



*A personal commitment
to New Mexico*

2008 Electric Energy Efficiency Program

Annual Report

April 1, 2009

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Introduction

PNM submits this annual report on the Electric Energy Efficiency Program (“Program”) for program year 2008. Also submitted is the final report prepared by the independent evaluator, KEMA, Inc. (“KEMA”), entitled “Evaluation, Measurement and Verification of PNM’s Electric Energy Efficiency Programs, October 2007 – December 2008 Program Year” (“M&V Report”), which was completed on March 6, 2009.

PNM filed the set of electric energy efficiency programs that were evaluated as part of this report in January 2007, and they were approved by the New Mexico Public Regulation Commission (“NMPRC” or “Commission”) on August 28, 2007 in the final order in Case No. 07-00053-UT. PNM began offering these programs to residential and commercial electric customers on October 1, 2007. This report covers all costs incurred in the implementation of the programs and all customer participation in the programs from October 1, 2007 through December 31, 2008.

The following programs are included in this annual report:

- (1) Home Lighting Discount: residential customers receive instant discounts on CFL bulbs in participating retail stores. Customers can also buy discounted bulbs online through PNM’s online store. PNM has hired the third-party contractors (Energy Federation, Inc (“EFI”) and Applied Proactive Technologies (“APT”) to implement and manage this program.
- (2) Refrigerator Recycling Program: residential customers can receive a \$30 rebate for recycling a qualifying refrigerator or freezer. PNM has hired the third-party contractor JACO Environmental, Inc. (“JACO”) to provide a turnkey refrigerator recycling program.
- (3) Residential Advanced Evaporative Cooling Rebate: residential customers can receive a rebate of up to \$400 for purchasing and installing advanced evaporative cooling technology, which is an alternative to refrigerated air conditioning.
- (4) Energy Saver Program: Income qualified customers can sign up to have energy saving items (e.g. CFLs, caulk, weatherstripping, water heater tank wrap, etc.) installed by a contractor. New Mexico Mortgage Finance Authority (“MFA”) administers this program.
- (5) Sierra Club CFL Exchange: PNM has partnered with the Sierra Club to exchange 40,000 CFLs for incandescent bulbs during the 2007/2008 school year. In addition to visiting schools, the Sierra Club is also exchanging bulbs at various community events.
- (6) ENERGY STAR Home Rebate: Homebuilders can receive a \$500 rebate for every home they build to ENERGY STAR standards, which are at least 15% more efficient than standard homes.

- (7) Business Lighting Rebate: Customers can receive a rebate for replacing inefficient lighting fixtures and lamps with energy-efficient fluorescent and high intensity discharge fixtures. Rebate amounts vary depending on what items were installed.
- (8) Commercial Advanced Evaporative Cooling Rebate: commercial customers can receive a rebate of up to \$500 for purchasing and installing advanced evaporative cooling technology, which is an alternative to refrigerated air conditioning.
- (9) PNM Power Saver: This program cycles refrigerated air conditioning units in participating homes during periods of peak demand. Participating customers will receive a \$25 check each cooling season. PNM has hired the third party contractor, Comverge, Inc., to implement and manage this program. Small and medium commercial customers are also eligible for this program, although instead of the \$25 incentive, rebate levels for medium commercial customers are determined by the demand reduction they achieve.
- (10) PNM Peak Saver: This program is designed to help large commercial customers reduce the amount of energy they require during peak demand periods. Participants will be paid an annual incentive, the amount of which will depend on the amount of electricity managed by the program. PNM has hired EnerNOC, Inc. to implement and manage this program.

This report begins with an executive summary that presents a high level assessment of program performance, a summary of the most important findings of the M&V Report and the impacts on the future of the programs. The second section presents a detailed discussion of the M&V Report recommendations. This is followed by specific program information as required in the NMPRC Energy Efficiency Rule (17.7.2 NMAC) (“Rule”), as well as additional program information.

Executive Summary

This is the first annual report on PNM’s Program. The following is a short summary of the overall results.

- The Program overall was very cost effective as measured by the Total Resource Cost test (TRC). The TRC for the portfolio of programs was 2.71.
- The total annual savings, after free rider adjustments were 35.2 GWH, which exceeded the target savings of 27.7 GWH.
- The demand response programs were very successful in recruiting customer participants. The total curtailable load was equivalent to 30 MW at the end of the control season in September and 47 MW by the end of the year. This exceeded the 30 MW target.
- Total program expenses were about \$8M, which was slightly over the targeted annual budget of \$7.6M. These are for a 15 month period beginning in October 2007.

The following table shows the total number of customer participants, the annual energy savings and the total costs for each of the programs for program year 2008.

Programs	Participants or Units	Annual Savings (kWh)*	Annual Savings (kW)*	Total Program Costs
Refrigerator Recycling	8,537	5,745,401	939	\$ 1,349,146
Residential Lighting	1,005,910	24,141,840	5,533	\$ 1,798,668
Energy Star Home	152	157,776	93	\$ 125,604
Residential Advanced Evap	10	12,920	11	\$ 36,945
Business Advanced Evap	2	3,876	3	\$ 35,000
Business Lighting	27,799	2,042,949	322	\$ 227,378
PNM Power Saver	16,686	NA	27,365	\$ 2,964,120
PNM Peak Saver	45	NA	20,000	\$ 1,044,591
CFL Exchange	80,920	1,942,080	445	\$ 165,497
Energy Saver Kit	675	130,275	22	\$ 250,967
Lrg. Customer Self-Direct	2	1,034,348	129	NA
Total:		35,211,465	54,862	\$ 7,997,915

* Savings adjusted for free riders

Independent Evaluation

The Rule requires that an independent evaluator conduct measurement and verification assessments of all energy efficiency and load management programs. Through a competitive bidding process, PNM selected and hired an independent program evaluator, RLW Analytics (“RLW”), to perform evaluation, measurement, and verification of PNM’s electric energy efficiency programs for the 2008 program year, which covered the period from October 1, 2007 to December 15, 2008. However, RLW Analytics was acquired by KEMA, Inc. (“KEMA”) in January 2009, and the M&V Report was prepared and submitted by KEMA. In order for KEMA to complete the 2008 program year report in a timely manner and allow PNM to incorporate the results into this annual report, KEMA had to select its sample of program participants by mid-July 2008. In addition, KEMA required that PNM submit its final number of participants and annual costs to be included in the M&V Report by December 15, 2008. The M&V Report for program year 2008 includes data from October 1, 2007 through December 15, 2008.

The M&V Report contains many important findings and recommendations. A more complete summary of these findings and recommendations along with PNM’s comments is provided in the next section. Highlights of these findings include the following:

- The total portfolio of programs was found to be cost effective; however, some smaller individual programs were found to not be cost effective.
- The 2008 PNM portfolio of electric energy efficiency programs were a success in terms of cost effectiveness and energy savings. The largest programs performed the best and additional M&V steps are planned for the 2009 programs to develop deeper confidence in the evaluated savings estimates. In particular, the Home Lighting, Business Lighting, Refrigerator Recycling and CFL Exchange programs were very successful in terms of savings and cost effectiveness.
- Results of the M&V analysis were used to adjust a number of PNM’s technical assumptions on program performance: for example, the average savings per unit and average customer expense.

- A review of the statistical sampling data from participating customers in the PNM Power Saver program, conducted in the fall of 2008, contributed to revision of the total load estimated under the PNM Power Saver program.

It should be noted that this initial evaluation serves as a “First Look” evaluation at how the Program is working for early adopters, and is designed to provide timely feedback to the program design and implementation team. Such an evaluation looks carefully at actual impacts, while taking into account that program delivery is evolving.

Tariff Collections

Beginning with the first billing cycle of October 2007, PNM implemented tariff Rider 16 (“Rider 16”) and tariff Rider 1 (“Rider 1”) on all affected customers’ bills. These riders were set at 1.288 percent of bills based on the projected annual program costs of \$7,613,621. As of December 31, 2008 PNM had recovered a total of \$9,510,455. Actual expenses for program year 2008 were \$7,997,915, which results in an over collection of \$1,512,540. PNM has proposed in its most recent energy efficiency program plan filing, Case No. 08-00204-UT, that this over-recovered amount be subtracted from the projected annual budget for program year 2009, which would be collected through Rider 16 and Rider 1 during 2009 and 2010.

Regulatory Proceedings

On September 15, 2008 PNM filed Case No. 08-00204-UT with the NMPRC for approval of a new portfolio of electric energy efficiency programs and changes to the existing electric programs. Although the NMPRC has not yet ruled on this case, PNM has reached consensus with intervening parties regarding the proposed programs.

On April 3, 2008, the Commission approved PNM’s request for a variance to allow PNM to contract with RLW, now KEMA, to conduct independent evaluation of its programs. On March 3, 2009, the Commission approved the selection of ADM Associates (“ADM”) as the state-wide independent evaluator. PNM will contract with ADM for evaluation services beginning in 2010.

Summary of M&V Report Findings

Background and Purpose of Independent Evaluation

PNM worked closely with KEMA to provide them with the data necessary to complete the 2008 M&V Report. This included providing rebate processing and participant files, budget data by program and avoided cost information. PNM also approved the research plan that KEMA proposed to complete the evaluation. (Please see Appendix B for the KEMA Research Plan)

The primary purpose of the independent evaluation is to assess the cost effectiveness of the programs using the TRC test, which includes a thorough analysis of achieved savings and free rider estimation. A secondary purpose of the evaluation is to perform a basic process evaluation of the program to determine customer satisfaction with how the programs operated and provide suggestions to improve delivery of the programs.

Summary of Findings and PNM Comments

PNM believes that KEMA has conducted a thorough and professional assessment of the electric energy efficiency programs. Below is a summary of KEMA's recommendations along with PNM's comments.

- 1) **KEMA recommends moving forward with an extended discarder survey that includes contractors in the sample to determine how customers are disposing of secondary refrigerators in New Mexico versus using results from other markets.**

PNM RESPONSE:

PNM agrees that this information would be valuable to further determine the effectiveness and success of the Refrigerator Recycling Program, and will broaden the scope of the M&V study in 2009 to include such a survey.

- 2) **Additional effort should be made to increase awareness of the Refrigerator Recycling Program, through bill enclosures, TV advertisements, and other media.**

PNM RESPONSE:

PNM is currently working with JACO Environmental to increase advertising in 2009 which will include increased television advertising. PNM will also continue to use the Energy Works monthly bill-insert newsletter to promote the program.

- 3) **The Business Lighting Program would benefit from better tracking, such as always including installed and replaced wattage, tracking hours of operation by weekdays and weekends, and having separate tracking fields for control measures such as occupancy sensors.**

PNM RESPONSE:

PNM has proposed a new Comprehensive Energy Efficiency Program in Case No. 08-00204-UT, to be managed by a third-party contractor. If approved, the Comprehensive Energy Efficiency Program will absorb the existing Business Lighting Program, and the third-party contractor will provide significantly enhanced tracking data to the M&V contractor. PNM has also made modifications to the existing program application forms and is reviewing applications for completeness.

- 4) **PNM should decide on a method for dealing with bias between the control and curtailment group for PNM Power Saver.**

PNM RESPONSE:

Recommendations 4 - 7 refer to the methodology used to determine the load response of the participants in PNM Power Saver. KEMA provided valuable review and assistance in program year 2008 in the determination of the total load acquired under the PNM Power Saver program. PNM is working with KEMA and Comverge, the third-party contractor for PNM Power Saver, to identify areas for improving the statistical assessment of participant data including the issue of bias between the control group and curtailment group.

- 5) **For the evaluation of PNM Power Saver, PNM should agree to a method that will be used if the peak event day occurs before the swapping of sites between the control and curtailment groups can be done.**

PNM RESPONSE:

This situation occurred during 2008 and a method of correction was determined and applied to the samples. This method will be used again in 2009 if a bias is determined between the control group and the curtailment group and a correction to the sample through exchanging sites does not occur before the occurrence of the peak event day.

- 6) **For the calculation of the load impact of the PNM Power Saver, change the peak 15-minute difference over the summer months that is currently used to calculate the difference between the control group and participant group to 30 minutes.**

PNM RESPONSE:

PNM understands KEMA's position that using a 30 minute window compared to a 15 minute window may have some advantages. However, as KEMA also notes in its recommendation, the program contract stipulates 15 minutes, so this will remain the unit of analysis.

- 7) **The third-party contractor that PNM is using for PNM Power Saver needs to report the methods used to calculate the precision of the final load impact estimate, and the calculations showing the assumptions that show the current sample will satisfy the 90/10 goal outlined in the plan.**

PNM RESPONSE:

PNM agrees with this recommendation and has requested this information from Comverge. Comverge has agreed and is in the process of providing it. Achieving a statistically accurate result within a 10% margin of error at a 90% confidence level is a standard level of confidence.

- 8) **As it is not cost-effective, the Low-Income Energy Saver Kit Program should be discontinued. However, if it is reaching a hard-to-reach market not served by other programs, a redesigned program should be considered.**

PNM RESPONSE:

PNM has included two new, cost-effective energy efficiency programs aimed specifically at low-income customers in the program filing that is currently under review by the NMPRC.

- 9) **Given the high installation rate reported by participants in the CFL Exchange Program, it should be continued, but with improvements. The tracking system used was not ideal and lacked important information.**

PNM RESPONSE:

If approved, this program will continue for one more year. PNM is working with Sierra Club, who implements the program, to make the improvements suggested by KEMA.

10) PNM should explore new ways to demonstrate the Advanced Evaporative Cooling technology and increase awareness.

PNM RESPONSE:

As part of the electric energy efficiency filing in Case No. 08-00204-UT, PNM has proposed to move this program to a new Market Transformation Program. This program would not be subject to the cost-effectiveness threshold, and part of its focus would be to promote emerging technologies such as Advanced Evaporative Cooling.

11) PNM should require engineering review of calculation methods, and in some cases measurement, before approval of any Large Customer Self-Direct Application. A system could be set up for the M&V contractor to review any calculations early on to help determine the best approach to quantifying energy savings.

PNM RESPONSE:

The PNM self-direct program manager has conducted an engineering review of all applications received and PNM will continue that practice in future. PNM's analysis was validated by KEMA in their report. KEMA will be informed of any new applications that PNM receives in 2009 to allow for timely review and verification of projects.

Energy Efficiency Rule Reporting Requirements

This section of the annual report follows the reporting requirements and section headings as specified in the NMPRC Energy Efficiency Rule Section 17.7.2.13.C.

C. (1) Independent Measurement and Verification Report

PNM contracted with RLW Analytics, Inc. (which was acquired by KEMA in January 2009) to conduct the independent evaluation of the electric energy efficiency programs. KEMA's report titled "Evaluation, Measurement and Verification of PNM's Electric Energy Efficiency Programs – October 2007 – December 2008 Program Year" is submitted with this report.

C. (2) Program Expenditures Not Included in the M&V Report

The expenditures for all programs for program year 2008 as of December 31, 2008 were \$7,997,915. These expenditures include all expenses incurred by PNM to develop and implement the programs. In order to complete the 2008 M&V Report in a timely manner and allow PNM to incorporate the results of the M&V Report into this annual report, KEMA required final budget and participation data by December 15, 2008. The total program expenditures reported to KEMA as of December 15, 2008 were \$ 6,124,812, which covers the period from October 1, 2007 through December 15, 2008. The difference between PNM's annual program expenses for program year 2008 and the annual expenses reported to KEMA are due to the slightly different time periods and to year-end program invoices that were either received late in December or received in January and accrued to program year 2008 expenses.

C. (3) Budgeted Funds Not Spent in Program Year 2008

There were no approved funds that were not spent in program year 2008. The program budget as approved by the PRC as of August 28, 2007 was \$7,631,621. Total expenses as of December 31, 2008 were \$7,997,915. Therefore, \$384,294 above the approved budget was spent in program year 2008. The following table shows the budgeted amounts, the actual expenditures and the variances.

Cost Category	Approved Budget	Actual	Variance
Administration	\$ 388,892	\$ 753,279	\$ 364,388
Promotion	\$ 306,000	\$ 300,403	\$ (5,597)
M&V	\$ 341,146	\$ 181,276	\$ (159,870)
Incentives	\$ 2,139,700	\$ 1,296,342	\$ (843,358)
Third Party Costs	\$ 4,437,883	\$ 5,466,614	\$ 1,028,731
Total	\$ 7,613,621	\$ 7,997,915	\$ 384,294

C. (4) Material Variances in Program Costs

Actual expenditures in program year 2008 were about 5 percent above the approved budget. The most significant differences were third-party costs and incentives which somewhat offset each other. Third party costs were significantly higher due to higher than anticipated participation in some programs, in particular the load management programs, PNM Power Saver and PNM Peak Saver. The lower amount for incentives was due primarily to lower than expected participation in some programs such as Energy Star Home and Business Lighting. Also, in the original budget, \$450,000 was included in the incentive category for the Energy Saver Kit program, whereas in the annual report it is reported under third party costs.

C. (5) Tariff Reconciliation

Beginning with the first billing cycle of October 2007, PNM implemented Rider 16 and Rider 1 on all affected customers' bills. This rider was set at 1.288 percent of bills based on the projected annual program costs of \$7,613,621. As of December 31, 2008 PNM had recovered a total of \$9,510,455. Actual expenses for program year 2008 were \$7,997,915, which results in an over collection of \$1,512,540. PNM has proposed in its most recent energy efficiency program plan filing, Case No. 08-00204-UT, that this over-recovered amount be subtracted from the projected annual budget for program year 2009, which would be collected through Rider 16 and Rider 1 during 2009 and 2010.

C. (6) Cost Allocation and Expenses by Program

All energy efficiency expenses including all labor, materials, third-party expenses and any other program costs are tracked through a unique set of account numbers. Likewise, all revenue collected through Rider 16 and Rider 1 is booked to a special regulatory asset account which is balanced against the expenses. These costs and revenues are kept separate from PNM's rate base accounting, therefore there is no cross-subsidization. The following table shows the allocation of costs to the various programs for program year 2008.

Programs	Administration	Promotion	M&V	Incentives	Third-Party Costs	Total Costs
Refrigerator Recycling	\$ 127,630	\$ 30,050	\$ 30,714	\$ 239,696	\$ 921,055	\$ 1,349,146
Residential Lighting	\$ 170,155	\$ 49,550	\$ 40,948	\$ 834,811	\$ 703,204	\$ 1,798,668
Energy Star Home	\$ 11,882.16	\$ 33,171.30	\$ 2,859.44	\$ 77,690.68	\$ -	\$ 125,604
Residential Advanced Evap	\$ 3,495	\$ 29,894	\$ 841	\$ 2,715	\$ -	\$ 36,945
Business Advanced Evap	\$ 3,311	\$ 29,866	\$ 797	\$ 1,026	\$ -	\$ 35,000
Business Lighting	\$ 21,510	\$ 60,288	\$ 5,176	\$ 140,403	\$ -	\$ 227,378
PNM Power Saver	\$ 280,407	\$ 33,243	\$ 67,480	\$ -	\$ 2,582,989	\$ 2,964,120
PNM Peak Saver	\$ 98,819	\$ 29,077	\$ 23,781	\$ -	\$ 892,914	\$ 1,044,591
CFL Exchange	\$ 12,328	\$ 4,173	\$ 2,967	\$ -	\$ 146,029	\$ 165,497
Energy Saver Kit	\$ 23,742	\$ 1,090	\$ 5,713	\$ -	\$ 220,422	\$ 250,967
Total	\$ 753,279	\$ 300,403	\$ 181,276	\$ 1,296,342	\$ 5,466,614	\$ 7,997,915

The PNM energy efficiency department consisted of five full-time staff members as of December 31, 2008. Staff time in 2008 was spent on the existing electric energy efficiency programs, developing new electric programs, and managing existing gas programs. Also included in the administration category is allocation to all programs of \$184,614 in development expenses which are being recovered over a three year period.

PNM's direct promotional expenses for program year 2008 were primarily for preparation of brochures and forms and for a general advertising campaign intended to raise awareness of all of PNM's energy efficiency and load management programs. Several of the programs that are implemented through third-party contracts have extensive promotional activities included in third party expenses. These include Refrigerator Recycling, Residential Lighting and PNM Power Saver and Peak Saver. (Please see the Promotional Activities section below for more details on specific promotional activities).

Measurement and Verification expenses were allocated based on the total actual costs of each program.

C. (7) Program Specific Metrics

The following tables present program-specific information, including forecasted savings, actual achieved savings, the number of participants, net participant costs, the cost per kWh of saved energy, the economic benefits realized in 2008 and the economic benefits to be expected over the life of the measures. The labeling of items a) through g) correspond to the items listed in section 17.7.2.13.C(7) of the Rule. Please see the above section for the utility costs by program and Appendix A for avoided cost information which responds to item (d) in the Rule.

Programs	(a) Forecasted Savings (kWh)	Achieved Savings (kwh)	Achieved Savings (kw)	Achieved Lifetime Savings (kWh)
Refrigerator Recycling	6,169,495	5,745,401	939	57,454,010
Residential Lighting	12,818,828	24,141,840	5,533	193,134,720
Energy Star Home	415,240	157,776	93	4,733,280
Residential Advanced Evap	129,200	12,920	11	206,720
Business Advanced Evap	96,900	3,876	3	62,016
Business Lighting	5,655,201	2,042,949	322	14,300,640
PNM Power Saver	NA	NA	27,365	NA
PNM Peak Saver	NA	NA	20,000	NA
CFL Exchange	1,536,000	1,942,080	445	15,536,640
Energy Saver Kit	862,200	130,275	22	911,925
Lrg. Customer Self-Direct	NA	1,034,348	129	15,515,220
Total	27,683,064	35,211,465	54,862	301,855,171

Programs	(b) Program Participants	Program Units	(c) Participant Costs	(e) Cost per kWh Saved	(f) 2008 Economic Benefits	(g) NPV of Total Economic Benefits
Refrigerator Recycling	8,537	8,537	NA	\$ 0.02	\$ 364,233	\$ 4,501,851
Residential Lighting	125,739	1,005,910	\$ 3,158,651	\$ 0.01	\$ 1,689,019	\$ 16,778,251
Energy Star Home	152	152	\$ 262,485	\$ 0.03	\$ 42,663	\$ 715,874
Residential Advanced Evap	10	10	\$ 6,785	\$ 0.18	\$ 1,910	\$ 23,765
Business Advanced Evap	2	2	\$ 2,974	\$ 0.56	\$ 573	\$ 7,130
Business Lighting	89	27,799	\$ 174,282	\$ 0.02	\$ 130,232	\$ 1,180,731
PNM Power Saver*	16,686	16,686	NA	NA	\$ 3,462,483	\$ 31,794,210
PNM Peak Saver*	45	45	NA	NA	\$ 2,527,360	\$ 16,458,013
CFL Exchange	20,230	80,920	NA	\$ 0.01	\$ 135,872	\$ 1,349,719
Energy Saver Kit	675	675	NA	\$ 0.28	\$ 35,312	\$ 232,949
Lrg. Customer Self-Direct	2	2	NA	NA	NA	NA
Total	172,167	1,140,738	\$ 3,605,178	\$ 0.013	\$ 8,389,658	\$ 73,042,493

*NPV of Total Economic Benefits based 10 year contracts

The various categories are described below:

- (a) Forecasted savings are based on the target participation levels for program year 2008 as approved in NMPRC Case No. 07-00053-UT.
- (a) Achieved savings were determined by applying the validated savings per participant for each program, adjusted for the free-rider rate, times the number of participants. Unit savings rates were adjusted based on the results contained in the 2008 M&V Report.
- (a) Achieved lifetime savings are annual savings times the useful life of the measure.
- (b) Program participants are those who participated in program year 2008. For some programs this value is estimated based on the number of units.
- (b) Program units are the number of measures installed or purchased.
- (c) Participant costs are the costs to purchase and install the measures less the rebates they received.
- (e) The cost per kWh saved is determined by dividing the program cost by the lifetime energy saved.

- (f) The 2008 economic benefit for each program was determined by multiplying the avoided cost of energy times the actual annual savings.
- (g) The net present value of the total economic benefits was determined by taking the discounted value of the annual avoided costs times the annual savings over the useful life of each program measure.

C. (8) Non-Energy Benefits

The following tables show the emission reductions and water savings associated with the portfolio of programs. The lifetime avoided emissions are determined by multiplying the emissions rates times the lifetime MWh and therms saved by the portfolio of programs.¹ The water savings are determined by multiplying PNM's average portfolio water consumption per MWh times the annual and lifetime energy savings.²

Emission Type	Avoided Electric Emissions Rate (lbs/MWh)	Avoided Gas Emissions Rate (lbs/therm)	Annual Avoided Emissions (tons)	Lifetime Avoided Emissions (tons)
SO2	1.5	-	52,817	452,783
NOx	3.0	0.091	106,479	921,024
CO2	1,459	1,170.8	62,244,405	639,296,344
Particulates	0.082	-	2,887	24,752

Water Impact	PNM Portfolio Water Consumption (gal/MWh)	Annual Water Saved (gal)	Lifetime Water Saved (gal)
Water Saved	484	17,042,349	146,097,903

C. (9) Rate of Return Impacts

All costs of the PNM Energy Efficiency Program are recorded under a special balancing account and are not included in base rates. The funds collected through Rider 16 and Rider 1 are used to offset the balance in this account. Therefore there is no impact on PNM's allowed rate of return.

C. (10) Self-Direct Programs

PNM received two applications for the self-direct program and both applications were approved. The PNM self-direct program manager reviewed the applications and communicated the approval to the customers and notified the Commission. The total cost to the customers of the two projects was \$99,098 and the total annual energy savings was 1,034,348 kWh. The simple payback periods for the two projects were 5.7 years and 1.6 years. One of the applications was submitted in time for independent evaluation by KEMA. The second application will be included in the 2009 independent evaluation.

¹ The avoided NOx emissions rate for gas combustion was taken from EPA's AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors. The avoided CO2 emissions rate for gas combustion was taken from U.S. Department of Energy - Energy Information Administration Instructions for Form EIA -1605. The electric emissions rates are taken from continuous emission monitoring or emission testing at PNM's generation facilities.

² PNM Portfolio Water Consumption is based on PNM's 2007 generation and purchased power mix.

Additional Program Information

This section of the report provides additional information about the energy efficiency programs in calendar year 2008, starting with a summary of promotional activities, followed by a few highlights on individual programs.

Promotional Activities

Program Kickoff

After the programs were launched on October 1, 2007, information about the programs including rebates forms were added to the PNM web site. Business and residential brochures were printed, which included information about the new programs. The brochures were used in a variety of venues including speakers bureau presentations. Packets of information about the new programs were sent to participating contractors. The PNM bill insert was also used throughout the year to promote the electric programs.

Within PNM, presentations were prepared and given to PNM Customer Service Representatives. PNM employees at large were also informed of the new programs through electronic communication.

Targeted Communication

The Business Lighting and Advanced Evaporative Cooling programs were two programs that were marketed directly by PNM. Because advanced evaporative air conditioning is an emerging technology without a strong marketplace presence, proactive communication about the program was done in a very targeted one-on-one manner with larger business customers and homebuilders who might be interested in alternative technologies as a way to save money and energy.

The Business Lighting program appeals to a broader market. However, mass media communication channels would have been an inefficient use of the promotional budget, so a five-part direct mail campaign to several thousand electric customer businesses promoted the benefits of the program. Area businesses and governments who had participated in the program were used as testimonial spokespersons for the Business Lighting program. The Albuquerque Public Schools, the City of Belen and SUMCO were among the participants featured.

The contractor-managed programs, PNM Power Saver and PNM Peak Saver, also used targeted communication strategies. With PNM input and guidance, a series of direct mail and email communications were sent to business and residential customers who qualified for PNM Power Saver, and to business customers who qualified for PNM Peak Saver. A special web site for PNM Power Saver was also developed, which gave responding customers detailed information and options for signing up for the program online.

Mass Media Communications

A PNM contractor coordinated newspaper and television advertising in support of the residential Refrigerator Recycling program from March through September 2008. In the third quarter of 2008, a broad-based energy efficiency communication campaign titled “Bright Idea – Save Energy, Save Money” was developed to help increase the awareness of PNM energy efficiency programs across the PNM customer base. Launching in October 2008, newspaper, radio, and the PNM bill were used to develop customer awareness statewide. In addition, outdoor advertising in

the Albuquerque area was purchased for additional reach into the marketplace. An innovative online campaign was also used in which online activity was tracked to determine interest level. When it could be established that the individual on line was interested in energy efficiency or related topics, a PNM banner ad appeared on a web site page.

Residential Lighting

There were a total of 139 participating retail stores in PNM's Residential Lighting program, 73 in the Albuquerque metro area and 66 throughout the rest of PNM's service territory. These stores included large DIY stores, buying clubs, discount retailers, drug stores, grocery stores, and independent hardware stores. Each participating retailer had point-of-sale materials describing the benefits of CFLs and information on the discounts provided by the program.

Refrigerator Recycling

JACO Environmental, Inc., PNM's third-party contractor for the Refrigerator Recycling program, has established a recycling center in Albuquerque. The facility disassembles all of the refrigerators and freezers collected through the program. The average age of the recycled refrigerators in program year 2008 was 23 years. The local recycling facility employs 12 people. The 8,537 refrigerators and freezers recycled in 2008 as part of the PNM Refrigerator Recycling Program prevented the emission of approximately 85,370 tons of CO₂ and CO₂ equivalents into the atmosphere.

ENERGY STAR® Home

The Energy Star Home program had 32 participating contractors. Four of those contributed about 80% of the qualifying homes.

School CFL Exchange

The Sierra Club provided volunteers to implement this program. Sierra Club estimates that over 120 volunteers have participated at the various distribution events which included presentations at schools and distribution of bulbs at various community events. Sierra Club also partnered with the faith community to organize events for distributing bulbs and information on energy efficiency.

PNM Peak Saver and Power Saver

PNM's load management programs, PNM Peak Saver and PNM Power Saver, were successfully utilized to offset the need for peaking resources during the summer of 2008. The following table provides a summary of the events.

Event Date	Length (hrs)	Event Performance (kW)	Peak Saver	Power Saver
6/6/08 (Test)	1	7,981	√	
6/16/2008	4	21,103	√	√
6/17/2008	4	20,988	√	√
7/30/2008	5	25,747	√	√
7/31/2008	5	27,100	√	√
8/1/2008	4	28,113	√	√

Appendix A – PNM Avoided Costs

The following table provides the avoided energy costs used in the TRC model. These costs are based on the avoided costs used in PNM’s 2008 Integrated Resources Plan (IRP).

	Winter Peak Energy	Winter Off-Peak Energy	Summer Peak Energy	Summer Off-Peak Energy	Summer Capacity
Units:	\$/kWh	\$/kWh	\$/kWh	\$/kWh	\$/kW-yr
2009	0.078	0.078	0.078	0.078	91.713
2010	0.087	0.087	0.087	0.087	94.006
2011	0.089	0.089	0.089	0.089	96.356
2012	0.092	0.092	0.092	0.092	98.765
2013	0.095	0.095	0.095	0.095	101.234
2014	0.097	0.097	0.097	0.097	103.765
2015	0.100	0.100	0.100	0.100	106.359
2016	0.103	0.103	0.103	0.103	109.018
2017	0.106	0.106	0.106	0.106	111.743
2018	0.109	0.109	0.109	0.109	114.537
2019	0.113	0.113	0.113	0.113	117.400
2020	0.116	0.116	0.116	0.116	120.335
2021	0.120	0.120	0.120	0.120	123.344
2022	0.123	0.123	0.123	0.123	126.427
2023	0.127	0.127	0.127	0.127	163.986
2024	0.131	0.131	0.131	0.131	168.086
2025	0.135	0.135	0.135	0.135	498.682
2026	0.139	0.139	0.139	0.139	511.149
2027	0.144	0.144	0.144	0.144	523.928
2028	0.149	0.149	0.149	0.149	537.026
2029	0.153	0.153	0.153	0.153	550.451
2030	0.158	0.158	0.158	0.158	564.213
2031	0.164	0.164	0.164	0.164	578.318
2032	0.169	0.169	0.169	0.169	592.776
2033	0.175	0.175	0.175	0.175	607.595
2034	0.181	0.181	0.181	0.181	622.785
2035	0.187	0.187	0.187	0.187	638.355
2036	0.193	0.193	0.193	0.193	654.314
2037	0.200	0.200	0.200	0.200	670.672
2038	0.207	0.207	0.207	0.207	687.438
2039	0.214	0.214	0.214	0.214	623.908
2040	0.222	0.222	0.222	0.222	639.506

Appendix B – RLW (KEMA) Research Plan

FINAL Research Plan
Evaluation Measurement and Verification
(EM&V) of
Public Service Company of New Mexico's
Electric Energy Efficiency Programs
July 16, 2008

Prepared for



*A personal commitment
to New Mexico*

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Prepared by

A handwritten signature in black ink, appearing to be "RLW", written over a horizontal line.

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Introduction

This document is the Draft Research Plan to assess and evaluate the Public Service Company of New Mexico's (PNM) portfolio of energy efficiency and load management programs for program years 2007-08 and 2009. RLW Analytics and KEMA form the RLW Team and will carry out all tasks described in this document. The document includes summaries of the programs, evaluation activities, task descriptions and schedule. Sample design memos and survey instruments will be attached to the document on an ongoing basis as addendums. RLW will manage an FTP site accessible by PNM to include the final plan, final sample design memos and

Program Goals and Background

The Efficient Use of Energy Act requires New Mexico's public utilities, in collaboration with other parties, to develop cost-effective programs to reduce demand and energy consumption. Utilities are required to submit their proposed portfolio of programs to the New Mexico Public Regulation Commission (NMPRC) for approval. As part of this approval process, cost-effectiveness of the program portfolio must be demonstrated utilizing the total resource cost ratio test (described in Task 7.1).

In August of 2007 the NMPRC approved these ten residential and commercial rebate programs which PNM began offering in October of 2007. The portfolio carries a total annual budget of \$7.614 million.

- **Home Lighting Program**
- **Residential Refrigerator Recycling**
- **Business Lighting Rebate**
- **PNM Peak Saver & PNM Power Saver**
- **Energy Saver Kit Direct Install**
- **CFL Exchange Program**
- **ENERGY STAR Home**
- **Residential & Commercial Advanced Evaporative Cooling**
- **Large Customer Self-Direct Applications**

The projected program participation and savings goals in the ten components of the electric efficiency rebate programs are listed in Table 1 below. Table 2 highlights the main features of each program. The Self Direct Program is not included in these tables but is described below.

Projected Program Goals		
Program	Year One Participation Target	Year One Savings Target
Home Lighting Program	65,167	12,818,828 kWh
Residential Refrigerator Recycling	10,000	6,169,495 kWh
Business Lighting Rebate	375	5,655,201 kWh
PNM Peak Saver & PNM Power Saver	6,815 Residential	8 MW Residential
	N/A Commercial	23 MW Commercial
Energy Saver Kit Direct Install	1,350	862,200 kWh
CFL Exchange Program	10,000	1,536,000 kWh
ENERGY STAR® Home	400	415,240 kWh
Residential & Commercial Advanced Evaporative Cooling	100 Residential	129,200 kWh Residential
	50 Commercial	96,900 kWh Commercial

Table 1: Projected Program Goals

Electric Energy-Efficiency Programs	
Home Lighting Program	Discounts on select CFLs at participating hardware stores or at PNM's EFI online store
Residential Refrigerator Recycling	\$30 rebate on each recycled refrigerator or freezer
Business Lighting Rebate	Rebate of \$1.75-\$75 for qualifying CFLs, T8s, T5s, HIDs, LED exit signs and occupancy sensors
PNM Peak Saver & PNM Power Saver	Rebate of \$25 each fall for summer participation for residential and small to medium commercial customers, large commercial participants receive an incentive based on the amount of electricity managed
Energy Saver Kit Direct Install	Energy audit and efficiency measure installation to income eligible customers (150% of poverty)
CFL Exchange Program	PNM funded program to exchange incandescent bulbs with CFLs in elementary schools and community events
ENERGY STAR® Home	\$500 rebate to homebuilders for each U.S. EPA certified Energy Star home
Residential & Commercial Advanced Evaporative Cooling	\$300-\$400 rebate on qualifying residential units, \$300-\$500 rebate for qualifying commercial units

Table 2: Program Descriptions

Description of Rebate Programs

Home Lighting Program

APT, a subcontractor to PNM's third-party contractor EFI, is using markdown incentives, in the form of instant rebates, in large do-it-yourself stores, such as Lowe's and Home Depot, and buying clubs such as Costco and Sam's Club. The product offering in large do-it-yourself stores and buying clubs is limited to CFLs. APT has enlisted the participation of smaller retail stores which will be featuring instant coupons, as opposed to markdowns, for CFLs and ENERGY STAR lighting fixtures. The Home Lighting Discount program also features EFI's online store, which can be accessed via the PNM website. This store features ENERGY STAR CFLs and the rebate amount varies depending on the wattage of the CFL and whether it is a standard or specialty lamp. The program is promoted in alignment with the national ENERGY STAR lighting campaigns by promotional mailings such as PNM residential bill inserts, working with retailers in

their advertising, such as point-of-purchase displays and in-store presentations, and events by the third-party subcontractor.

Residential Refrigerator Recycling

The Refrigerator Recycling program is designed to encourage early retirement of old or unnecessary second refrigerators and freezers. The program will pay a \$30 incentive to customers who retire an operating refrigerator or freezer. PNM has contracted with JACO, Inc. to provide turnkey refrigerator recycling services. JACO is responsible for marketing the program, qualifying product eligibility over the phone and through their website, arranging appointments for refrigerator and freezer pick-up, transporting units to a recycling facility, and arranging for the de-manufacture and recycling of units. JACO is responsible for keeping records of all refrigerators collected and recycled as part of this program and provide this data to PNM in electronic form, which will allow tracking of energy savings. JACO will also be responsible for processing rebate forms and issuing incentives to program participants.

Business Lighting Rebate

Incentives are provided to commercial customers who replace existing lighting with energy-efficient lighting. To limit the number of free riders, this program is designed as a retrofit program, which means that in order to qualify for a lighting rebate, the new fixtures must be installed in place of current fixtures. This applies to incandescent, mercury vapor, magnetic ballast T12 or T8 fluorescent, and other high wattage ballast fixtures.

Implementation of this program is being primarily achieved through the lighting vendor and lighting and electrical contractor community. PNM is educating the participating contractors, electrical contractors, installation contractors, lighting distributors and lighting wholesalers on the program details and rebate requirements, which will allow contractors to in turn educate their customers and help them receive their rebate. PNM's commercial account managers are also playing a role in promoting this program to their customers. PNM is also presenting to various trade associations to help promote the program and its benefits.

PNM Peak Saver & PNM Power Saver

The Power Saver residential program offers residential customers an incentive and the opportunity to participate in limiting the system peak demand on the highest peak demand days of the year. Comverge, Inc. is implementing this program. Comverge is installing load control devices primarily on residential air-conditioning units which can be cycled on and off at PNM's request during peak days. Units are not turned off for long periods; rather they are cycled in groups to lower overall demand without affecting comfort significantly. Comverge is responsible for marketing the program, installing and maintaining all equipment, and tracking and reporting results. The program will cycle refrigerated air conditioners on and off during peak load periods. PNM system operators will decide when an event should happen and communicate this to Comverge. Capacity delivered under this program must respond within ten minutes of notification.

The Peak Saver program offers non-residential customers an incentive and the opportunity to participate in limiting the system peak demand on the highest peak demand days of the year. Comverge, Inc., and EnerNOC, Inc., will implement this program. Comverge will install load control devices similar to the residential devices on small (<50 kW) commercial facilities and will install more sophisticated devices on medium (50 to 150 kW) commercial facilities. EnerNOC will install energy management systems on medium to large (> 150 kW) commercial facilities. The program will control air conditioning, lighting, manufacturing process equipment and other loads during peak load periods. PNM system operators control operation of the equipment. Capacity delivered under this program must respond within ten minutes of notification.

Energy Saver Kit Direct Install

The goal of the Energy Saver Kit program is to assist income-qualified residential customers with their efforts to reduce their energy bills. This program is administered by the Mortgage Finance Authority (MFA) and implemented through their network of sub-grantees located throughout the state. Each of the four agencies is assigned a group of counties, and each is assigned a portion of the kits based on census data from the counties they serve.

All items from the Energy Saver Kits are being installed as needed and appropriate in each qualifying home. Originally all items not installed in the home were to be left with the homeowner, along with instructions on how to self-install each item. However, PNM has requested that contractors collect all items not used. To be eligible homeowners must have incomes relative to family size at or below 150% of federal poverty guidelines, but due to the scarcity of resources, priority is given to the lowest income households. MFA also administers PNM's Gas Efficiency Low-Income Weatherization Program.

CFL Exchange Program

PNM is funding a CFL Exchange Program in partnership with the Sierra Club. PNM is funding 40,000 CFLs to be exchanged for traditional incandescent light bulbs at forty elementary schools and several community events in Albuquerque and Santa Fe. Sierra Club volunteers will contact school officials; set a presentation calendar; staff all school assemblies, presentations and turn-in events; and collect M&V data for PNM. The Sierra Club has also agreed to plan, staff and execute public CFL exchange events held between Fall 2007 and Spring 2008.

ENERGY STAR Home

Homes that earn the ENERGY STAR Home rating must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. ENERGY STAR qualified homes are at least 15% more energy efficient than homes built to the 2007-08 International Energy Conservation Code (IECC). ENERGY STAR qualified homes can include a variety of energy-efficient features, such as effective insulation, high performance windows, tight construction and ducts, efficient heating and cooling equipment and ENERGY STAR qualified lighting and appliances. Homebuilders must register with the EPA as ENERGY STAR Partners in order to have any of the homes they build ENERGY STAR qualified.

Residential & Commercial Advanced Evaporative Cooling

This program is intended to educate residential customers, contractors, homebuilders, and suppliers of air conditioning (AC) equipment about the many advances in evaporative technology. This program offers a rebate on an indirect cooling module that mounts in front of single-inlet evaporative cooling equipment, as well as any indirect evaporative technology.

Large Customer Self-Direct Applications

The self-direct option allows qualifying customers (those using more than 7 million kWh annually) to offset up to 70% of the Energy Efficiency Fee tariff rider on their bill provided they have completed energy efficiency measures that meet certain criteria. Large customers must submit an engineering study and other information such as invoices and product data for approval by PNM. Projects must have been completed after January 1, 2005 and have a simple payback of between one and seven years. The PNM self-direct program administrator may request additional information before approving or rejecting the application. Approved project expenditures are applied to the Energy Efficiency Fee to offset up to 70% of the fee. Approved projects are subject to verification by the independent evaluator and the results will be included in the annual report.

Goals of the Evaluation

RLW understands that the objectives of this study are to:

- ❑ Develop a detailed study plan of EM&V activities
- ❑ Develop a project management framework that includes reporting, schedule, and issue resolution
- ❑ Develop a sampling plan to be used for all programs
- ❑ Evaluate resource savings related to the efficiency programs
- ❑ Acquire data from necessary sources including PNM and its contractors
- ❑ Evaluate the cost effectiveness of each program in the Portfolio using the Total Resource Cost test
- ❑ Perform field checks to verify product purchase and installation
- ❑ Provide yearly reporting which may include: documentation of program expenditures, estimation of program savings and, evaluation of program cost effectiveness, and program improvement recommendations.
- ❑ All databases, data, analyses, and reports created will be made available to PNM, and reasonable support provided.

Due to reporting requirements, the PY08 Evaluation will be based on a final tracking database snapshot on December 1, 2008, which will include the first fourteen months of the 2007-08 program (10/07 to 12/08). The PY09 report will be based on the next twelve months of program tracking data (12/1/08 to 12/1/09). Participant rebates processed after 12/1/09 will not be evaluated in either report.

RLW is pleased to submit this work plan for the measurement and verification of Public Service Company of New Mexico's (PNM) electric energy efficiency programs for PY 2007-08 and 2009. We foresee the life of this project commencing in March 2008 and concluding by February 2010, assuming that all dependencies are completed in a timely fashion. During that time we are looking forward to helping PNM build a strong evaluation framework.

Work Plan

This section of the proposal is organized in the following order:

- **Overview of Impact Evaluation Methodology**– overarching evaluation philosophy for designing program evaluation studies
- **Program Summaries**– RLW team's understanding of the programs and our approach for determining **Gross Savings** and **Net Savings (where applicable)**
- **Task by Task Description of the Evaluation** - In this section we outline each task RLW will perform in order to meet the goals of the evaluation.

Overview of Impact Evaluation Methodology

Any set of evaluation protocols must take a long-term view of the information needs of the stakeholders. Evaluation studies are used to take the pulse of the market, and are designed to look at program issues as the program offering matures. Initial "First Look" evaluations look at how the program is working for early adopters, and is designed to provide timely feedback to the program design team and implementers. It looks carefully at actual impacts, while respecting that program delivery is evolving and there may be barriers to participation. Second year evaluations benefit from implementing first year recommendations and have reduced planning needs. However, third year studies refocus on detailed assessments of impacts, program delivery, and customer satisfaction, and begin to address measure retention. Evaluation tasks in following years follow a similar cycle. Appropriate analysis tasks will change as the program evolves and will vary from year to year.

The RLW team has approached this RFP based on this evaluation framework. Therefore, this first year impact evaluation will encompass as much data collection and analysis as can be afforded. We also propose a separate planning task to allow for tasks such as refinement of tracking data to improve sampling and overall measurement and verification plans. In the following sections we discuss the general evaluation approach RLW will take toward satisfying the goals of the first year impact evaluation. General high level discussion is followed by program specific summaries and approaches.

Sampling

Sampling arises whenever there is a need to collect information about a sample of units in a population in order to estimate the collective characteristics of all units in the population. The central challenge of sample design is to guide the selection of projects so that findings from a sample can be extrapolated to a target population without bias and with measurable statistical precision. In addition, sample design helps to identify the size of the sample needed for a given level of precision, or to identify the statistical precision to be expected from a given sample size. The sample design for each program will be quite unique including a multifaceted upstream approach to Home Lighting Discount Program, a census tracking data analysis for the Refrigerator Recycling Program, and nested telephone and onsite double sampling for Business Lighting Program.

RLW will conduct telephone surveys and/or onsite inspections with statistically representative samples of program participants for each energy efficiency program to estimate the number of measure installations and impacts achieved by the program. Essentially there are no samples for the Refrigerator Recycling Program and Load Management Programs as they rely solely on tracking data, implementer metered data, and/or PNM whole premise 15-minute data for the entire program population. Sample sizes for the three largest remaining energy efficiency programs, Upstream Lighting Discount, Business Lighting, and Energy Saver Direct Install, were planned to achieve a relative precision of 10 percent at the 90 percent level of confidence. The preliminary planned samples are presented in Table 3. If the programs have less participation than the planned sample size in a given year, a census will be attempted for all participants. The final sampling will be performed after receipt of tracking data and optimized at the portfolio level.

Telephone		
Program	Estimated n - 2008	Estimated n - 2009
Home Lighting Program	200 in store (100 follow-up phone)	150 in store (75 follow-up phone)
Residential Refrigerator Recycling	100	80
Business Lighting Rebate	70	70
CFL Exchange Program	70	N/A
Energy Star Home	~ 10 builder interviews	80 part 100 non-part
Residential & Commercial Adv. Evaporative Cooling	20	30

Onsite		
Program	Estimated n - 2008	Estimated n - 2009
Business Lighting Rebate	20	20
Energy Saver Kit Direct Install	40	30
Energy Star Home	TBD	40 part 40 non-part
Residential & Commercial Adv. Evaporative Cooling	5	10

Manufacturer/Retail Interviews		
Program	Estimated n - 2008	Estimated n - 2009
Home Lighting Program	6 manufacturers, 12 retailers	TBD

Table 3: Preliminary Sample Sizes

Gross Savings

The RFP suggests using secondary research and existing data in conjunction with on-site inspections to evaluate the impact of the program. RLW concurs with this approach given the significant amount of research and analysis that already exists for PNM's portfolio of measures. There is not one single source that RLW would recommend using to inform the analysis, rather our approach would draw from numerous data sources and studies in order to determine the gross savings resulting from the installation of the various measures.

A major task for this evaluation study will include a thorough review of studies conducted to evaluate the energy savings resulting from the measures PNM will be offering. The RLW team has significant experience conducting research for the energy efficiency measures in question and has compiled the data. Most of our research has been done for program planning and evaluation contracts with similar goals and objectives. Based on our knowledge of the measures we would recommend using the following data sources.

Net-to-Gross Analysis

Net savings represent the energy savings that are a direct result of the program and do not include savings associated with free-ridership. Since most of PNM's energy efficiency programs are new, RLW recommends determining net-to-gross adjustment factors at the measure level. The RLW team will implement different data collection initiatives to estimate net-to-gross ratios; these include manufacturer and retailer interviews, participant self-report surveys, consumer phone interviews, and on-site visits.

Free-Ridership Analysis

In order to assess the impact of free-ridership on the program and to get a better understanding of how well the program design is working, RLW will perform telephone surveys with a statistically representative sample of participating customers. The RLW team has significant experience designing telephone and on-site questionnaires to elicit information from customers for understanding market conditions, baseline practices, decision making processes, and attitudes and satisfaction with regard to program services. All of these are important areas of program design and evaluation and will be included in RLW's telephone and on-site survey instruments.

Cost Effectiveness

Using PNM's final cost accounting system, RLW will conduct the cost effectiveness analysis. RLW is extremely familiar with conducting cost effectiveness analysis for California programs, which are regulated by the *California Standard Practice Manual (SPM): Economic Analysis of Demand Side Management Programs*, for testing Program cost effectiveness. Two primary cost-effectiveness tests are used to value mandated programs, they are the Total Resource Cost (TRC), societal version, and the Participant Test (PAC). To be considered cost-effective, programs must demonstrate a minimum TRC of 1.0, which in short means that the present value of the benefits outweigh the present value of the costs.

The key factors associated with Program cost-effectiveness that influence the TRC include:

- Benefits are measured by avoided costs, not energy or demand,
- TRC considers the present value of lifecycle benefits and costs,
- The greater the measure's effective useful life, EUL the greater the benefits,
- For the TRC, expenditures by the Program are just as important as participant related expenditures

Using the data resulting from the gross, net and measure cost analysis, RLW will compute a TRC and a PAC in order to determine ex post cost effectiveness values. In advance of making any changes RLW will present all suggested modifications to the cost-effectiveness parameters. The presentation will show impacts resulting from changes and rationale behind RLW's modifications. The EM&V Team and the stakeholders will openly discuss the merits of the proposal in order to come to final understanding and agreement. For each measure (unit), the following ex ante parameters will be assessed and compared to ex post parameters:

- Annual kWh and kW Savings
- Effective Useful Life
- Gross Incremental Measure Cost
- Net-to-gross ratios

It is fairly typical for residential programs to struggle to be cost-effective, mainly because measures do not produce nearly the savings they do in commercial settings, it is difficult to convince or educate residential customers to adopt multiple measures, and first cost and other key market barriers further complicate measure adoption.

For this analysis we will strive to find ways to improve cost effectiveness by working with the structure of the cost effectiveness calculations.

Program Summaries

Background

The Efficient Use of Energy Act requires New Mexico's public utilities, in collaboration with other parties, to develop cost-effective programs to reduce demand and energy consumption. Utilities are required to submit their proposed portfolio of programs to the New Mexico Public Regulation Commission (NMPRC) for approval. As part of this approval process, cost-effectiveness of the program portfolio must be demonstrated utilizing the total resource cost test. PNM filed a portfolio of energy efficiency and load management programs with the NMPRC on January 31, 2007 and gained approval for the portfolio in time to begin program implementation in August 2007. The estimated annual budget for the electric energy efficiency programs will be approximately \$7.614 million.

The 2008-10 PNM portfolio measurement and verification will require several approaches specific to each program while optimizing cost effectiveness and reliability. The total portfolio budget and a majority of expected energy and demand savings focus the evaluation to the Home Lighting, Refrigerator Recycling, and Commercial Lighting Energy Efficiency Programs and the Residential and Commercial Peak Saver Load Management Programs. The three large energy efficiency programs account for 89 percent of electric (kWh) savings and the load management programs account for 95 percent of demand (MW) savings. The other energy efficiency programs include the Energy Saver Direct Install, Energy Star Homes, School CFL Exchange, and the Residential and Commercial Indirect Cooling programs. The following section briefly describes the programs in this order with specific evaluation approaches

A. Home Lighting Program

APT, a subcontractor to PNM's third-party contractor EFI, is using markdown incentives, in the form of instant rebates, in large do-it-yourself stores, such as Lowe's and Home Depot, and buying clubs such as Costco and Sam's Club. The product offering in large do-it-yourself stores and buying clubs is limited to CFLs. APT has enlisted the participation of smaller retail stores which will be featuring instant coupons, as opposed to markdowns, for CFLs and ENERGY STAR lighting fixtures. The Home Lighting Discount program also features EFI's online store, which can be accessed via the PNM website. This store features ENERGY STAR CFLs and the rebate amount varies depending on the wattage of the CFL and whether it is a standard or specialty lamp. The program is promoted in alignment with the national ENERGY STAR lighting campaigns by promotional mailings such as PNM residential bill inserts, working with retailers in their advertising, such as point-of-purchase displays and in-store presentations, and events by the third-party subcontractor.

Gross Savings

The RLW team proposes to use a combination of primary data collection and analysis with evaluation results developed through large, well-funded studies in nearby jurisdictions to produce what we believe to be the most accurate possible estimate of Home Discount Lighting Program savings given budget constraints. The following data sources will be used:

- Manufacturer/retailer interviews and "transactions" audit: In-depth interviews with participating retailers and manufacturers to assess program impacts on shipments and merchandising practices.

- Consumer in-store intercept surveys: Interviews to assess effect of in-store displays and program-related pricing on purchase of CFLs.
- Consumer intercept follow-up telephone surveys. Telephone interviews to explore CFL disposition, location (related to hours of use), wattage of lamps replaced.
- Metering studies in other jurisdictions

Steps in the analytical process. The RLW team will use the following steps to estimate electric energy and demand savings attributable to the Home Lighting Discount Program using the following steps.

1. **Estimate gross energy savings.** First-year gross electricity savings will be estimated using a simple engineering model of savings as shown in Equation 1. Parameters in this model will be estimated as described below.

Equation A1: First-Year Gross Electricity Savings Calculation

CFL	Average	Average Hours	Days	= kWh savings
Install Rate	Change in	of Use per Day	per	per year per
X	X	X	Year / 1000	bulb

Installation Rate. We will rely on data collected through the Consumer Intercept Follow-up Survey to estimate the distribution of time-to-installation for CFLs. Data from this survey will also be used to develop relationships among bulb acquisition, installation and storage rates, and to develop a profile of household CFL usage patterns. As discussed below this survey will be administered to all consumers who participated in the retail location intercepts.

- Information collected for each household in each wave will include:
- Number of CFLs in storage
- Number of CFLs purchased in the past 3 months
- Number of CFLs currently in sockets by location/application type
- Number of CFLs installed (put into sockets) in the past 3 months

Additional questions may be added to the survey to ask the number of CFLs purchased and installed since the initial program discounts in October 2007. Typically survey respondents are only asked to remember three months in the past as older recollections may be unreliable. The follow-up survey will focus on the installation of CFLs purchased at the time of the intercept.

The installation rate is typically applied conservatively and assumes stored CFLs replace CFLs originally installed in the first few months after purchase. This assumption is the most defensible and most likely to be applied, however the team will also review saturation studies for CFLs in New Mexico homes and explore options to modify the installation assumption if primary or secondary data suggest a less conservative assumption.

Delta Watts. The wattage of the bulbs being replaced by CFLs will be determined through surveys with CFL purchasers/users and confirmed through site visits.

Specifically, households using CFLs will be asked to indicate:

- The type of light bulb replaced (e.g., incandescent, CFL)
- The wattage of the light bulb replaced
- The location/application of the light bulb replaced
- Changes in hours of use since the light bulb was replaced for that socket and for other light fixtures in that room as a result of the installed CFL

Hours of Use. Developing primary data on lighting hours of use is expensive since it requires long-term metering of a large sample of lamps installed. The best data currently available come from the 2005 CFL metering study³ in which 369 homes with at least one interior CFL were metered during July 2003 through October 2004. The study attempted to meter all interior fixtures in which CFLs were installed and, on average, two fixtures were metered per household. The study provided estimates of hours of use by room, which can readily be transferred to other jurisdictions. The study also provided hourly profiles, which can be used as a basis for estimating coincident demand savings.

2. **Estimate gross kW impacts.** Gross demand savings will be calculated as shown in Equation 2 below. Installation rates and delta watts will be determined as described above. Average coincidence factors can be developed from meter data discussed above. RLW has also analyzed meter data to develop coincidence factors.

Equation A2: Gross Demand Savings Calculation

$$\text{CFL Install Rate } \times \text{Average Change in Wattage } \times \text{Average Coincidence Factor} / 1000 = \text{demand savings (kW)}$$

Net Savings

The Home Lighting Discount Program accounts for 46 percent of projected energy impacts in 2008. Moreover, characterization of program impacts on customer purchase decisions, given the relative lack of program visibility to the customer, constitutes the largest area of uncertainty in developing impact estimates. The RLW team will therefore implement two major data collection initiatives to estimate the net-to-gross ratio for the program. The first will be a series of in-depth interviews with manufacturers and retailers to assess how the program affected their decisions regarding quantities shipped into New Mexico versus into other states; merchandising efforts, including time- and area-limited promotions; pricing, stocking, and display. The results of this line of questioning will be used to structure stated-preference type questions to consumers regarding their recognition and response to changes in retailer promotion of compact fluorescent lamps. The manufacturer and retailer interviews will also seek assessments

³ “CFL Metering Study: Final Report,” prepared by KEMA, Inc. for PG&E, SCE and SDG&E, February 2005.

of free-ridership fractions, based on the market participants' observations of customer behavior before and after the promotions.

The second major effort will be a set of consumer intercept interviews conducted with purchasers of compact fluorescent lamps in participating retailer facilities. The consumer intercept interviews will be designed to capture the respondents' recall and assessment of the effects of the following potential influences on the customers' purchase decisions:

- Shopping/CFL purchase intent (e.g., impulse buy, planned purchase, etc.)
- Retail channel where CFL was purchased
- CFL price (initial versus discount)
- Product placement, signage, etc. (end-cap versus in-aisle)
- Product packaging (multi- versus single packs)
- CFL advertising
- Prior awareness/usage of CFLs
- Location/application for which CFL will be/is being used

We will design the study to provide data on what CFL purchasers would have done under alternative program scenarios. This data will come from both revealed preferences (observed purchases under alternative conditions) and stated preferences (consumers' statements of what they would have purchased with different pricing, packaging, or promotion). Depending on quality of the consumer data, we may explore constructing the demand curves using contingent valuation (CV) methods. We will attempt to identify a couple of points on the demand curve (i.e., would you have purchased if the price was \$x?). Also, depending on the length of the survey, the team will explore the option of utilizing a "double bounded" CV. This approach utilizes asking the respondent if he would have purchased at a price higher than actual price. If the answer is yes, the price is raised and the question is asked a second time. If the answer is no, the price is lowered (still higher than actual price) and the question is asked a second time. In the economic CV literature, this is the preferred approach as it produces significantly more efficient (lower standard errors) estimates.

B. Residential Refrigerator Recycling

The Refrigerator Recycling program is designed to encourage early retirement of old or unnecessary second refrigerators and freezers. The program will pay a \$30 incentive to customers who retire an operating refrigerator or freezer. PNM has contracted with JACO, Inc. to provide turnkey refrigerator recycling services. JACO is responsible for marketing the program, qualifying product eligibility over the phone and through their website, arranging appointments for refrigerator and freezer pick-up, transporting units to a recycling facility, and arranging for the de-manufacture and recycling of units. JACO is responsible for keeping records of all refrigerators collected and recycled as part of this program and provide this data to PNM in electronic form, which will allow tracking of energy savings. JACO is also responsible for processing rebate forms and issuing incentives to program participants.

Gross Savings

The RLW team will use data on refrigerators and freezers actually recycled by the program to enumerate a regression model that estimates UEC as a function of production date (age), type of unit (refrigerator or freezer), size, configuration, and various other features. KEMA developed and refined a model in other projects in which sufficient resources were available to meter the use of collected refrigerators according to Department of Energy Standards. The activities included in this step are as follows.

- The JACO database of recycled units includes all necessary data except for nameplate amperage. Nameplate amperage is necessary to use previously developed regression models that estimate UEC. Other appliance recycling impact evaluations have successfully filled the missing amperage data. They used data from a competing appliance recycling company that collects amperage data on the units it picks up. We believe we can get permission to use ARCA data for the purpose of filling the missing amperage data.
- Enumerate the model. The RLW team will use the model developed in other studies to estimate the UEC for each refrigerator or freezer for which a complete data record is available⁴. We will use the results of that process to estimate the mean UEC for units recycled by the project, as well as a 90 percent confidence interval for that estimate. If we are unable to provide amperage data for the JACO database to support the enumeration of the existing model, other approaches are available. For example, the AHAM database contains “as new” UECs for listed models. Model number look-ups can be used to estimate “as new” UECs for collected refrigerators and freezers. KEMA has estimated models of UEC degradation over time in the course of appliance recycling program evaluations.⁵ The “as new” UECs can be combined with the degradation models and information on unit age to estimate UECs at the time of recycling.

Net Savings

Appliance recycling programs are different from most other programs in that the measure is removal of a working unit rather than installation of an efficient unit in place of an inefficient unit. Moreover, the program goal is defined as removal of units not from participating homes but from the grid. We define the baseline for this program as the usage that would have occurred on the grid if the unit had not been destroyed. This usage that would have occurred in the absence of the program depends on what would have been used on the grid in place of the destroyed unit had it not been destroyed.

- For units that would otherwise have remained in the participant’s home as secondary units, the baseline usage is the full-year usage or Unit Energy Consumption (UEC), multiplied by the fraction of the year this secondary unit would have been in use.
- For units that would otherwise have been transferred to another user (given away, sold, or taken away and sold by a used appliance dealer) the baseline is the average usage of the units the would-be recipients would have acquired instead, if any.
- For units that would otherwise have been destroyed or taken permanently out of use without the program, baseline usage is 0.

⁴ KEMA, Inc. 2003. *Final Report: Measurement and Evaluation Study: 2002 Statewide Residential Appliance Recycling Program*. Rosemead, CA: Southern California Edison.

⁵ See KEMA, Inc. 2004. *2003 EM&V RARP Study: Verification, Degradation, & Market Potential Analysis*. Rosemead, CA: Southern California Edison.

The RLW team will use the results of surveys of program participants, results of recent surveys of disposers of used refrigerators, and the results of previous studies to estimate the proportion of units collected by the program that would have gone into each of the three disposition “bins” described above. We will use those same sets of data and information to assess the degree to removal of the refrigerator from the grid was attributable to the program. See Figure 2 for a graphic depiction of this sorting. The portions shown of program recycled units in the various categories are used as examples. They are based on the results of KEMA’s evaluation of the California statewide appliance recycling program. In addition to this type of assessment the PNM program may include additional savings attributable to the early replacement of refrigerators with more efficient models. Questions will be included in the participant survey to further investigate early retirement savings.

Discarder Survey

The evaluation approach for the Residential Refrigerator Recycling program utilizes the results of recent surveys of individuals who recently discarded refrigerators. An additional discarder survey could be added to the scope specific to the PNM program. This task was eliminated from the original proposed scope to optimize the overall evaluation budget. If the surveys are added to this scope of work, the workplan will be revised to reflect the additional tasks in this section.

What participants would have done with the unit without the program.	Percent of units recycled through the program	How participant would have disposed of the unit?	Percent of discarded units	How transferred units would have been used	What purchasers of used equipment would have done in the absence of available units	Percent of transferred units within service area	Attribution Assigned	Average Attribution (A)	Usage Factor (U)	Net-to-Gross Ratio (A*U)
Participant Survey		Disposer Survey		Previous Studies		Partic. Survey				
Kept Unused	5%						1.00	1.00	0.00	
Kept in Use	9%						1.00	1.00	0.88	
Discarded	86%							0.32		
		Destroyed	25%				0.00	0.00		
		Transferred	75%					0.43		
				Main				0.37	1.00	
				Bought New	34%	0.70	0.70			
				Bought or fixed similar	35%	0.00	0.00			
				Bought or fixed lower efficiency	5%	0.00	0.00			
				Acquired None	7%	1.00	1.00			
				Spare				0.65	0.88	
				Bought New	5%	0.70	0.70			
				Bought or fixed similar	4%	0.00	0.00			
				Bought or fixed lower efficiency	1%	0.00	0.00			
				Acquired None	9%	1.00	1.00			
Of total	100%		86%				66%			
All Units								0.41		0.35

Figure 2: Net to Gross Calculation

Expand sample results to the program level. The RLW team will use the following formula to estimate net energy savings at the program level:

$$E_y = N_y * UEC_m * A_m * U_m$$

Where:

E_y = Program-level energy savings in year y .

N_y = the number of units recycled by the program in year y .

A_m = Mean attribution factor as described above.

U_m = Mean usage factor for second refrigerators and freezers.

We will use essentially the same approach for estimating total demand savings, substituting mean unit kW reductions for UEC. Most programs use an estimate of mean unit kW reductions of 0.33 kW for refrigerators and 0.31 for freezers. The RLW may modify these estimates to reflect local information on the coincidence of refrigerator load with system peaks.

C. Business Lighting Rebate

Incentives are provided to commercial customers who replace existing lighting with energy-efficient lighting. To limit the number of free riders, this program is designed as a retrofit program, which means that in order to qualify for a lighting rebate; the new fixtures must be installed in place of current fixtures. This applies to incandescent, mercury vapor, magnetic ballast T12 or T8 fluorescent, and other high wattage ballast fixtures.

Implementation of this program is being primarily achieved through the lighting vendor and lighting and electrical contractor community. PNM is educating the participating contractors, electrical contractors, installation contractors, lighting distributors and lighting wholesalers on the program details and rebate requirements, which will allow contractors to in turn educate their customers and help them receive their rebate. PNM's commercial account managers are also playing a role in promoting this program to their customers. PNM is also presenting to various trade associations to help promote the program and its benefits and promoting the program through targeted direct mail campaigns.

Gross Savings

Gross energy savings are based on the difference between pre and post retrofit conditions. The kW savings resulting from the retrofit are combined with the hours of operation for the lighting to determine kWh savings. In order to determine the hours of operation, schedules that describe the amount of time the lights are being used are developed by the contractor. Each audited fixture is assigned a schedule that most closely represents its hours of operation. The hours of operation, and wattage reduction of all the fixtures on-site, are used to determine the kWh reduction for the site. RLW will thoroughly investigate the assumptions that go into each of these three variables that define the gross energy savings equation. This will be achieved using numerous evaluation strategies, including:

- ❖ Detailed project file reviews, Verification of pre retrofit assumptions and post retrofit conditions

- ❖ Secondary data collection and comparisons (e.g., lamp and fixture wattage assumptions),
- ❖ On-site surveys and Verification of installations,
- ❖ Lighting logger installations and On-site metering of lighting schedules

Gross savings analysis will be performed using a combination of the program tracking, phone surveys, and on-site visits. This is the typical verification procedures to verify retrofit conditions and hours-of-operation. Once the RLW Team is able to review the program documentation it will be confirmed if this is indeed the most appropriate method. Specific challenges include confirming the pre-retrofit conditions, verifying the hours of operation, and verifying the installation of the retrofit equipment.

Table C-1 shows a typical spreadsheet entry used for the calculation of demand and energy savings. The pre-retrofit and post-retrofit conditions, as determined by the file review and the on-site survey, are entered into the spreadsheet. In the example below, the retrofit consisted of replacing T12 standard lamps and standard ballasts with energy efficient T8 lamps and electronic ballasts. In addition, occupancy sensors were installed to further increase savings. The post-retrofit hours of operation shown represent lighting logger data for a two-week period extrapolated to annual hours of use. The pre operating hours of 8,760 were changed to 6,412 hours due to the installation of the occupancy sensors. In this example, the total kWh savings for the measure were calculated by summing the lighting and occupancy sensor savings.

Space	Pre Count	Pre Watts	Pre Hours	Post Count	Post Watts	Post Hours	Measure Description	kW Savings	Lighting kWh Savings	Sensor kWh Savings	Total kWh Savings
Storage	5	188	8,760	9	54	6,412	(2) 4' T8 with Electronic Ballast	0.45	3,977	1,141	5,118
Storage	4	188	8,760	4	54	6,412	(2) 4' T8 with Electronic Ballast	0.54	4,695	507	5,203
Storage	24	94	8,760	21	54	6,412	(2) 4' T8 with Electronic Ballast	1.12	9,829	2,663	12,491
Storage	3	248	8,760	3	178	6,412	(2) 8' T12 with Electronic Ballast	0.21	1,840	1,254	3,093
								2.32	20,341	5,565	25,905

Table C-1: Typical Spreadsheet Entries

On-site metering

In commercial lighting retrofit programs it is common to have a few large commercial sites make up the majority of the claimed savings for a program. The RLW Team will review PNM's program tracking to determine if this is the case for the Business Lighting Rebate Program. On-site verification will be focused toward these large sites.

RLW intends to install time-of-use lighting loggers at these sites in order to confirm each of the lighting schedules assigned by the implementation contractor. Lighting loggers will be mounted near fixtures determined to represent each schedule type described.

The loggers will record lighting on/off events for several weeks. RLW will use this data to determine if the contractors estimated schedules are appropriate for use in savings calculations or if they need to be adjusted. Auditors will install several loggers in order to ensure an accurate representation of the lighting schedule, and to provide redundancy in case of logger failure or removal.

Net Savings

The net savings analysis is often the more challenging aspect of the impact calculation. The net savings analysis represents an estimate of the energy savings that are a direct result of the program. That is to say, the net savings do not include savings associated with free-ridership. We believe the best, and likely the most cost effective, approach for measuring net savings is to use a participant self-report methodology, further informed by other key information discovered during the course of the evaluation. In essence, we look for corroborating evidence or contradictory evidence during phone surveys, within the project files, and other information sources.

Free-ridership is calculated as the difference between the baseline (i.e., the pre-retrofit condition) and what would have been installed absent the program, divided by the difference between baseline and what actually was installed. For example, assume a project has a lighting baseline of 120 watts/fixture, and the participant received incentives for and installed lighting equipment resulting in 60 watts/fixture. If the participant would have retrofitted lighting to their current 120 watts/fixture in the absence of the program, then free-ridership would be zero. If the participant would have selected lighting equipment equaling 60 watts/fixture absent the program, then the free-ridership would be 100 percent. In reality, however, such a project may have had a slight increase in efficiency. If the participant would have installed equipment at 100 watts/fixture without the program; this would result in a free-ridership rate of 33.3%. The free-ridership assessments will be at the measure level and will be consistent with the standard measure categories tracked by the program. Some measure categories may only have one replacement option better than baseline and would not be subject to "partial free-ridership".

When a participant would have installed equipment that was better than baseline but not optimally efficient in absence of the program, it is called "partial free-ridership". Partial free-riders plan to under-go retrofits regardless of the program, but the program influences them to install even more efficient equipment than they had intended. Assigning a "partial free-ridership" is appropriate since measure savings vary in relation to the efficiency level chosen for the equipment installed. While a dichotomous treatment is appropriate for some measures, researchers believe that in any program, probing participant actions absent the program influence provides a far more accurate picture of program-induced savings.

Data and Other Requirements

It is anticipated that implementation contractors document information regarding lighting quantity and technology for both pre and post retrofit conditions. Additional information that should be available through tracking data includes: site contact information, installation date, specific retrofit fixture location notes, and savings estimate calculations. RLW anticipates the need to verify fixture wattage, life expectancy, type, and light output from the manufacturers.

D. PNM Peak Saver (Commercial Load Management) and PNM Power Saver (Residential Load Management)

The primary goal of the Peak Saver commercial load management program is to diversify PNM's resource portfolio by adding cost-effective load control resources. This program offers non-residential customers an incentive and the opportunity to participate in limiting the system peak demand on the highest peak demand days of the year.

- Comverge will install load control devices similar to the residential devices on small (<50 kW) commercial facilities and will install more sophisticated devices on medium (50 to 150 kW) commercial facilities.
- EnerNOC will install energy management systems on medium to large (> 150 kW) commercial facilities.

These contractors are responsible for marketing the program, installing and maintaining all equipment, and tracking and reporting results. The Peak Saver program will control air conditioning, lighting, manufacturing process equipment and other loads during peak load periods. PNM system operators control operation of the equipment. Capacity delivered under this program must respond within ten minutes of notification.

The approach below focuses on the residential program and will also apply to small commercial units. For the larger sites in the Peak Saver program, site level M&V and analysis plans will be developed and reviewed by PNM.

The Power Saver residential program offers residential customers an incentive and the opportunity to participate in limiting the system peak demand on the highest peak demand days of the year. Comverge, Inc. is implementing this program. Comverge is installing load control devices primarily on residential air-conditioning units which can be cycled on and off at PNM's request during peak days. Units are not turned off for long periods; rather they are cycled in groups to lower overall demand without affecting comfort significantly. Comverge is responsible for marketing the program, installing and maintaining all equipment, and tracking and reporting results. The program will cycle refrigerated air conditioners on and off during peak load periods. PNM system operators will decide when an event should happen and communicate this to Comverge. Capacity delivered under this program must respond within ten minutes of notification.

Gross Savings

A common approach for demand response impact assessment and customer settlement is to compare a site's average hourly load on the day of an event with the hourly average of the loads of the three of the previous 10 days with the highest average load (the 3-in-10 approach). While this approach works well on sites with relatively stable loads and where weather on event days is not significantly different from the preceding days, it could run into some limitations for analyzing highly weather-sensitive customer settlement, a site with highly variable residential loads, or where a load reduction is called on a non-standard day (such as a weekend, holiday, or non-peak-temperature day). For this reason, RLW is proposing using a hybrid approach, based on the 3-in-10, but materially different.

For standard weekday load-reduction events, we propose using the average of the three of the prior ten days with the highest average loads as our comparison load. Rather than compare this load directly to the site load, we will adjust the comparison load up or down by a fixed amount such that the site's hourly loads during the hours preceding a load reduction event most closely match the revised comparison load curve. Once this "morning-adjustment" has been applied, the actual site's hourly load will be compared to the comparison load's average hourly load over the hours of the event to produce an estimate of average hourly load reduction. For holidays, weekends, or abnormal load days that load reductions are called, RLW will find a day or set of days whose temperature profile and day-type most closely match the event day. These loads will be

averaged and then morning-adjusted to produce a comparison load that will be a better fit than using the standard 3-in-10 approach.

We will use RLW's proprietary Visualize-IT software to automate the production of morning-adjusted comparison days and to perform the analysis of hourly site savings. An example of the Visualize-IT output for a small commercial load reduction event can be seen in Figure 1 below. RLW has successfully used this software with a morning-adjusted comparison day approach in conducting the impact evaluations of Southern California Edison's 2002, 2003, and 2004 EnergySmart Thermostat small commercial demand-response programs.

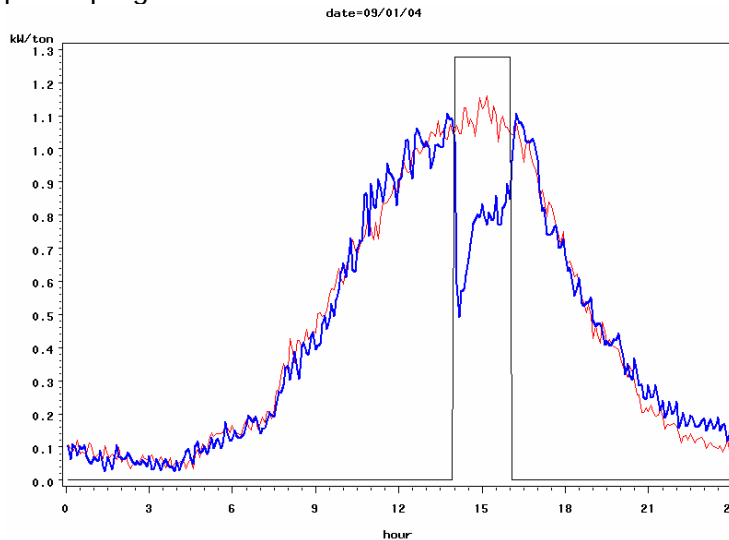


Figure 1 – Visualize-IT Output of a morning-adjusted comparison day analysis of an afternoon load curtailment event.

E. Energy Saver Kit Direct Install

The goal of the Energy Saver Kit program is to assist income-qualified residential customers with their efforts to reduce their energy bills. This program is administered by the Mortgage Finance Authority (MFA) and implemented through their network of sub-grantees located throughout the state. Each of the four agencies is assigned a group of counties, and each is assigned a portion of the kits based on census data from the counties they serve.

All items from the Energy Saver Kits are being installed as needed and appropriate in each qualifying home. Originally all items not installed in the home were to be left with the homeowner, along with instructions on how to self-install each item. However, PNM has requested that contractors collect all items not used. To be eligible homeowners must have incomes relative to family size at or below 150% of federal poverty guidelines, but due to the scarcity of resources, priority is given to the lowest income households. MFA also administers PNM's Gas Efficiency Low-Income Weatherization Program.

Gross Savings

The primary data source will be records collected by MFA of measures installed at each site. A survey is completed for each home that receives assistance and records of all improvements are required. All records and reports would be requested by the RLW

team for review. We would also like to have PNM cross check program participants with addresses served by the other MFA low-income programs to ensure there is no double counting of savings amongst the various programs.

The energy savings will be primarily evaluated using an IPMVP Option A approach as deemed savings will be appropriate for measures such as CFL's, low flow showerheads and aerators, and water heater blankets. The RLW team will conduct random inspections of a sample of participating homes in order to make an assessment of the installed measures. Other weatherization measures such as weather-stripping and gaskets can only truly be evaluated if pre and post infiltration (home leakage) measurements were made at the homes, which may be true given the MFA testing requirements. If a reasonable number of program sites have pre and post infiltration data available, an engineering analysis may be used to determine deemed savings of the weatherization components. The RLW team will rely on other secondary research and previous program evaluations of similar programs should these test data not become available.

Net Savings

Traditional freeridership and spillover assessments do not readily address low-income programs. The customer makes no purchasing decision in this program and a net to gross ratio of unity is proposed.

F. CFL Exchange Program

PNM is funding a CFL Exchange Program in partnership with the Sierra Club. PNM is funding 40,000 CFLs to be exchanged for traditional incandescent light bulbs at forty elementary schools and several community events in Albuquerque and Santa Fe. Sierra Club volunteers will contact school officials; set a presentation calendar; staff all school assemblies, presentations and turn-in events; and collect M&V data for PNM. The Sierra Club has also agreed to plan, staff and execute public CFL exchange events held between Fall 2007 and Spring 2008.

The school programs include an all-school assembly at which Sierra Club volunteers will make a presentation that includes the benefits of switching to CFLs. The following three days Sierra Club volunteers spend part of the morning at the school for the CFLs turn-in event. Parents and students are able to bring up to four incandescent bulbs to exchange for CFLs. Community events are run in a similar fashion, except that these are one-day events.

Gross Savings

Lighting exchange, and turn-in, programs are traditionally difficult to evaluate. RLW will review the program materials to determine the most appropriate evaluation method. At this time, given that participant contact information will be available, RLW supports PNM's recommended self-reported, phone survey method to determine installation rates for the CFLs.

RLW understands the tasks associated with this evaluation to include:

- ❖ Estimate the wattage of the replaced incandescent lamps,
- ❖ Identify annual and lifetime energy savings resulting from replacements,
- ❖ Verify installation of CFLs through phone surveys.

Estimation of wattage of replaced incandescent lamps.

RLW encourages PNM to incorporate wattage reporting as part of the exchange process. Since implementers are already recording the number of lamps exchanged it would be very easy to have them record the wattage of the lamp, when visible, as well. If wattage information can not be collected at the time of the exchange RLW will determine a reasonable estimate for the incandescent lamp wattage using other methods.

The most straight forward method for determining the wattage of the replaced lamps will be to ask the participant during the phone survey. It is likely that after participating in the exchange, and receiving information at the assembly or community event, the customer will be aware enough of the benefits of lower lighting wattage to remember what the wattage was for the replaced lamps.

If they are unable to recall the lighting wattage RLW will identify the fixture type and location where the lamp was replaced. Prior studies regarding average incandescent wattage in certain fixture type and locations will be leveraged to determine what the likely wattage was for the incandescent lamps.

Identify annual and lifetime energy savings resulting from lamp replacements.

Several factors will be incorporated into the savings estimates. Annual energy savings estimates are determined by multiplying the difference in wattage between the original and retrofit lamps by the hours the lamp is used in a year. This calculation requires three pieces of information: the replaced incandescent lamp wattage, the new CFL wattage, and the hours of operation. Since it is likely that only the CFL wattage will be known there are several assumptions that will have to be made to reach a savings number. The wattage of the incandescent lamp will have to be assumed using one of the techniques discussed above. The hours of operation for the lamp will be identified through self reporting with the customer. If the customer cannot determine the hours of operation for the fixture, the hours will have to be assumed using estimates derived from studies regarding typical hours of operation for fixtures in comparable rooms of the house.

Estimating the lifetime energy savings will be slightly easier because the average lifetime for CFLs and incandescent lights is well documented. This means the only assumption that must be made is the wattage of the replaced incandescent lamp. As before, the lifetime savings associated with the exchange will be the difference in wattage between the old and the new lamps, multiplied by the lifetime of the lamp.

Conduct Telephone Surveys

Phone surveys will be conducted to verify the installation of CFLs. The surveys will aim to determine the wattage of the replaced lamp, and the hours of operation associated with the replaced lamp.

In order to gather this information, RLW will use questions similar to the following:

- ❖ Was/were the CFL(s) installed?
- ❖ What was the wattage of the incandescent lamp(s) you replaced?
- ❖ What type of fixture(s) did the replacement CFL(s) get placed in?
- ❖ What room(s) are these fixture(s) located in?
- ❖ How many hours of the day do you estimate each fixture is on?
- ❖ If CFL wasn't installed, why not?

- ❖ Do you plan to install the CFL? When?

For each participant in the sample, the survey will verify the measures listed in the PNM tracking database. For each measure that was not initially installed or is not still installed, the survey will determine why not.

Using sound statistical techniques, we will use the verified measure installations in the sample to estimate the number of measure installations in the program. Specifically, we will use stratified ratio estimation techniques to estimate the total number of measures distributed by the program. We will also calculate the 90% confidence interval associated with our estimate. We will also calculate measure-specific realization rates by comparing the tracking system data to the verified installations. Based on our analysis of the parameters in the program's cost-effectiveness workpapers, we will use IPMVP option A, stipulated energy savings to calculate the energy savings and demand reduction achieved by the program. We will also measure the program's cost effectiveness.

Data and Other Requirements

As specified in the RFP, RLW expects to receive customer names, addresses, phone numbers, number of bulbs exchanged, and the wattage of the CFL. Additionally RLW would request PNM documents, when possible, the wattage of the bulbs being replaced. Since this is a pilot program PNM may be interested in the effectiveness of the delivery mechanism (assemblies). RLW suggests the implementer tracks assembly attendance rates in order to estimate what percentage of students are motivated to participate in the exchange.

G. ENERGY STAR® Home

Homes that earn the ENERGY STAR Home rating must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. ENERGY STAR qualified homes are at least 15% more energy efficient than homes built to the 2006 International Energy Conservation Code (IECC). ENERGY STAR qualified homes can include a variety of energy-efficient features, such as effective insulation, high performance windows, tight construction and ducts, efficient heating and cooling equipment and ENERGY STAR qualified lighting and appliances. Homebuilders must register with the EPA as ENERGY STAR Partners in order to have any of the homes they build ENERGY STAR qualified.

Gross Savings

RLW will conduct detailed on-site surveys at new constructed participant and non-participant homes. Building characteristics and building performance data will be gathered at each home. Additionally, RLW will gather detailed information on builder installed (hard-wired) lighting and appliances. The resulting data will be used to build building simulation models. The models will provide residential energy, code compliance and HERS rating analysis. The software calculates heating, cooling, hot water, lighting, and appliance energy loads, and consumption. Using inspection data and REM/Rate™, a HERS approved energy simulation and rating software package, output from non participating new homes and the new ENERGY STAR homes RLW will calculate gross energy and demand impacts for each energy star home in the program. Impacts will be calculated in terms of ratios and in gross amounts and proportions. Site-level findings will be expanded to the population to provide an estimate of gross savings for this program element.

The data from the HERS inspections will provide the majority of the data needed to effectively measure the conditions of the RNC market in the PNM service area. Since HERS audits are the only way a home can become accredited with the ENERGY STAR logo, using HERS inspectors and HERS approved energy simulation software is the most effective way to gather data for measuring the efficiency. There are several advantages to the software and this strategy:

- ❑ Modeling controls for behavioral variations between homes
- ❑ Software has a built in and customizable baseline facility
- ❑ Modeling estimates expected annual energy consumption and design day peak loads
- ❑ HERS approved software gives a standard Energy Star rating relative to baseline (using our methodology, several baseline models will be available)
- ❑ The same tool can be used for future assessments and could be compared unilaterally to this study
- ❑ Relatively fast and cheap way to get energy usage and demand estimates
- ❑ The software has export/archive file features that can be imported into a database for statistical analysis (again, we would customize this operation to be efficient now and into the future)

Using the output data from the simulation software, RLW will easily be able to determine the average efficiency of new homes. The average efficiency will be based on the HERS rating Index (e.g., 85 or less is Energy Star), the annual energy consumption and design day load calculations. Each home inspected will be categorized by fuel types, e.g., all electric homes and dual fuel homes. The annual energy consumption and demand for each home will be normalized by dividing by the home's conditioned square footage. The weighted kW and kWh per square foot by building type will then be used to determine the typical home baseline efficiency.

H. Residential Advanced Evaporative Cooling and Commercial Advanced Evaporative Cooling

This program is intended to educate residential customers, contractors, homebuilders, and suppliers of air conditioning (AC) equipment about the many advances in evaporative technology. This program offers a rebate on an indirect cooling module that mounts in front of single-inlet evaporative cooling equipment, as well as any indirect evaporative technology. The indirect module is not directly available at the retail level. Therefore, PNM is recruiting participating contractors whom customers may contact to acquire and install the module. The commercial program also offers an incentive for installing an indirect cooling module, which is an additional piece of equipment that mounts in front of the single-inlet evaporative cooling equipment. The rebate also applies to indirect evaporative technology. This program targets small and medium size businesses, architects and engineering firms, HVAC contractors and local distributors.

Gross Savings

The measurement and verification approach is to primarily verify measure installation. We feel that telephone surveys will be insufficient to verify these contractor installed measures. Simple onsite verifications will be used for both modules installed on existing single-inlet evaporative cooling units and newly installed evaporative cooling systems. For new installations the evaluation may be dependent on whether or not participating contractors are collecting information about the replaced HVAC systems.

Net Savings

The measure incentives provided by the Advanced Evaporative Cooling programs are early on in the market adoption process as noted in the RFP. Our team will administer a brief customer survey, administered during recruitment or onsite, to gather information regarding the customers plans to purchase the system upgrade or choose indirect evaporative systems to replace their existing cooling system.

I. Self-Direct Rebate Program

The self-direct option allows qualifying customers (those using more than 7 million kWh annually) to offset up to 70% of the Energy Efficiency Fee tariff rider on their bill provided they have completed energy efficiency measures that meet certain criteria. Large customers must submit an engineering study and other information such as invoices and product data for approval by PNM. Projects must have been completed after January 1, 2005 and have a simple payback of between one and seven years.

The M&V budget, scope, and deliverables will be developed for those projects on a site specific basis. The RLW Team will at a minimum verify product purchase and installation, evaluate resource savings and validate simple payback calculations of qualifying large customer self-direct applications.

Task by Task Description of the Evaluation

The tasks are grouped into two phases Planning and First and Second Year Evaluations. The planning phase is comprised of the Kickoff meeting, Study Plan Development, and Tracking Data Review. The first and second year evaluations include all the sample design, data collection, analysis and reporting tasks. The subtasks presented later in the budget are also grouped by program using the lettering used in the previous section.

The tasks do not include specific deliverable dates as that schedule is intended to be developed at the project Initiation Meeting and subsequent conference calls as the study plans are developed. The RLW team believes that working with PNM to develop program specific timelines and critical path schedules will be most beneficial to respect the unique program data needs and optimize the overall workload.

Phase I: Planning

Task 1: Project Initiation Meeting

Upon being awarded the measurement and evaluation contract, an initiation meeting shall take place at PNM headquarters building in Albuquerque, New Mexico. The RLW project manager and key staff will meet with the PNM program manager and representatives to discuss and finalize key aspects of the evaluation project. The project initiation meeting is critical to the success of the evaluation effort as it will ensure an understanding of the deliverables and sequencing of events necessary to complete the tasks associated with the program evaluation. Specifically, the following issues will be discussed and finalized during the initiation meeting:

- Evaluation objectives
- Evaluation methodology including scheduling, identification of data needs, and project deliverables
- Management and communications protocols

Task 2.1: Study Plan Development

A draft research plan will be developed for this project after the project initiation meeting and data and document review have been completed. The research plan will detail the overall project and each task's objectives, methodology, and deliverables, forming the basis of the methodology section in the final report. The research plan will include an evaluation methodology that is specific to each program, therefore the plan will be arranged in order of program type.

The Research Plan will detail:

- The evaluation objectives for each program
- How the research objectives will be accomplished
- Sample design
- The approach to measure verification of installed measures
- The method of evaluation for each program
- A description of the key research components included in the study

A draft research plan will be submitted to the PNM project manager for comments and approval. All comments and changes will be modified in the draft research plan by the RLW

team and again approved by the PNM project manager before the final research plan is distributed to the project team.

Task 2.2: Review Utility Tracking Data

Program tracking data is critical to all M&V efforts. Savings estimation techniques, estimated savings, measure descriptions including baseline conditions, and customer data are expected to be tracked by PNM. These data form the basis of the evaluation, serving as the program population and the data to support the cost effectiveness analysis. Since the program evaluation would be occurring in parallel with the implementation efforts, RLW would need regular access or downloads of program tracking data. RLW would also like to provide early review of PNM's tracking system and for the ability to suggest modifications that would improve evaluation efforts.

Phase II: First and second year evaluations

Task 3: Sample Design

Sampling Frame

The first step in devising a sampling plan for a specific study is to identify the sampling frame that will be used. A sampling frame is a list of the units in the population, e.g., the participants in the program. To minimize bias, the sampling frame should be as complete as possible, and it should avoid duplication. Ideally the sampling frame should include a variable related to the population characteristic of interest as well as any relevant categorical stratification variables. In this case, the sampling frame will be generated from the PNM program tracking data. We anticipate that the PNM program tracking data will contain the precise number of measures installed, in addition to the amount of estimated savings from the measure(s).

Selecting the Sample

The selection of the sample will be guided by a statistical sampling plan. The plan will also include an approach to extrapolate the findings from the sample participants to the target population of all program participants and to evaluate the statistical precision of the results. , Where applicable, we will stratify the participant population by amount of savings or number of measures as a way to maximize the quantity of measures and savings verified in our sample. Assuming the existence of participants with multiple measures distributed through the program, we will stratify the population of program participants by the number of measures distributed, when applicable, as a way to maximize the number of measures verified in the sample. For programs with bundles of measures, we will stratify by savings to ensure that we capture the measures that account for the majority of the savings, while also ensuring that there is a good mix of measures in the sample.

Timing of the Sample Selection

A key issue pertaining to this task is the timing of the sampling process. Conducting an evaluation in parallel with implementation can raise problems that are non-issues when the

evaluation is completed post implementation. Designing a sample for “in parallel” evaluations is difficult because the program population has yet to be defined. In order to capture a sample of customers that represent the diversity of the population it is normally best to sample when the population is fully defined. However, given the timeline of the evaluation results and the program implementation period it is not recommended to wait until the program has ceased to select a sample.

To manage this issue, we propose selecting two different samples; one sample of PY2007 and 2008 participants selected during the 2nd quarter of 2008, and another sample of participants from PY2009 selected during the 2nd quarter of 2009. This will allow the RLW Team to provide a complete impact evaluation from the PY2007-08 findings that may be used to inform 2007 activities, yet still devoting resources to projects in PY2009. Conducting two sample designs also helps make the EM&V timeline more manageable. At the time we design the sample of 2007-08 participants, we will examine the amount of program activity to date as well as the future planned program activity to insure our proposed allocation of the surveys among the 2 program years is appropriate. This issue can be further discussed with PNM. Sample Design memos will be issued and reviewed for each program and the overall portfolio and attached to the workplan as addendums.

Task 3.1: Sample Design PY2007-08

Task 3.2: Sample Design PY2009

Task 4: Design Survey Instruments and Collect Data

The Home Lighting program will require the use of in-store customer intercept interviews to assess effect of in-store displays and program-related pricing; a survey instrument will also be developed for intercept interviews to take place in participating stores with follow-up telephone surveys. For other programs the impact evaluation of the project can utilize a telephone survey for data collection followed by an onsite visit. We will develop questionnaires for each program with separate sections dedicated to the verification of measure installations and net savings. A separate survey instrument will be developed for the on-site verification data collection that will support the telephone survey responses and assist in a robust gross savings analysis. Other data collection efforts including higher level interviews of manufacturers, retailers, and home builders will also be conducted to support savings estimates.

In-Store Intercept Interview Survey Instruments and Data Collection

The third subtask for Task 4 will be the development of in-store customer intercept interview survey instrument by senior members of the RLW team. These surveys will be used as part of the data analysis for the Home Lighting Program to assess the effect of in-store displays and program-related pricing on purchase of CFLs.

The RLW Team will focus 2008 data collection on high volume stores and conduct intercept interviews in the Costco and Home Depot stores that participate in the PNM Home Lighting Program. In order to gain access to the stores and collect data during peak implementation, the team has asked Applied Proactive Technologies (APT) to supply the personnel to complete this data collection for 2008. APT/PNM implementation representatives in this area will be limited to providing introductions to the Costco and Home Depot staff and logistical support.

APT will use Field Representatives from another state who will conduct interviews and are available to travel. APT staff will not be involved in any review of the survey results, nor will they make any changes to the content or format of the interview guide or interviewing procedures. Their roles will be limited to completing the customer interviews and reporting on customer concerns regarding the survey process.

Before the research commences, APT will prepare a schedule of store visit dates and locations for review and approval by the RLW Team. APT will make recommendations to the team regarding which stores an interviewer should visit each day based on that store's historical performance in CFL sales. KEMA will have a supervisor experienced in in-store intercepts meet with the APT team in New Mexico for a training session and supervision prior to the start of the conducting interviews. APT staff will attempt to recruit in-store survey participants for participation in a follow-up telephone study that will be administered by the RLW Team

Telephone Survey Instruments and Data Collection

The first subtask that will be completed for Task 4 is development of the telephone survey instrument. Participant telephone surveys will be designed and used for several program evaluations and will be used to obtain information that will be used to inform the impact evaluation. Information will be collected through open-ended and close-ended questions and will also include questions regarding demographics and energy related behavior.

At a minimum, the impact evaluation topics to be covered in the telephone surveys would include:

- Recollection of participation
- Measure installation and retention
- Baseline information

Secondly, some surveys will gather information regarding customers' experience with the program. More specifically,

- Decision process for participation
- Participant satisfaction with the existing program
- Participant satisfaction with contractor services

RLW shall submit the completed telephone survey instrument to the PNM project manager for a final review. Upon approval, a pretest will be performed to identify any difficulties with the instrument. Any revisions necessary will be reviewed and once approved will be implemented into the instrument.

Upon approval of the final survey instrument by the PNM Program Manager, the RLW Team will implement the telephone survey data collection. Highly experienced staff under the direction of the project manager will carry out the surveys. All calls will be tracked and any refusals or incomplete responses will be recorded. Upon completing each survey, the data will be entered into an electronic database designed specifically for this survey. To ensure quality control, the project manager will continuously review the data. The PNM Project Manager will be given bi-weekly progress reports on the telephone survey outcome status.

Non-Customer Data Collection - Energy Star Builder Surveys

Instrumental in the success of the Program are those who build the Energy Star new homes in the PNM service area. As part of this evaluation we propose to implement a survey of

participant home builders in the PNM service area. The survey will investigate builders' attitudes, awareness, barriers, and other key market tracking indices that can be used to measure the progress of the Energy Star Homes Program. Although RLW has access to lists of Energy Star builders, we believe the best way to develop a sample of builders to survey is to ask the new home owners who constructed their home and survey those builders. With this approach we are sure to be surveying the active builders in the PNM service area. To facilitate this process, the Energy Star homeowner survey and the non-Energy Star homeowner survey will include a question that asks the respondent who built their home. After the homeowner surveys are completed the results will be compiled, each builder name that was returned will be called and asked to complete a survey.

On-site Inspection Survey Instruments and Data Collection

The second subtask for Task 4 will be the development of an on-site survey instrument by senior members of the RLW team.

On-site inspection visits will be conducted as means of verification of measures and retention, and also to visually verify *properly installed* measures. The Business Lighting, Energy Saver Direct Install Kit, Energy Star Homes, and Advanced Evaporative Cooling program evaluations will include on-site inspections. An energy efficient measure is dependant on proper installation if it is to realize energy savings. The on-site inspection survey instrument will be designed to gather information specific to the measure, or measures, and will include specifics for all measures similar to the following examples:

Business Lighting

- Verify the wattage and life of the rebated equipment according to Vendor/Brand specifications.
- Verify the typical wattage of bulbs that are replaced.

Energy Saver Direct Install Kit

- Verify the installation and storage rates for the measures in the kit, which should include:
15 CFL bulbs; caulk; outlet and switch gaskets; window and door weather-stripping; door sweeps; 1.5 GPM energy- and water-efficient showerhead; 2.2 GPM energy- and water-efficient kitchen aerator; 1.5 GPM energy- and water-efficient bathroom aerator; water heater tank wrap; outlet safety caps; outlet draft stoppers; and energy-efficiency client education literature.

Energy Star Homes

Due to the recent climate of the housing and construction market, it is possible that as of July 31 participation in the program will be insufficient; if such is the case, onsites and testing will be suspended for 2008 and will take place only in 2009.

The onsite data collection includes the following data points:

- Home location
- Home orientation
- Number of stories
- Conditioned floor area and volume measurements
- Framing type and exterior framing properties
- Fenestration and skylight frame areas, material and efficiency properties (low-e, SHGC, U-value)

- Whole house infiltration from blower door test
- Overhang and shading measurements
- Foundation type
- Hard wired lighting and appliances
- Attic insulation installation grade and presence of radiant barrier
- Water heater data
 - Size, type, fuel, efficiency
- Thermostat type
- Heating and cooling system information
 - Heating fuel type
 - Nameplate data
 - Total duct leakage and duct leakage to outside using duct blaster testing protocols
 - HVAC coil and condenser brand, model, and serial number
- HVAC installation grade

Advanced Evaporative Cooling

- Verify measure installation

During the project kickoff meeting RLW will provide a topic list for review and discussion. The revised topic list will be used by RLW to develop the draft survey instrument(s). RLW will provide a draft to the PNM project manager for review and comment. RLW will make final adjustments and prepare the instrument for use in the field. RLW will pilot the survey in the field, report to PNM on the outcome of the pilot, and make final field tested modifications to the survey for full field implementation.

Task 4.1: Design Survey Instruments and Collect Data PY2007-08

Task 4.2: Design Survey Instruments and Collect Data PY2009

Task 5-7: Data Analysis

The data analysis task will consist of gross, net, and cost effectiveness analyses. For the 2007-08 program year RLW will complete an analysis for each, while the 2009 program year evaluation should leverage some of the 2007-08 analysis data, such as measure cost data for cost effectiveness. Detailed discussions of the gross and net savings analysis of each program are contained in the prior Program Summaries section.

Task 5.1: Gross Savings Analysis PY2007-08

Task 5.2: Gross Savings Analysis PY2009

Task 6.1: Net Savings Analysis 2007-08

Task 6.2: Net Savings Analysis PY2009

Task 7: Cost Effectiveness Analysis

For each program year RLW will perform program level Total Resource Cost (TRC) testing. The TRC test is used to determine program cost effectiveness. To be considered cost-effective, programs must demonstrate a minimum TRC of 1.0, which in short means that the present value of the benefits outweigh the present value of the costs.

RLW has significant experience conducting cost effectiveness testing for both residential and commercial programs, including each of the measures included in PNM's 2007-08 program offerings. PNM will be required to work with RLW on some of the inputs to the TRC test, including avoided costs for PNM's service territory and regions. The key inputs that must be validated for the TRC test include:

- Measure counts
- kWh and kW savings
- Gross incremental measure cost
- Net to gross
- Effective useful life
- Program costs (administrative, marketing, operations)

Using final measure installation rates for each program and each program year, RLW will conduct the TRC test. RLW and PNM will review cost effectiveness inputs and avoided cost forecasts prior to the analyses and again before delivery of the final report.

7.1: Cost Effectiveness Analysis PY2007-08

7.2: Cost Effectiveness Analysis PY2009

Task 8: Reporting

There will be two final reports provided to PNM, a 2007-08 EM&V report and a 2009 EM&V report. The reports will include a discussion of each program and the related findings. The 2007-08 report, covering PNM's first year program offering will be a comprehensive EM&V of the program efforts. The 2009 report will reuse many of the evaluation findings (unit level measure savings, net to gross factors, costs, etc.) from the 2007-08 analysis. This will allow PNM to learn as much as possible from the 2007-08 program for improving 2009 operations. Based on this approach more resources go into 2007-08 EM&V activities than 2009 EM&V activities.

Task 8.1: 2007-08 Draft and Final Report

The Program Year 2007-08 report will be delivered in February of 2009. The 2009 report will be more comprehensive than the subsequent 2007-08 report since much of the 2007-08 material will be reused for the 2009 impact analysis.

- Executive summary
- Introduction and Background
- Results
 - Program and measure level savings
 - Cost effectiveness
- Process Evaluation Findings
- Methodology

- Appendices including 1) a bibliography and reference list, 2) Clean copies of interview guides and survey instruments, 3) and Documentation of databases and other deliverable materials.

Each report produced by RLW will have the appropriate ownership and disclaimer language included as provided by the PNM project manager.

Task 8.2: 2009 Draft and Final Report

The 2009 EM&V report will be an update report to the 2007-08 report. The report will include updated impacts and cost effectiveness based on 2009 implementation rates and program costs. The report will include updates to the process evaluation previously described in the 2007-08 report. To the extent possible, the 2009 report will address process and logic changes made by PNM based on the 2007-08 findings. In general, the 2009 report will contain less overall material when compared to the more comprehensive first year 2007 -08 report. Like the 2007-08 report, the outline of the 2009 report will include:

- Executive summary
- Introduction and Background
- Results
 - Program and measure level savings
 - Cost effectiveness
- Process Evaluation Findings
- Methodology
- Appendices including 1) a bibliography and reference list, 2) Clean copies of interview guides and survey instruments, 3) and Documentation of databases and other deliverable materials.

Task 9: Project Management and Progress Reporting

These project management tasks are not budgeted separately but rather are included in the planning or program specific evaluation budgets.

Task 9.1: On-going Project Management

All Key staff on the RLW Team will be available by all modern business practices (phone, cell, email, fax, etc.) during regular business hours (M-F, 8am-6pm) for the entire duration of the study. Responses to the PNM project manager's communications will be made within ½ business day within reason.

Task 9.2: Conference Calls and Memos

RLW will provide weekly or bi-weekly updates to PNM on an agreed day and time. These conference calls will include discussion of study progress and any issues related to the study. Action items and critical path issues will be discussed during all meetings.

Task 9.3: Monthly Reports

Once data collection commences, the RLW project manager will submit monthly reports by the tenth business day of the following month. Monthly reports will include:

- Summary of weekly/bi-weekly conference calls
- Summary of accomplishments of the month,

- Current activities and plans including any outstanding requests,
- Changes to schedule and budget, and
- Any issues or concerns.

Project Management

Project Management

RLW has assigned the team's experts in each major task area to streamline the evaluation. Mr. Eric Swan will be in charge of the overall study design. Mr. Jarred Metoyer will provide overall project coordination and management. Figure PM-1 shows the organization of the RLW team. Mr. Eric Swan will be the overall Project Director. Mr. Swan brings many years of evaluation experience to the study. Eric is RLW's Western Regional Manager and has been at RLW for 10 years. He has managed numerous studies in that time and is well known for his ability to guide teams to successful project completion.

Mr. Jarred Metoyer will serve as project manager. Mr. Metoyer understands the nuances of each of these individual evaluations. He has overseen the performance of several large projects at RLW and has proven his ability to expertly lead this program.

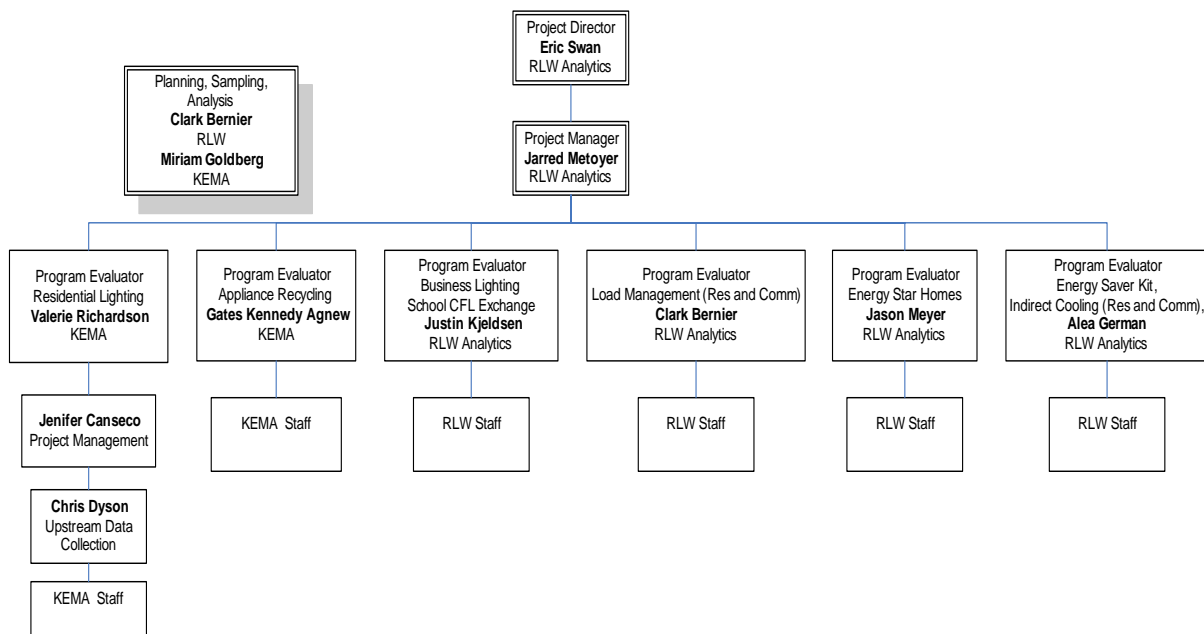


Figure 2: Organizational Chart

Each of the program evaluators shown in Figure PM-1 will be responsible for the management of their evaluation. They will be responsible for the day-to-day management of the projects, and will work with the RLW Team to see that critical aspects of the evaluation are incorporated into the methodology. Program evaluators will oversee all evaluation tasks including: planning, sample design, survey development, data collection and QC, analysis, and reporting. They will communicate with the project manager to ensure each evaluation is meeting PNM's needs.

In addition to the program evaluators, there are several staff members that will have involvement across several projects. Mr. Clark Bernier and Dr. Miriam Goldberg will coordinate the sampling design. They will be assisted by RLW and KEMA analysts in the development of samples for all of the evaluations. All of the key staff will have input in the survey design. Ms. Amber Watkins will supervise the phone survey data collection. She will communicate with the

program evaluators to make certain the data collection efforts keep the goals of the program in sight. Mr. Eric Swan will head the impact and cost effectiveness evaluations. He will ensure the methodology behind the cost effectiveness calculations is appropriate and sound. He will be assisted by all staff.

If PNM determines additional paid services are necessary during the contract period RLW will accommodate those needs. If RLW is unable to fulfill those needs with current staff we will employ enough outside resources to complete the work. We have an excellent working relationship with numerous other firms in the industry demonstrated by past partnering projects.

Appendix A1: Sample Design Background

Sampling arises whenever there is a need to collect information about a sample of units in a population in order to estimate the collective characteristics of all units in the population. The central challenge of sample design is to guide the selection of projects so that findings from a sample can be extrapolated to a target population without bias and with measurable statistical precision. In addition, sample design helps to identify the size of the sample needed for a given level of precision, or to identify the statistical precision to be expected from a given sample size. The sample design for each of the programs will produce estimates of savings that are accurate to at least ± 10 percent at the 90 percent confidence level.

RLW will conduct telephone surveys with statistically representative samples of program participants for each program to estimate the number of measure installations and therms achieved by the program. The telephone surveys will be followed-up with a nested sample of on-site audits.

Theoretical Foundation

MBSS™ methodology will be used to develop an efficient sample design and to assess the likely statistical precision associated with the planned sample. The target variable of analysis, denoted y , is the verified amount of therms incented through the program. The primary stratification variable, the program tracking amount of therms incented, will be denoted x . The number of measures or therms actually installed or saved will be extrapolated using the amount of therms incented as the stratification variable. A ratio model was formulated to describe the relationship between y and x for all units in the population, e.g., program participants.

The MBSS™ ratio model consists of two equations called the primary and secondary equations:

$$\begin{aligned}y_k &= \beta x_k + \varepsilon_k \\ \sigma_k &= sd(y_k) = \sigma_0 x_k^\gamma\end{aligned}$$

Here $x_k > 0$ is known throughout the population. k denotes the sampling unit, i.e., the participant. $\{\varepsilon_1, \dots, \varepsilon_N\}$ Are independent random variables with zero expected value, and β , σ_0 , and γ (gamma) are parameters of the model. The primary equation can also be written as

$$\mu_k = \beta x_k$$

Under the MBSS ratio model, it is assumed that the expected value of y is a simple ratio or multiple of x .

Here, y_k is a random variable with expected value μ_k and standard deviation σ_k . Both the expected value and standard deviation generally vary from one unit to another depending on x_k , following the primary and secondary equations of the model. In statistical jargon, the ratio model is a (usually) heteroscedastic regression model with zero intercept.

One of the key parameters of the ratio model is the error ratio, denoted er . The error ratio is a measure of the strength of the association between y and x . The error ratio is suitable for measuring the strength of a heteroscedastic relationship and for choosing sample sizes. It is *not* equal to the correlation coefficient. It is somewhat analogous to a coefficient of variation except that it describes the association between two or more variables rather than the variation in a single variable.

Using the model discussed above, the error ratio, er , is defined to be:

$$er = \frac{\sum_{k=1}^N \sigma_k}{\sum_{k=1}^N \mu_k} = \frac{\frac{1}{N} \sum_{k=1}^N \sigma_k}{\frac{1}{N} \sum_{k=1}^N \mu_k}$$

Figure 3 gives some typical examples of ratio models with different error ratios. An error ratio of 0.2 represents a very strong association between y and x, whereas an error ratio of 0.8 represents a weak association.

As Figure 3 indicates, the error ratio is the principle determinant of the sample size required to satisfy the 90/10 criteria for estimating y. If the error ratio is small, then the required sample is correspondingly small.

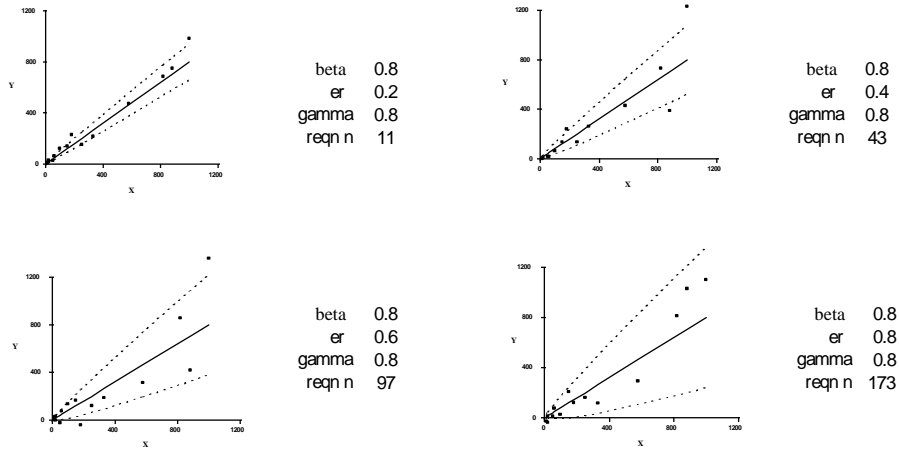


Figure 3: Examples of MBSS Ratio Models

Appendix A2: Sample Design Memos

Appendix B: Survey Instruments

This section includes final survey instruments.