

APS MEASUREMENT, EVALUATION & RESEARCH (MER) REPORT

SOLUTIONS FOR BUSINESS
LARGE EXISTING BUILDINGS
SMALL BUSINESS
NEW CONSTRUCTION
SCHOOLS

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TABLE OF CONTENTS

E	Executive Summary	1
E.1	Impact Analysis	1
E.2	Net to Gross Analysis	5
E.3	Cost-Benefit Analysis	5
E.4	Process Analysis	6
E.5	Summary of Findings and Recommendations	8
	E.5.1 Impact and Cost-Effectiveness Findings and Recommendations	8
	E.5.2 Process Findings and Recommendations	9
1	Program Overview and Evaluation Objectives	11
1.1	Program Overview	11
1.2	Program Goals and Objectives	11
1.3	MER Evaluation Objectives	12
1.4	Analysis of Program Participation	14
2	Impact Evaluation	29
2.1	Impact Evaluation Approach	29
2.1.1	Engineering Analysis	29
	Data Resources	29
	Development of Analytic Databases and Models	30
	Supplemental Engineering Analysis	31
	Approach to Gross Demand and Energy Savings Analysis	31
2.1.2	On-site Verification	32
	Sampling Protocols	32
	Data Collection	33
	Completed Measure Verifications	33
	Compiling the Data	36
	Determining Verified Energy and Demand Savings	36
2.1.3	Benefit-Cost Analysis	36
2.2	Impact Research Results	41
2.2.1	Large Existing	43
2.2.2	Small Business	48
2.2.3	New Construction	51
2.2.4	Schools	55
2.2.5	Total Solutions for Business	57
2.3	Net to Gross Analysis	62
2.3.1	Free Rider Survey Questions	62
2.3.2	Analysis Overview	63
2.3.3	Results	65
	Strict Free-ridership	66
	Adjusted Free-ridership	67
	Minimum Free-ridership	67
	Sensitivity Analysis	68
2.3.4	Free-ridership Results Summary and Recommendation	70
2.3.5	Measure and Program Specific Results	70
2.3.6	Spillover	71
2.4	Cost-Benefit Analysis	74

3	Process Evaluation.....	75
3.1	Process Evaluation Approach and Research Tasks	75
3.2	Process Research Results by Primary Research Objective.....	77
3.2.1	Effectiveness of Program Design and Processes.....	77
	Key Performance Indicators	77
	Other Performance Indicators	78
3.2.2	Effectiveness of Program Education Efforts	79
	Key Performance Indicators	80
	Other Performance Indicators	83
3.2.3	Effectiveness of the Program Marketing and Recruiting Efforts	85
	Key Performance Indicators	85
	Other Performance Indicators	91
3.2.4	Participant Experience and Satisfaction with the Program.....	99
	Key Performance Indicators	99
	Other Performance Indicators	103
4	Key Study Findings and Recommendations	105
4.1	Impact Evaluation Conclusions and Recommendations.....	105
4.2	Process Evaluation Conclusions and Recommendations.....	106

E EXECUTIVE SUMMARY

This report presents results from the evaluation of the Solutions for Business program to determine the performance of the program and the overall savings that resulted from the measures installed. The evaluation consisted of both a process and an impact evaluation. The process evaluation provides feedback on a wide range of topics and program activities, such as data base management and timely payment of incentives, with the ultimate goal of identifying opportunities to improve the function of program processes. The impact evaluation is primarily a quantitative assessment designed to evaluate the demand and energy impacts of the program. The APS Solutions for Business programs provide prescriptive incentives to owners and operators of non-residential facilities for energy-efficiency improvements in lighting, HVAC, motors, and refrigeration measures. The primary markets covered by the program are large and small businesses and schools, including both existing buildings and new construction.

To support both the process and the impact evaluation, qualitative research included review of program materials, interviews with program administrators and implementation staff, interviews with APS Technical Account Representatives, and case studies. Quantitative research included a survey of 64 customers who have participated in the Solutions for Business program and a survey of 140 customers who have not participated (70 large customers and 70 small customers).

E.1 Impact Analysis

The Impact Analysis examined the Implementation Contractor's or KEMA's program tracking database to calculate gross reported energy and demand savings. Based on an engineering review and field data measurements, the Measurement, Evaluation and Research (MER) evaluation produced the verified gross energy and demand savings shown in Exhibits E-1 and E-2.

The MER impact evaluation found that program reported savings are very close to MER verified gross savings, with a total gross annual energy realization rate of 97% and a gross coincident demand realization rate of 82%. Most of the adjustments to gross savings were driven by using data at a slightly higher level of resolution, which included breaking measures out into more sub-categories by size and efficiency. T As such, the adjustments are more a reflection of using a more detailed calculation with more data than a reflection of problems in program implementation, data recording, or calculations using the measurement analysis spreadsheet (MAS) approach.

Note that the Schools results shown below in Exhibits E-1 and E-2 group all installations in schools, regardless of the program or funding source that results after the customer hits the Schools program cap, which is the lessor of \$25,000 per school district or \$15 per student. Therefore, schools installations are not included in the other sectors in Exhibits E-1 and E-2.

Exhibit E-1. Verified Gross Energy Savings by Program (kWh)

Sector	2006	2007	Cumulative Total	Lifetime	% of Total
Large Existing	7,973,256	48,352,394	56,325,650	746,181,027	67%
Small Business	215,844	1,624,456	1,840,300	30,936,396	2%
New Construction	1,349,540	9,192,525	10,542,065	170,470,485	13%
Schools	2,359,806	12,379,604	14,739,410	240,292,700	18%
Total	11,898,446	71,548,979	83,447,425	1,187,880,608	100%

Source: Summit Blue analysis of KEMA database extract of January 9, 2008.

Exhibit E-2. Verified Demand Savings by Program (kW)

Sector	Non-Coincident Demand (kW)				Coincident Demand (kW)			
	2006	2007	Cumulative Total	% of Total	2006	2007	Cumulative Total	% of Total
Large Existing	1,021	5,917	6,938	65%	961	5,347	6,308	72%
Small Business	47	402	448	4%	43	365	408	5%
New Construction	57	1,095	1,152	11%	54	1,025	1,079	12%
Schools	531	1,626	2,156	20%	294	664	958	11%
Total	1,656	9,040	10,694	100%	1,352	7,401	8,753	100%

Source: Summit Blue analysis of KEMA database extract of January 9, 2008.

Exhibit E-3 presents a summary comparison of impact evaluation results. Note that the MER Verified values include a line loss factor adjustment of 9.8% in order to be consistent with the values reported in the semi-annual report. The numbers in the tables above do not include this adjustment. *Note also that savings values for each program (e.g., Large Existing) in Exhibit E-3 include the contribution of Schools projects which exceeded the Schools program cap and were thus funded under each program, and that the reported savings for Schools are only for those projects which were funded under the Schools Program and met the program funding limitations.*

Exhibit E-3. Impact Evaluation Summary 2005 – 2007

	Reported Results	MER Verified Results	Impact on Reported Savings
Large Existing			
Total Number of Projects	333	335	Increase
Demand Savings (KW)(Coincident) ¹	8970	7497	Decrease
Annual Energy Savings (KWh) ¹	71,929,000	69,946,000	Decrease
Lifetime Energy Savings (KWh) ¹	1,003,888,000	949,873,000	Decrease
Realization Rate – Demand ¹	NA	84%	NA
Realization Rate – Annual Energy ¹	NA	97%	NA
Realization Rate – Lifetime Energy ¹	NA	95%	NA
Free-ridership	10% – 30%	17%	---
Spillover	NA	NA	NA
Net to Gross Ratio	0.70 – 0.90	0.83	---
Benefit to Cost Ratio	2.89	2.55	Decrease
Small Business			
Total Number of Projects	62	62	Same
Demand Savings (KW)(Coincident) ¹	520	460	Decrease
Annual Energy Savings (KWh) ¹	2,585,000	2,193,000	Decrease
Lifetime Energy Savings (KWh) ¹	42,577,000	36,252,000	Decrease
Realization Rate – Demand ¹	NA	88%	NA
Realization Rate – Annual Energy ¹	NA	85%	NA
Realization Rate – Lifetime Energy ¹	NA	85%	NA
Free-ridership	4% – 40%	17%	---
Spillover	NA	NA	NA
Net to Gross Ratio	0.60 – 0.96	0.83	---
Benefit to Cost Ratio	3.08	0.81	Decrease

Exhibit E-3. Impact Evaluation Summary

New Construction			
Total Number of Projects	33	31	Decrease
Demand Savings (KW)(Coincident) ¹	1680	1390	Decrease
Annual Energy Savings (KWh) ¹	16,269,000	16,172,000	Decrease
Lifetime Energy Savings (KWh) ¹	257,424,000	260,219,000	Increase
Realization Rate – Demand ¹	NA	83%	NA
Realization Rate – Annual Energy ¹	NA	99%	NA
Realization Rate – Lifetime Energy ¹	NA	101%	NA
Free-ridership	10% – 30%	17%	---
Spillover	NA	NA	NA
Net to Gross Ratio	0.70 – 0.90	0.83	---
Benefit to Cost Ratio	2.54	1.71	Decrease
Schools			
Total Number of Projects	74	74	Same
Demand Savings (KW)(Coincident) ¹	590	264	Decrease
Annual Energy Savings (KWh) ¹	3,710,000	3,314,000	Decrease
Lifetime Energy Savings (KWh) ¹	63,602,000	57,949,000	Decrease
Realization Rate – Demand ¹	NA	45%	NA
Realization Rate – Annual Energy ¹	NA	89%	NA
Realization Rate – Lifetime Energy ¹	NA	91%	NA
Free-ridership	4% – 10%	17%	---
Spillover	NA	NA	NA
Net to Gross Ratio	0.90 – 0.96	0.83	---
Benefit to Cost Ratio	1.21	1.92	Increase
Total Solutions for Business			
Total Number of Projects	502	502	Same
Demand Savings (KW)(Coincident) ¹	11,760	9611	Decrease
Annual Energy Savings (KWh) ¹	94,493,000	91,624,806	Decrease
Lifetime Energy Savings (KWh) ¹	1,367,491,000	1,304,292,240	Decrease
Realization Rate – Demand ¹	NA	82%	NA
Realization Rate – Annual Energy ¹	NA	97%	NA
Realization Rate – Lifetime Energy ¹	NA	95%	NA
Benefit to Cost Ratio	NA	2.14	NA

Notes:

1. The reported results in this table are those presented in the semi-annual report. The reported results in the body of the report are those that were reported in the extract from the implementation contractor database used in the impact analysis. In addition, the values in this table include a line loss factor adjustment of 9.8%. The values in the body of the report do not include this adjustment. Thus, there may be some discrepancies between the reported values in this table and those in the body of the report. The realization rates reported above are based on a comparison between the values reported in the semi annual report and the MER values.

E.2 Net to Gross Analysis

The Solutions for Business participant survey included several questions designed to measure free-ridership and spillover. Valid data from the KEMA database and the participant survey for the purposes of calculating free-ridership was captured from 76 customers, the majority of which were from the Large Existing program. The numbers of completed surveys from Small Business and Schools was too small to provide valid results for free-ridership at the program level. As a result, the analysis was done at the Solutions for Business level rather than at the program level.

The free-ridership analysis looked at the results in several different ways, all of which are presented in Exhibit E-4. The free-ridership results varied between 0% and 25%. The high estimate (labeled the “strict” approach in the following exhibit) of 25% is based solely on whether the participants stated that they would have installed the same level of efficiency, in the same quantity, and at the same time in the absence of the program. In calculating the other estimates, an additional question was asked to provide a consistency check to the responses given on timing, quantity, and efficiency. If we allow the consistency question to over-rule the efficiency, quantity and timing questions and use liberal assumptions for those questions the free-ridership rate drops to zero (“Liberal” approach). We tested several scenarios by assigning various weights and precedence to the each question. The Liberal approach uses assumptions that are quite extreme and so does not represent the best approach. The Base Case and the Conservative assumptions are more in keeping with standard practice and the true free-ridership rate is best represented by one or the other of these options. We recommend using the Base Case, which produces a free-ridership rate for the program of 17%.

Exhibit E-4. Free-ridership Rates in Sensitivity Analyses

Free-ridership Approach	Free-ridership	Net-to-Gross Ratio	Notes
Strict	25%	75%	Timing, quantity, and efficiency only, no consistency adjustments
Adjusted (Base Case)	17%	83%	Base case with consistency adjustments
Minimum	0%	100%	Liberal multipliers and consistency question trumps timing, quantity and efficiency
Liberal	11%	89%	Liberal multipliers for consistency, timing, quantity and efficiency
Conservative	22%	78%	Conservative multipliers for consistency, timing, quantity and efficiency

E.3 Cost-Benefit Analysis

The benefit-cost analysis relied on the Total Resource Cost test as defined by the California Standard Practice Manual¹. Across all program components, the Solutions for Business program had a Benefit-Cost ratio of 2.1 (Exhibit E-5). The highest ratio was for the Large Existing program, at 2.6 and the smallest was for the Small Business program at 0.8. The overall ratio for

¹ California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects. July 2002. Available at <http://drrc.lbl.gov/pubs/CA-SPManual-7-02.pdf>.

the Solutions For Business Program is slightly below the expected value of 2.6 as originally estimated in the DSM Portfolio Plan.

Exhibit E-5. Benefit-Cost Analysis Summary

Program For Reporting	NPV of Benefits	NPV of Costs	Benefit-Cost Ratio
Large Existing Buildings	\$ 25,574,342	\$ 10,022,745	2.55
Small Business	\$ 1,239,246	\$ 1,529,540	0.81
New Construction	\$ 5,420,996	\$ 3,175,811	1.71
Schools	\$ 6,934,776	\$ 3,605,192	1.92
Solutions for Business Program (in total)	\$ 39,169,360	\$ 18,333,288	2.14

Due to the fact that all of these programs are new, start up costs tend to drag down the Benefit to Cost Ratios. As all of these programs mature and develop higher program participation, we anticipate higher ratios.

The low benefit-cost ratio for the small business segment indicates the difficulty of achieving sufficient energy and demand savings relative to the costs of implementing the program under the current program design. The revised small business program design submitted as part of the 13-month re-filing is intended to address this issue by focusing efforts on achieving greater savings by installing more measures at each customer’s site. The revised approach also uses a direct install approach to counteract knowledge/awareness and hassle factor barriers.

E.4 Process Analysis

The Process Evaluation examined key performance indicators associated with four primary research objectives:

- Effectiveness of Program Design and Processes
- Effectiveness of Program Education Efforts
- Effectiveness of the Program Marketing and Recruiting Efforts
- Participant Experience and Satisfaction with the Program

Full details on the results are presented in the body of the report.

In summary, customer satisfaction is very high. Customers participating in the rebate program were asked to rate their satisfaction with various elements of the APS program. Ratings were given on a scale of one, meaning very dissatisfied, to ten, meaning very satisfied. Mean satisfaction scores are summarized in Exhibit E-6 and discussed in the bullets following the exhibit.

Exhibit E-6. Rebate Participant Rating of Various Elements of the APS Solutions for Business Program

	Mean Rating			% with Rating of 9-10 (n=64)	% with Rating of 7-10 (n=64)
	Total Participants (n=64)	Large (n=45)	Small (n=19)		
Level of Satisfaction (1=very dissatisfied, 10=very satisfied)					
Overall Satisfaction with APS	9.0	9.0	8.9	72%	87%
Overall Solutions for Business Program	9.2	9.3	8.9	75%	96%
Rebate Amount	9.1	9.1	9.2	73%	88%
Overall Rebate Process	9.0	9.1	9.0	72%	84%
Program's Ability to Meet Technical and Financial Assistance Needs	8.3	8.3	8.1	40%	65%
Program's Ability to Help Control Energy	8.4	8.8	7.2	45%	75%
Support Received Through APS Program	8.7	8.9	8.2	61%	83%
Level of Ease/Difficulty (1=very difficult, 10=very easy)					
Application Process	7.8	7.9	7.5	34%	66%
Filling Out Incentive Worksheets for Each Measure	7.8	7.7	7.8	33%	48%

Source: APS Solutions for Business Rebate Participant Survey.

- Rebate program participants have a high overall satisfaction with APS and the Solutions for Business program, providing overall mean ratings of 9.0 and 9.2, respectively, out of 10. For both, more than half provide a 10 and more than 70% provide a 9 or 10 on a 10-point scale. Ratings are very similar for large and small customers.
- Rebate participants are very satisfied with the rebate amount received from APS. Nearly two thirds rate their satisfaction as the highest value on a ten-point satisfaction rating. Results did not vary significantly between large and small firms. In general, participants are satisfied with the overall rebate process and provide a mean rating of 9.0, on a scale of 1 to 10. Fifty-six percent of respondents provide the highest satisfaction score.
- Compared to other measures of satisfaction, rebate program participants provided slightly lower ratings for the program's ability to meet their technical and financial assistance needs and the program's ability to help control energy. Less than half provide a rating of 9 or 10 for these two measures, with mean ratings of 8.3 and 8.4, respectively. Additionally, 27% of overall participants do not know how the program meets their needs. Nearly half (48%) of participants were very satisfied with the support received through the APS program. The relatively low incidence of dissatisfaction suggests that APS current level of support is meeting participants' needs.
- Although satisfaction is generally high, rebate participants are least satisfied with the ease of the application process and completing incentive worksheets. Both measures receive an

average score of 7.8, and only about one third of participants provide a rating of 9 or 10. Conversely, 16% percent of participants rate the application process with a score of 5 or lower. Most of these customers noted filling out the application was time consuming, difficult, or confusing. Notably, ratings are similar for custom and prescriptive projects. While most participants do not find filling out the incentive worksheets to be difficult – more than one quarter described this task as “very easy” – some do have problems. The most commonly cited problems involve the time spent documenting large numbers of measures (such as lighting) and finding equipment that qualifies for the rebate. Almost one third (31%) of participants do not know the level of difficulty in filling out the incentive worksheets. It is likely that some firms spread this task among multiple individuals or even utilize a third party.

In 2007, APS also offered three courses in its Technical Training Series: Lighting, Retro-Commissioning, and Motors. In total, 106 people registered for the trainings, although attendance was slightly higher. Registrants included representatives from municipal and state departments, businesses and schools, as well as trade allies and KEMA and APS staff.

Attendee evaluations were available for the lighting, motors and retro-commissioning sessions. Participants evaluated elements of both the instruction and the course. Overall, attendees were very satisfied with the trainings and provided the lighting and retro-commissioning courses mean ratings of 9.0 and 8.2, respectively, on a 10-point scale of one to ten, (with one meaning needs improvement and ten meaning excellent).

E.5 Summary of Findings and Recommendations

E.5.1 Impact and Cost-Effectiveness Findings and Recommendations

Key conclusions and recommendations based on the results of the impact and cost-effectiveness analysis are summarized below:

- MER results include adjustments to gross savings driven by using data at a slightly higher level of resolution than originally used in the Market Analysis Spreadsheet (MAS) approach. MER observations about the energy savings results across Solutions for Business include the following:
 - Custom energy savings consist mostly of lighting measures
 - Lighting operating hours adjustments made for each business type affects the energy savings results
 - Programmable thermostats did not save as much energy as assumed because the actual area served by each programmable thermostat was much smaller than originally estimated.
 - Custom and prescriptive lighting projects made up approximately half of the energy, and 75% of demand savings realized
 - Motors savings reported were almost all (99%) realized from variable speed drives (VSD) installations and made up about 20% of all energy savings.
- Free-ridership is estimated to be 17%. This rate is in the range of commonly found free-ridership results for this type of program.

- Most of the Solutions for Business programs yielded a benefit-cost ratio greater than 1:1.
- The Small Business Program is the only program that yielded a benefit-cost ratio less than 1:1; the benefit-cost ratio for the Small Business Program is 0.8:1.
 - The low benefit-cost ratio for the small business product segment indicates the difficulty of achieving sufficient energy and demand savings relative to the costs of implementing the program under the current program design.
 - The revised small business program design submitted as part of the 13-month filing was intended to address this issue by focusing efforts on achieving greater savings at each customer's site. The benefit-cost analysis substantiates the need to revise the program to achieve greater savings at reduced costs, and the MER team thus recommends that APS implement the program design changes specified in the 13-month including adjusting incentive levels to reduce first cost barriers, implementing a direct installation method to overcome customer information/knowledge deficit and hassle-factor barriers, and stimulating program promotion through contractor incentives and support.
- As all of these programs mature, it is likely that the benefit/cost ratio will improve as start-up costs are amortized over the life of the program and as program processes become more efficient

E.5.2 Process Findings and Recommendations

Key findings and recommendations based on the process evaluation are summarized below, by primary research objective:

Effectiveness of Program Design and Processes

- Project ID numbers are assigned to pre-applications as they are received and project funds are reserved. However, pre-application numbers are not always reconciled with the final project IDs under which the measures are installed. We suggest that this process occur as part of regular database maintenance and that reconciliation of all legacy project numbers occur as a matter of standard practice when projects are completed and incentives paid.
- Some key evaluation data fields, e.g., contractor name and phone number, are not populated for all records. We recommend periodically reviewing the database to ensure that these fields are complete and to correct database entries that repeat for various projects.

Effectiveness of Program Education Efforts

- The MER team recommends that APS continue to educate customers, including non-participants, about the training and programs available as well as other energy saving measures could encourage them to participate in this and other APS programs.
- Overall, 74% of non-participants have installed energy efficient lighting in the past two years and 52% have installed energy efficient AC/HVAC equipment, compared to less than 30% for all other equipment types. This suggests higher free-ridership rates for these measures and underscores the need to promote other types of measures as the program matures.

- Small customers tend to have much lower awareness of energy efficiency programs and measures and are far less interested in energy efficiency training. Recognizing the difficulty of reaching smaller customers, APS has filed for additional program elements such as direct install to address this need. Continued marketing and education targeting these customers is recommended.
- Few Trade Allies have participated in APS training sessions. APS may wish to increase the reach of its training offerings, particularly among Trade Allies. APS may also consider targeting the engineering firms that attend training sessions for potential enrollment as Trade Allies.

Effectiveness of the Program Marketing and Recruiting Efforts

- **Customer awareness of program** –APS should stress the ease of participation and efficiency improvements in future marketing promotions targeted toward small firms that lack program knowledge and other non-participants.
- **Promotion and marketing** – APS should use electronic and other media to educate and disseminate information about energy efficiency programs to its customers. A customer email campaign to specific target market should be used and allow the customer to opt-out and thus avoid violating APS’ anti-spam policy.
- **Identifying and recruiting customers** – Flyers, advertisements and mailings are commonly used to recruit customers, but contractors are also a valuable tool. APS may wish to continue to educate contractors and other market actors about its programs through a variety of marketing channels.
- **Trade Allies** – APS should add the date the trade ally joined the program as well as the service territory they serve and the degree to which they are active in the program. This would improve future marketing efforts.
- **Barriers** APS should focus its marketing strategy on awareness to ensure that (1) customers find out about the program and (2) they receive sufficient information about the program to be able to assess their ability to participate. This effort could eliminate awareness as a barrier.

Participant Experience and Satisfaction with the Program

- On average, participants thought the application process and incentive worksheets were fairly easy, however they scored them lower than other aspects of the program. Based on these findings, the APS team has reviewed and made changes to the applications. Continued monitoring of customer feedback and recommendations is recommended to ensure that the application process remains simple and easy for participants.
- Twenty-seven percent of participants report waiting more than eight weeks for their rebate check from the time of submission of the final application. APS should investigate the reasons for the longer processing times and address any issues.
- APS should continue to develop success stories to inform nonparticipating customers of projects undertaken and energy savings achieved by other customers.