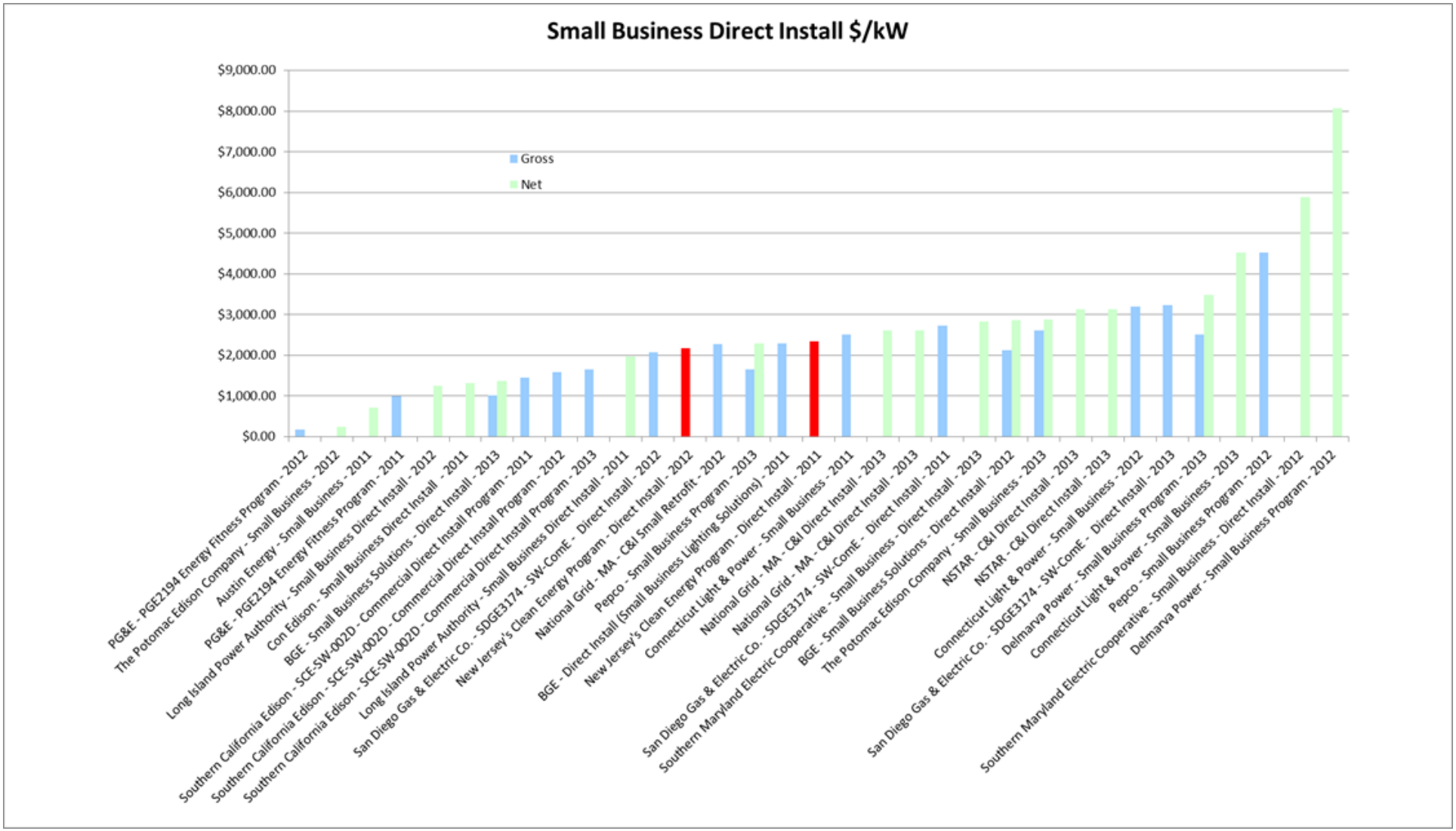
Gross Savings Per Participant Category	kWh/part.	kW/part.
SBDI 2012	*28,094*	*6.5*
NJCEP Percentile	*88%*	*100%*
Sample Size	9	8
Std Deviation	8,012	2.0
Min	8,842	1.7
25th Percentile	11,028	2.0
Average	18,240	3.6
Median	19,054	2.8
75th Percentile	21,376	5.0
Max	31,426	6.6



Spending Breakout Category	% Incentive
SBDI 2012	*96%*
NJCEP Percentile	*100%*
Sample Size	23
Std Deviation	0.20
Min	20%
25th Percentile	73%
Average	76%
Median	81%
75th Percentile	89%
Max	96%




Small Business Direct Install $/kWh
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
Gross
Net
The Potomac Edison Company - Small Business - 2012
National Grid - Niagara Mohawk - Small Business Services Energy Efficiency - 2013
PG&E - PGE2194 Energy Fitness Program - 2012
National Grid - Niagara Mohawk - Small Business Services Energy Efficiency - 2012
Austin Energy - Small Business Energy Solutions - 2011
Public Service of New Hampshire - Small Business Energy Fitness Program - 2011
PG&E - PGE2194 Energy Fitness Program - 2011
Con Edison - Small Business Direct Install - 2011
Long Island Power Authority - Small Business Direct Install - 2012
Southern California Edison - SCE-SW-002D - Commercial Direct Install Program - 2011
National Grid - MA - C&I Small Retrofit - 2011
Con Edison - Small Business Direct Install - 2013
Southern California Edison - SCE-SW-002D - Commercial Direct Install Program - 2013
Connecticut Light & Power - Small Business - 2011
Con Edison - Small Business Solutions - Direct Install - 2013
Connecticut Light & Power - Small Business - 2012
Con Edison - Small Business Direct Install - 2012
BGE - Small Business Solutions - Direct Install - 2012
Southern California Edison - SCE-SW-002D - Commercial Direct Install Program - 2012
San Diego Gas & Electric Co. - SDGE3174 - SW-ComE - Direct Install - 2012
Connecticut Light & Power - Small Business - 2013
The Potomac Edison Company - Small Business Direct Install - 2013
National Grid - MA - C&I Small Retrofit - 2012
BGE - Direct Install (Small Business Lighting Solutions) - 2011
National Grid - MA - C&I Direct Install - 2013
National Grid - MA - C&I Direct Install - 2011
New Jersey's Clean Energy Program - Direct Install - 2011
Connecticut Light & Power - Small Business - 2013
New Jersey's Clean Energy Program - Direct Install - 2012
Long Island Power Authority - Small Business Program - 2013
Pepco - Small Business Direct Install - 2011
NSTAR - C&I Direct Install - 2013
NSTAR - C&I Direct Install - 2012
BGE - Small Business Solutions - Direct Install - 2013
Delmarva Power - Small Business Program - 2013
Southern Maryland Electric Cooperative - Small Business - Direct Install - 2013
San Diego Gas & Electric Co. - SDGE3174 - SW-ComE - Direct Install - 2011
Pepco - Small Business Program - 2012
San Diego Gas & Electric Co. - SDGE3174 - SW-ComE - Direct Install - 2013
Southern Maryland Electric Cooperative - Small Business - Direct Install - 2012
Delmarva Power - Small Business Program - 2012


Small Business Direct Install $/kW
$9,000.00
$8,000.00
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$0.00
Gross
Net
PG&E - PGE2194 Energy Fitness Program - 2012
The Potomac Edison Company - Small Business - 2012
Austin Energy - Small Business - 2011
PG&E - PGE2194 Energy Fitness Program - 2011
Long Island Power Authority - Small Business Direct Install - 2012
Con Edison - Small Business Solutions - Direct Install - 2011
BGE - Small Business Direct Install - 2013
Southern California Edison - SCE-SW-002D - Commercial Direct Install Program - 2011
Southern California Edison - SCE-SW-002D - Commercial Direct Install Program - 2012
Southern California Edison - SCE-SW-002D - Commercial Direct Install Program - 2013
Long Island Power Authority - Small Business Direct Install - 2011
San Diego Gas & Electric Co. - SDGE3174 - SW-ComE - Direct Install - 2012
New Jersey's Clean Energy Program - Direct Install - 2012
National Grid - MA - C&I Small Retrofit - 2012
Pepco - Small Business Program - 2013
BGE - Direct Install (Small Business Lighting Solutions) - 2011
New Jersey's Clean Energy Program - Direct Install - 2011
Connecticut Light & Power - Small Business - 2011
National Grid - MA - C&I Direct Install - 2013
National Grid - MA - C&I Direct Install - 2012
San Diego Gas & Electric Co. - SDGE3174 - SW-ComE - Direct Install - 2011
Southern Maryland Electric Cooperative - Small Business Solutions - Direct Install - 2013
BGE - Small Business Direct Install - 2012
The Potomac Edison Company - Small Business - 2013
NSTAR - C&I Direct Install - 2013
Connecticut Light & Power - Small Business - 2012
NSTAR - C&I Direct Install - 2012
San Diego Gas & Electric Co. - SDGE3174 - SW-ComE - Direct Install - 2013
Delmarva Power - Small Business Program - 2013
Connecticut Light & Power - Small Business Program - 2013
Pepco - Small Business Program - 2012
Southern Maryland Electric Cooperative - Small Business - Direct Install - 2012
Delmarva Power - Small Business Program - 2012

APPENDIX J: COMBINED HEAT & POWER AND FUEL CELLS

NJCEP's Combined Heat & Power (CHP) and Fuel Cells program provides incentives on a dollar-per-watt basis for CHP, fuel cells, and heat recovery generation. These generation measures are less typical and less emphasized by most PAs in comparison to efficiency programs. CHP is more common than fuel cells or heat recovery generation. For NJCEP's program, more than 90% of the projects are CHP, so the bulk of this discussion is centered on CHP.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS makes the following conclusions:

- The program has suffered through years of instability arising from circumstances beyond the program's control.
- The nature of the CHP program comparison sample – few programs, often bundled, few projects per cycle, etc. – did not lend itself to benchmarking. Moreover, NJCEP experienced fewer than ten projects per year for the years in question, which leads to high variability. Consequently, the program was benchmarked on a very limited basis.
- The program's incentive levels are somewhat higher on a per-kW basis than comparison programs for the smaller scale projects (i.e., <1 MW).
- The incentive structure is complex and likely confusing to potential participants.
- The project intake process, including sizing evaluation and technology filtering, follow industry standard practices, but potentially more effective alternatives exist.
- NJCEP's post-installation performance period and associated requirements are somewhat limited in comparison to other programs. For example, the performance period is shorter (only 1 year) than most and does not include any recommissioning requirements.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R31. Reboot the program, both the offerings and the approach. The following recommendations feed into this reboot.
- R32. Use the process evaluation to identify demand-side/perception factors that are impeding participation.
- R33. Simplify, harmonize, and consolidate the incentive system.
- R34. Consider using an "exploding" incentive rate (i.e., one that has a scheduled decline in incentive rate over a period of years) to signal a long-term commitment and to motivate projects today.
- R35. Consider adopting NYSERDA's alternative approaches to sizing evaluation and technology approval.
- R36. Reexamine M&V and performance payment structure and levels as part of the upcoming process evaluation, with an eye towards expanding performance data collection and including recommissioning requirements.

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Sixteen of the twenty-five comparison PAs offer some form of incentive for CHP or fuel cells as part of their programs:

- Certain PAs that do not offer CHP or fuels (e.g., Con Edison and CL&P) redirect to statewide initiatives
- Of the sixteen programs that do incentivize these technologies, fourteen offer it as part of a broader incentive program (e.g., their larger C&I or their larger renewables programs), thus clouding any analytical comparison
- The other two programs are NYSERDA and Duquesne
  - Duquesne's program is too new to have data
  - NYSERDA's data was not available in any available documentation

ERS identified various public documents that included imperfect data, but offer some form of comparison:

- A NYSERDA presentation showing their performance from 2001-2009
- A BGE filing that projected future CHP participation for 2015-2017
- A PG&E impact evaluation file that included CHP as part of a larger renewables program

Additionally, ERS performed interviews were completed to compare NJCEP's offering with top performing CHP programs. Four well establish CHP programs were identified for this further investigation. These programs are offered by: NYSERDA, BGE, PG&E, and Mass Save. Information on program size, incentive rates and structures, as well as pertinent program requirements was recorded during interviews with these PAs.

Benchmarking Discussion

The information available for benchmarking the CHP program is very limited. Three other programs were examined, but each of these carries a caveat as to how useful the information is. NYSERDA's program is long-running, but the best information available is from a 2009 presentation in which cumulative statistics are given. The BGE program is fairly new, and the best available information is from a program plan filing for the 2015-2017 cycle. PG&E has a long-running and well-reported Self-Generation Incentive Program (SGIP), but that contains projects much broader than just CHP and fuel cells. Additionally, NJCEP's program shows significant variability year to year, as seen in the first two columns of the table below. With that in mind, it is with caution that statistics are given about NJCEP's performance. Table J-1 shows those figures, for reference.

Table J-1. Summary of Available CHP Data

Statistic	NJCEP (NJ)	NJCEP (NJ)	NYSERDA (NY)	BGE (MD)	PG&E (CA)
Program Name	CHP and Fuel Cells	CHP and Fuel Cells	Combined Heat & Power Performance Program	Prescriptive Combined Heat and Power	Self-Generation Incentive Program
Data source	Reported Program Summary	Reported Program Summary	Feb 2009 CHP Presentation	Program Plan Filings	2014 Impact Evaluation
Data period	2010 Committed & Actual	2012 Committed & Actual	Cumulative 2009	2015-2017 Plan	Cycle Totals
MW installed	11.5	1.3	193.0	15.2	294.0
Number of projects	8	2	127	24	617
Avg project size (kW)	1,438	645	1,520	632	476
Avg cost per project ($)	$588,502	$1,133,712	$3,976,378	$547,478	$1,944,895
Incentive rate ($/W)	$0.41	$1.76	$2.62	$0.87	$1.37

NJCEP's 2012 year had a program-wide incentive rate of $1.76/W. This is the average of two projects, which were an average of 645 kW in size. Contrast this with NJCEP's 2010 year where eight projects averaged 1,438 kW and $0.41/W. Both these years are reasonably competitive on a $/kW basis. It is clear, however, that with just 1.3 MW in 2012, NJCEP's program is significantly smaller than those run by NYSERDA or PG&E. With CHP as a specific reporting category of the ACEEE report card, this is an important program to develop and expand.

Further Research on Key Program Components

ERS solicited further information from comparison PAs on offerings and incentives and quality assurance models. That information is presented below.

One item that does not fit neatly into the below categories is the tumultuous administrative past that the program has had. Based on interviews and discussion with NJCEP staff, there is a belief that customers lack confidence in the program because of inconsistent administration in the past. **Recommendation #31:** ERS recommends that NJCEP "reboot" the program in a way that publicly wipes the slate clean. The recommendations below feed into this concept.
Recommendation #32: Additionally, ERS recommends that NJCEP use the process evaluation to better understand specific demand-side and perception issues that are impeding the growth of the program.

3.8.1 Offerings and Incentives

ERS reviewed the incentive offerings of the comparison PAs. Like NJCEP, most of them had split programs, with one catering to "large scale" CHP and others to smaller modules. Each program's size target and per-kW incentive rate is shown in Table J-2.

Table J-2. Summary of Size Targets and Incentive Rates

Program Administrator	NJCEP	NJCEP	NYSERDA	NYSERDA	BGE	BGE	PG&E	Mass Save	Mass Save
Size	<=1 MW	>1 MW	50 kW-1.3 MW	>1.3 MW	<250 kW	>250 kW	all sizes	<=150 kW	>150 kW
Incentive rate	$1,000-$2,000/kW	$350-$550/kW	$1,200/kW-$1,600/kW	$0.10/kWh over first two years and $600-750/kW	$275-175/kW; and $.07/kWh over first 18 months	$75-175/kW; and $.07/kWh over first 18 months	up to $460/kW (declines by size)	$750-$1,200	$750-$1,200

First, incentive rates vary significantly. That said, although an apples-to-apples comparison is difficult to pin down, it appears that NJCEP incentives for small size CHP (i.e., <1 MW) are on the high side. The large scale incentives appear to be more in line with other PAs.

Another area of improvement would be the structure of the incentives. Figure J-1 is a screenshot of the incentives from the NJCEP program website.

Figure J-1. The CHP Incentive Approach

Eligible Technology	Size (Installed Rated Capacity)	Incentive ($/Watt)[2]	P4P Bonus[3] ($/Watt) (cap $250,000)	% of Total Cost Cap per project	$ Cap per project
Combined Heat & Power	≤500 kW	$2.00		30-40%[4]	$2 million
Powered by non-renewable fuel source	>500 kW – 1 MW	$1.00			
Gas Internal Combustion Engine Gas Combustion Turbine	>1 MW – 3 MW[1]	$0.55		30%	$3 million
Microturbine	>3 MW[1]	$0.35			

The incentive structure is complex and disjointed:

- There are four different tiers.
- There are two different caps, both in terms of percent of project and total dollar amount.
- There is an additional bonus for performing efficiency measures.
- Finally, there is "tiering" for projects above 1 MW, but none below. That is, the incentives are treated "marginally" for large projects; the first 3 MW receive $0.55/W, while any wattage above that is incented at $0.35/W. For the smaller projects, on the other hand, a 500 kW system will receive $1 million dollars, while a 501 kW system will receive only $501,000. This sort of inconsistency allows gaming and is also confusing.

These are partly the result of the program having split administration for a period of time and not being able to fully combine for contractual and political reasons. **Recommendation #33**:

Once those issues are resolved, ERS recommends that the program revise the approach to simplify, consolidate, and harmonize it.

One potential feature that was seen was the concept of an "exploding" incentive. PG&E's program (and all of CA) have a ten-year incentive schedule. The program's CHP incentives are decreasing 10% year-over-year. This incentive structure motivates projects today, while also projecting a long-term commitment to the program. **Recommendation #34**: ERS recommends the NJCEP explore using this type of approach for those reasons.

3.8.2 Quality Assurance

Quality assurance is based on two key areas: application screening (i.e., intake processes) and post-installation processes. For CHP, the largest issue is persistence. Projects are often disingenuously sold on the prospect of cheap kWh, which leads to oversizing and poor usage. The intake processes can help screen out bad candidates, while the post-installation review can help guide the project, through incentives and support, towards proper utilization of the equipment that the program has just assisted in purchasing.

NJCEP takes a typical approach, on paper, to application screening. First, projects are required to submit energy bills that can be analyzed to show that the project has been properly sized. Second, the specific technology (i.e., the product) in question must meet certain technical specifications. These are common steps that programs take to ensure appropriate projects are approved. These should be reviewed as part of the process evaluation, since ERS did not validate levels of rigor. Additionally, NYSERDA, through its more than a decade of experience incentivizing these types of projects, has identified ways to simplify these two steps while maintaining quality. First, for small projects (<1.3 MW) they have identified pre-approved size ranges for certain customer segments (e.g., multifamily, hospitals, nursing homes, and hotels) for which no detailed sizing evaluation is required. Second, they have cultivated a catalog of approved products for use in typical applications. **Recommendation #35**: ERS recommends that NJCEP consider leveraging this information as a possible way of streamlining the participation process for smaller projects.

The second aspect to quality assurance for CHP is the post-installation process. NJCEP currently requires only 1 year of performance data, with 10% of the incentive held back until the customer successfully provides that data. BGE extends that period to 18 months, while offering a $0.07/kWh production incentive during that period. PG&E goes further, holding back half the incentive, and paying it out 10% at a time over five years. Interestingly, NYSERDA does not hold back the incentive, though they do require that they be allowed to remotely monitor performance for the life of the project, which allows them to collect valuable data. On the flipside, NYSERDA provides – for free – a recommissioning report at the completion of the first year. NYSERDA reports that most customers follow through on the recommendations within the report. BGE similarly requires commissioning, and MassSave actually holds back 20% of the incentive until recommissioning is completed. **Recommendation #36**: ERS recommends that NJCEP consider adopting more stringent post-inspection quality assurance policies, which should include longer performance validation periods with some level of incentive withholding in combination with a recommissioning provision of some sort. There is less consensus on these

items, but it is clear that NJCEP's post-installation requirements are less rigorous than the other programs.

Proposed Target Metrics

ERS does not have sufficient information to provide target metrics for this program.

APPENDIX K: LARGE ENERGY USERS PROGRAM

NJCEP's Large Energy Users (LEU) program is a unique program offering that limits participation to those who contribute $300,000 or more per year to the System Benefits Charge fund. By nature, the program offers mostly custom measures to primarily industrial clients, but is open to any participant that meets the criteria. The program requires that users provide a master energy plan and perform measurement and verification. These features along with the participation criteria make the program unique.

Conclusions

Based on ERS's benchmarking analysis and additional research, ERS makes the following conclusions:

- The NJCEP LEU is more expensive than other industrially focused programs on a $/savings basis as well as more expensive than NJCEP nonresidential alternatives.
- The incentive rates are very high for $/kWh ad $/therm incentives.
- The program reports a challenge of recruiting new members.

Recommendations

Based on ERS's benchmarking analysis and additional research, ERS offers the following recommendations:

- R37. Reduce the incentives by about half.
- R38. Consider developing an outreach model to expand participation and tap into the deep savings potential of the industrial sector.

These conclusions and recommendations are discussed in greater detail in the following sections.

Comparison Program Sample

Due to the distinctive offerings of NJCEP's Large Energy Users program, no PAs have programs with comparable participation criteria and features.

- Wisconsin offers a Large Energy Users program defined as those with peak demand 1,000 kW and up, which includes custom measures and technical assistance
- NYSERDA offers the Industrial and Process Efficiency Program, which is limited to manufacturers and data centers and includes custom measures and technical assistance with a minimum incentive of $30,000
- PG&E and SCE offer a slew of targeted industrial programs offered as turnkey programs by third party efficiency partners; they offer custom measures and technical assistance
- Together, these programs offer a limited-use benchmarking comparison set

Following the benchmarking analysis detailed below, no further review was planned. However, the topic of the Large Energy Users program came up in the interview with NJCEP and Wisconsin, and ERS is able to make some judgments based on those conversations and our experience with the NYSERDA and CA industrial programs.

Benchmarking Discussion

Due to the unique nature of the program, the benchmarking sample is less robust than for other programs. The sample includes programs dedicated for specific fields like oil production, refinery, heavy industry, chemical products, and cement, which are administered by PG&E or SCE. It also includes NYSERDA's Industrial Process Efficiency program and Wisconsin's Large Energy Users program. With the exception of Wisconsin's program, these are approximate matches, and so the results must be viewed with that caveat in mind.

The program acquires savings at a rate of $0.66/kWh, which is worse than most (19th percentile) in the peer group (n=34). Moreover, the median is less than half the NJCEP figure, and those programs that are worse than NJCEP are a subset of the CA programs, which are very low volume programs and which can have skewed results based on only having one or two projects that year. The situation is very similar for $/kW.

The $/therm figure is quite different, at $0.37/therm coming in at the 88th percentile, albeit among a small sample (n=9). ERS believes that it is inflated due to the way spending was split between electric and gas for this program for this analysis. ERS used a program-reported estimate of spending by fuel (i.e., 94% electric and 6% gas) to distribute the spending; even a slight increase in estimated spending on gas measures (e.g., going from 6% of budget to 7% of budget will double the) would have a disproportionate effect, and an industrial-focused program such as this is very likely to receive large gas projects. Thus, the gas benchmark should be heavily discounted. Note that the effect will be much smaller on the electric side (e.g., going from 94% to 93%) and thus those results are more solid. Even if, for example, the split was 80% on electricity and 20% on gas, they would achieve $0.57/kWh and $1.24/therm. That puts them at the 21st percentile on electricity and down to the 25th percentile on gas.

There was too little participant and spending breakdown data available to draw conclusions.

Further Research on Key Program Components

ERS analyzed information from discussions with NJCEP and Wisconsin program managers, as well as from our experience with CA's and NYSERDA's industrial programs. The topics for further review included the incentive offerings as well as ways to increase the program reach.

Offerings and Incentives

Table K-1 shows the LEU incentive rates, alongside the all-in costs for the core NJCEP Commercial Retrofit program.

Table K-1 LEU Incentive Rates v. Commercial Retrofit Program Costs

Category	LEU (Incentive)	Com. Retro. (Cost)
$/kWh	$0.33/kWh	$0.19/kWh
$/therm	$3.75/therm	$0.75/therm

There are other LEU program rules, such as total incentive caps, that limit the situations in which these full prices are paid. Consequently, LEU's all-in-costs are lower than these rates. That said, these rates are very high, compared both to other incentive rates from other custom programs (which tend to be between $0.10 and $0.20/kWh) and to the all-in-costs incurred by

the Commercial Retrofit program which would be a substitute for LEU if LEU didn't exist.
Recommendation #37: ERS recommends that the LEU drop its incentive rates by about half.

Non-Incentive Costs

A major non-incentive cost experienced by these types of programs is marketing and outreach. NJCEP noted that they have had trouble getting interested parties, beyond those who advocated for the creation of the program in the first place. NJCEP lacks this marketing and outreach.

NYSERDA, the CA industrial programs, and Wisconsin all invest in dedicated outreach efforts. In CA, the programs are run by utilities that already have in-house account managers who own the relationship. The challenge for NJCEP and statewide PAs like NYSERDA and Wisconsin is that the programs do not have that dedicated relationship. Both NYSERDA and Wisconsin employ full-time outreach teams. The programs' outreach efforts have similar features:

- A key account approach: target the biggest customers, learn their needs, and develop a long-term relationship
- Inside/outside sales combination: make first contact using less expensive inside sales staff and then supplement that with engineering experts in the field
- Deliver engineering expertise: offering free walk-throughs and other engineering support makes the engagement worth it for the customer
- Relieve administrative burden: another part of the value for the customer is taking the pain out of the application process by handling the paperwork on their behalf

Recommendation #38: ERS recommends the NJCEP explore developing a dedicated outreach team for the LEU to expand the programs penetration into the large industrial sector.

Proposed Target Metrics

The LEU should be able to reduce expenditures by simply reducing incentives to a more industry-standard level. Keeping in mind that a more realistic distribution of program spending is probably 80% electric/20% gas, ERS proposes the targets shown in Table K-4.

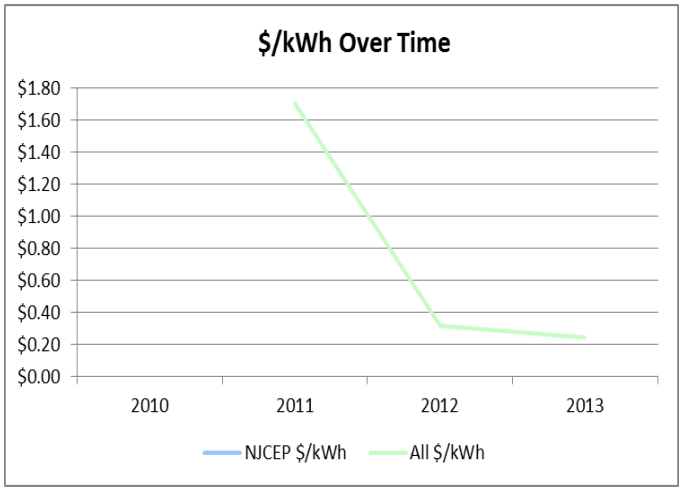
Table K-4. NJCEP SBDI Target Metrics

Metric	Target
$/kWh	$0.30/kWh
$/therm	$1/therm

Full Benchmarking Results

The full benchmarking results are presented beginning on the following page.

Cost per Gross Savings			
Category	$/kWh	$/kW	$/therm
Large Energy Users Pilot 2012	*$0.66*	*$4,308*	*$0.37*
NJCEP Percentile	*19%*	*24%*	*88%*
Sample Size	34	34	9
Std Deviation	$1.77	$10,305	$0.61
Min	$0.06	$295	$0.14
75th Percentile	$0.17	$1,451	$0.72
Average	$0.73	$4,700	$0.96
Median	$0.29	$2,279	$0.91
25th Percentile	$0.54	$4,090	$1.10
Max	$10.35	$60,868	$2.25

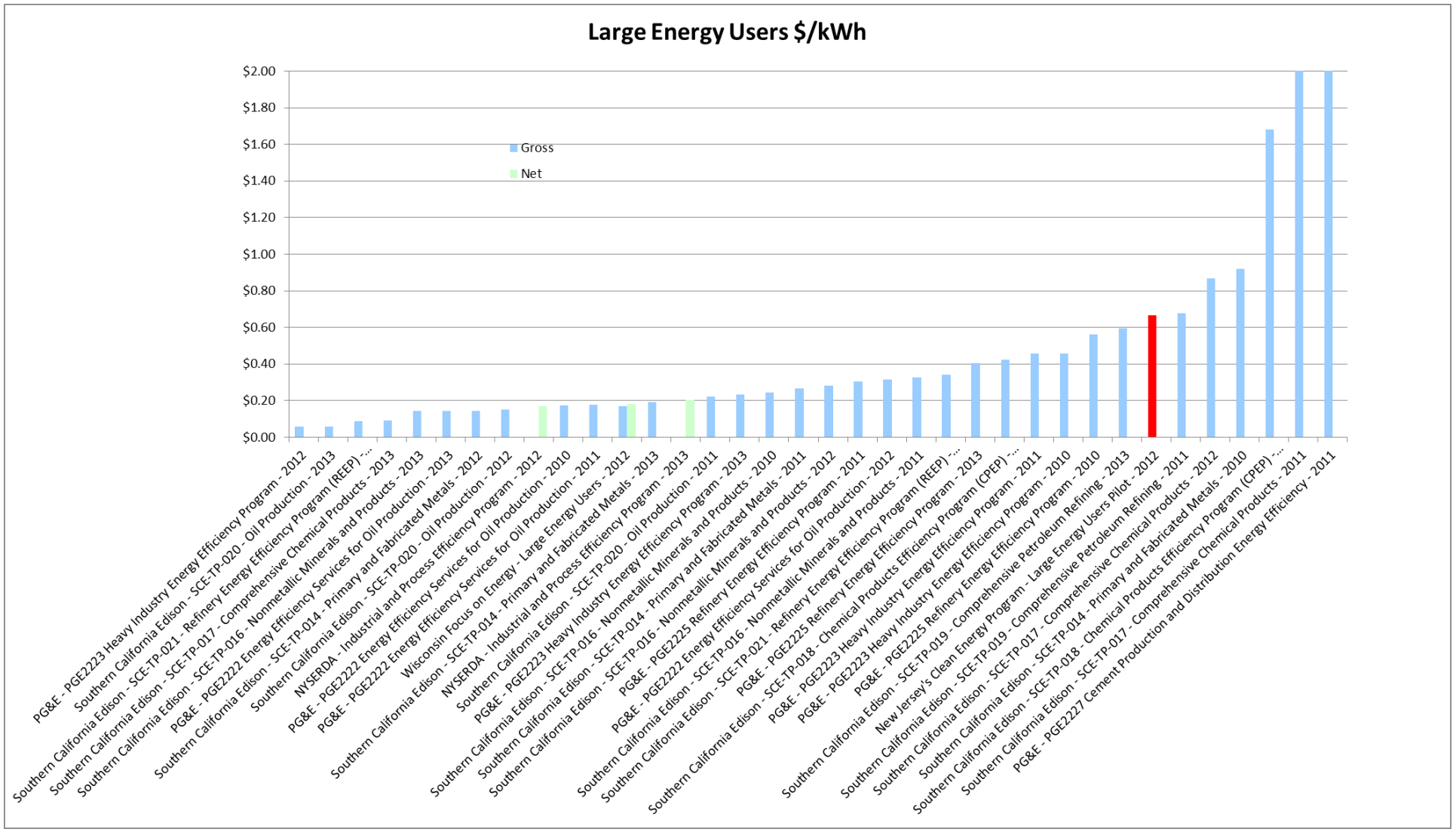


"Participant Over Time" data not available

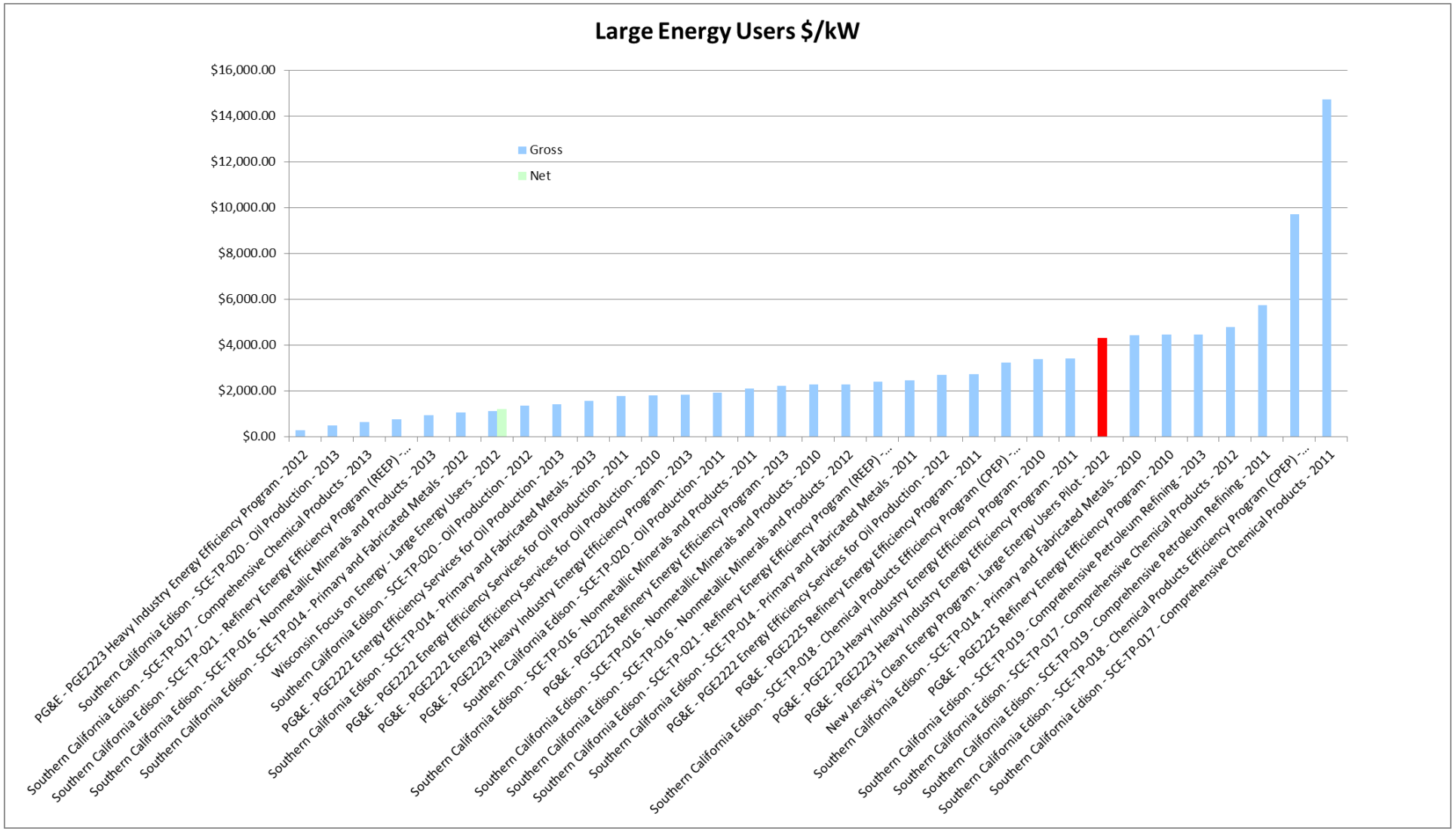
"Participant Over Time" data not available

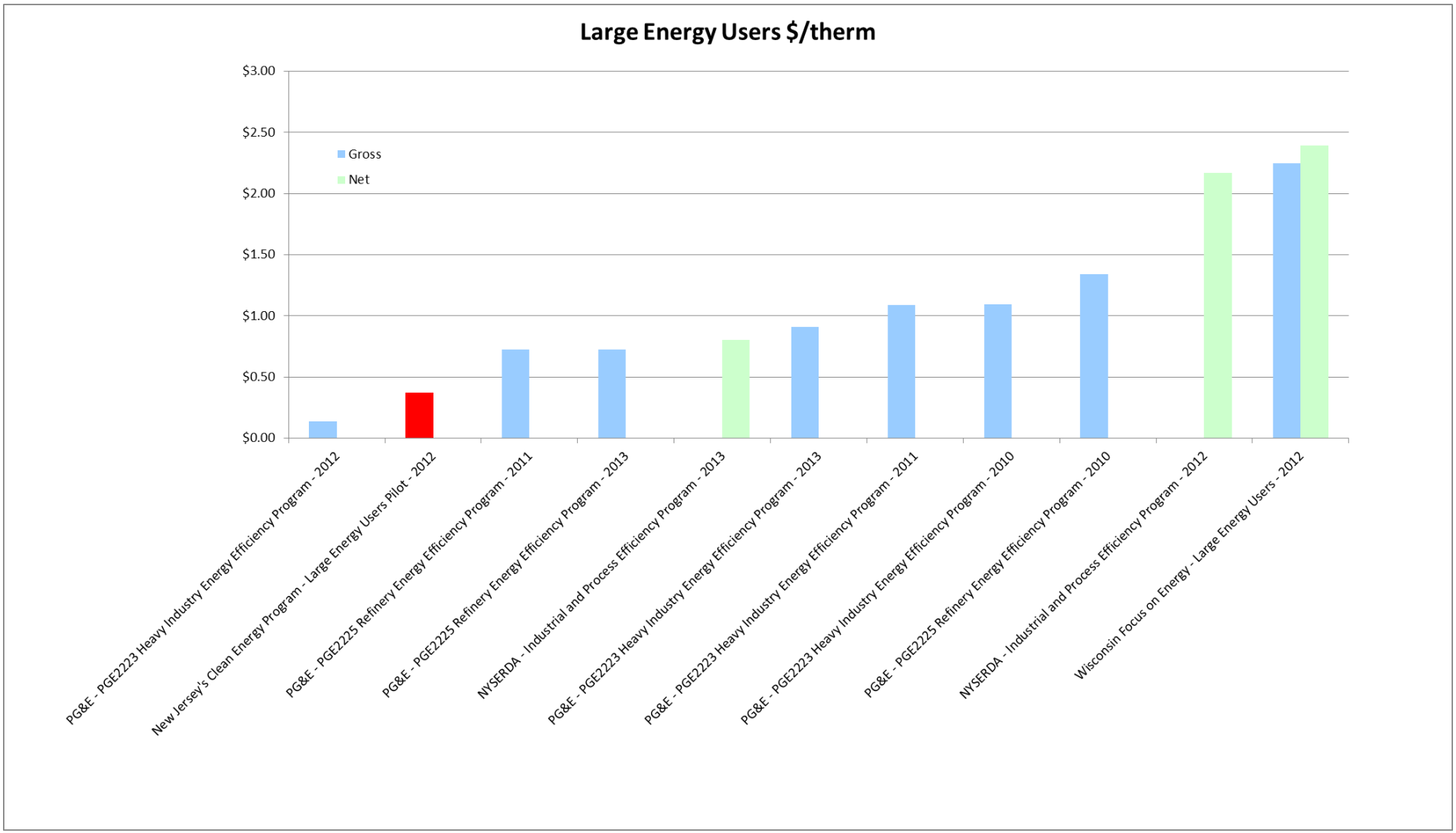
"Admin Spending" data not available

"Admin Spending" data not available



*Note: The last two entries are cut off from this scale. SCE Chemical Products is $2.54/kWh and PG&E Cement is $10.25/kWh.


Large Energy Users $/kW
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$0.00
Gross
Net
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2012
Southern California Edison - SCE-TP-020 - Oil Production - 2013
Southern California Edison - SCE-TP-017 - Comprehensive Chemical Products - 2013
Southern California Edison - SCE-TP-021 - Refinery Energy Efficiency Program (REEP) -...
Southern California Edison - SCE-TP-016 - Nonmetallic Minerals and Products - 2013
Southern California Edison - SCE-TP-014 - Primary and Fabricated Metals - 2012
Wisconsin Focus on Energy - Large Energy Users - 2012
Southern California Edison - SCE-TP-020 - Oil Production - 2012
PG&E - PGE2222 Energy Efficiency Services for Oil Production - 2013
Southern California Edison - SCE-TP-014 - Primary and Fabricated Metals - 2013
PG&E - PGE2222 Energy Efficiency Services for Oil Production - 2011
PG&E - PGE2222 Energy Efficiency Services for Oil Production - 2010
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2013
Southern California Edison - SCE-TP-020 - Oil Production - 2011
Southern California Edison - SCE-TP-016 - Nonmetallic Minerals and Products - 2011
PG&E - PGE2225 Refinery Energy Efficiency Program - 2013
Southern California Edison - SCE-TP-016 - Nonmetallic Minerals and Products - 2010
Southern California Edison - SCE-TP-021 - Refinery Energy Efficiency Program (REEP) -...
Southern California Edison - SCE-TP-014 - Primary and Fabricated Metals - 2011
PG&E - PGE2222 Energy Efficiency Services for Oil Production - 2012
Southern California Edison - SCE-TP-021 - Refinery Energy Efficiency Program - 2011
PG&E - PGE2222 Energy Efficiency Program (CPEP) -...
Southern California Edison - SCE-TP-014 - Primary and Fabricated Metals - 2012
PG&E - PGE2225 Refinery Energy Efficiency Services for Oil Production - 2011
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2010
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2011
New Jersey's Clean Energy Program - Large Energy Users Pilot - 2012
Southern California Edison - SCE-TP-014 - Primary and Fabricated Metals - 2010
PG&E - PGE2225 Refinery Energy Efficiency Program - 2010
Southern California Edison - SCE-TP-019 - Comprehensive Petroleum Refining - 2013
Southern California Edison - SCE-TP-017 - Comprehensive Chemical Products - 2012
Southern California Edison - SCE-TP-019 - Comprehensive Petroleum Refining - 2011
Southern California Edison - SCE-TP-018 - Chemical Products Efficiency Program (CPEP) -...
Southern California Edison - SCE-TP-017 - Comprehensive Chemical Products - 2011


Large Energy Users $/therm
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
Gross
Net
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2012
New Jersey's Clean Energy Program - Large Energy Users Pilot - 2012
PG&E - PGE2225 Refinery Energy Efficiency Program - 2011
PG&E - PGE2225 Refinery Energy Efficiency Program - 2013
NYSERDA - Industrial and Process Efficiency Program - 2013
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2013
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2011
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2010
PG&E - PGE2223 Heavy Industry Energy Efficiency Program - 2010
PG&E - PGE2225 Refinery Energy Efficiency Program - 2012
NYSERDA - Industrial and Process Efficiency Program - 2012
Wisconsin Focus on Energy - Large Energy Users - 2012

APPENDIX L: LOCAL GOVERNMENT ENERGY AUDIT

NJCEP's Local Government Energy Audit (LGEA) program provides no-cost audit services to local government facilities, such as municipal buildings and schools, as well as nonprofit organizations. Nearly every PA offers some form of audit to nonresidential customers, but unlike NJCEP, typically they are not standalone, but rather are a component of equipment incentive programs.

Conclusions and Recommendations

The LGEA program did not receive a benchmarking analysis or further review. Thus, ERS's perspective on this program is limited. However, from experience, it is atypical for a program to offer only a targeted audit program. Most PAs offer some kind of broadly available nonresidential audit program, either with a significant cost share (e.g., NYSERDA's FlexTech Program) or at no cost to the customer (e.g., CA IOUs). These are important programs for seeding interest in demand-side management and the NJCEP portfolio. As such, ERS recommends that NJCEP:

- ❑ R39. Explore the appetite for audit programs within NJ as part of the process evaluation.

Comparison Program Sample

Every comparison program offers some form of audit program

- ❑ All SBDI programs include an audit component
- ❑ Many commercial incentive programs include some form of technical assistance or audit
- ❑ Incentive models range from 50% cost share (e.g., NYSERDA and Con Edison) to free (e.g., all California investor owned utilities)
- ❑ Free models tend to be more focused (i.e., targeted at one or two measures that are likely to be installed) whereas cost-share models are more open-ended and up to the customer
- ❑ None of the PAs include segment-specific audit programs on a standalone basis, though many segment-specific incentive programs include audits and technical assistance
- ❑ No programs report identified savings or similar metrics and very few report anything at all (e.g., participant count)

ERS did not perform further analysis on the LGEA because of the lack of benchmarking data and the relatively small role of this program in the portfolio.

Benchmarking Discussion

The LGEA program did not have data for benchmarking.

Further Research on Key Program Components

No further research was performed.

Proposed Target Metrics

No target metrics are proposed for this program.

APPENDIX L: SUMMARY LIST OF RECOMMENDATIONS

#	Program	Page	Recommendation
1	Portfolio	29	Account for all relevant spending at the program level in order to better understand the total cost of programs and improve accountability.
2	Portfolio	29	Only count dollars that go to end users (or their vendors) as incentives to improve tracking and accountability.
3	Portfolio	29	Reevaluate the composition of the commercial retrofit portfolio as part of the process evaluation.
4	Portfolio	30	Make long-term plans on a portfolio level to replace the savings offered by the Upstream Lighting program. CFL savings will significantly diminish in the next five years and need to be made up elsewhere in the portfolio.
5	Portfolio	30	Perform updates to the protocols with greater regularity.
6	Portfolio	31	Regularly perform impact evaluations and include net-to-gross as a part of that evaluation activity.
7	Res Existing	35	Reduce incentive levels by 20%-40% to better align with industry average.
8	Res Existing	35	Consider converting to a measure-specific rebate approach, which is more common and ties rebates to savings more directly.
9	Res Existing	37	Budget program loans separately in program accounting (i.e., as if a separate program) in order to track program performance more directly.
10	Res Existing	37	Consider reducing inspections by as much as half in order to reduce costs.
11	Res NC	45	Review and consider alternative ENERGY STAR New Homes models that better incentivize and claim savings from unregulated loads.
12	Res NC	45	Reduce incentive levels to better align with industry average. The specific reductions will vary by tier and offering.
13	Res NC	45	Adopt a more targeted incentive approach to align program spending more closely to project savings (e.g., by aligning payments to home size or type, or by including prescriptive requirements that more consistently deliver savings than the ENERGY STAR requirements).
14	Res HVAC	56	Examine application and review processes as well as measure mix as part of upcoming process evaluation to identify any opportunities for improvement.
15	EEP Recycling	63	Restructure the contract with the implementation firm to pay less for the second unit picked up at a location recycling more than one unit.
16	EEP Recycling	64	Savings claims, in particular the demand (kW) savings, should be revisited during an upcoming evaluation to ensure they are realistic and in line with units being recycled by the program.
17	EEP Recycling	65	Differentiate between primary and secondary units during screening calls or as part of pickup. Down the road, the program could then consider claiming different savings levels based on the type of unit picked up.
18	EEP Lighting	76	Accelerate promotion of LEDs.
19	EEP Lighting	77	Consider creative ways to retain CFLs through targeted promotions, in particular a geographically targeted approach.
20	EEP Lighting	78	Commission a new residential lighting study to update hours-of-use and CFL penetration estimates to develop a mixed baseline for accurate savings estimates. Regularly update the mixed baseline with periodic studies.
21	EEP Lighting	79	Perform regular impact evaluations that include FR and apply an appropriate net-to-gross estimate to program savings.
22	Com Retrofit	93	Revise key savings assumptions as part of any upcoming evaluation.
23	Com Retrofit	94	Consider reducing inspection rates to roughly half their current levels.

#	Program	Page	Recommendation
24	P4P NC	102	Reduce incentive levels by roughly one half to better align with industry averages.
25	P4P NC	102	Convert the incentive approach to $/savings (as opposed to the current $/square-foot approach).
26	P4P NC	103	Increase quality assurance rigor if migrating to a $/savings incentive approach.
27	SBDI	117	Examine implementing a 0% cost-share model to increase sales conversion rate and expand participants and market penetration.
28	SBDI	117	Investigate subcontractor attitudes towards measure prices as part of the process evaluation. Greater-than-needed incentives are common in SBDI programs and may be contributing to poor $/savings results with this program.
29	SBDI	118	Consider re-orienting the contractor model to a turnkey approach, which reduces costs and increases control and quality. Note that it is challenging to follow this approach while also emphasizing HVAC-related measures; contractors generally do not do both the lighting and HVAC measures on a turnkey basis.
30	SBDI	120	Review inspection processes as part of the process evaluation. Reasonable quality assurance may be attainable with a lower inspection rate. Overall inspection rates can come down even as greater quality assurance efforts are targeted at larger or riskier projects.
31	CHP	126	Reboot the program, both the offerings and the approach. The following recommendations feed into this reboot.
32	CHP	126	Use the process evaluation to identify demand-side/perception factors that are impeding participation.
33	CHP	127	Simplify, harmonize, and consolidate the incentive system.
34	CHP	128	Consider using an “exploding” incentive rate (i.e., one that has a scheduled decline in incentive rate over a period of years) to signal a long-term commitment and to motivate projects today.
35	CHP	128	Consider adopting NYSERDA’s alternative approaches to sizing evaluation and technology approval.
36	CHP	128	Reexamine M&V and performance payment structure and levels as part of the upcoming process evaluation, with an eye towards expanding performance data collection and including recommissioning requirements.
37	Large Users	132	Reduce the incentives by about half.
38	Large Users	132	Consider developing an outreach model to expand participation and tap into the deep savings potential of the industrial sector.
39	LG Audit	137	Explore the appetite for audit programs within NJ as part of the process evaluation.