FINAL Annual Report on Evaluation, Measurement &Verification Findings for Greater Missouri Operations

Program Year 2013

Prepared by:

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with

Final Report

October 7, 2014

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Executive Summary

As a result of the Missouri Public Service Commission's (PSC) approval of a Stipulation and Agreement in Case No. EO-2012-0009, KCP&L-Greater Missouri Operations Company (GMO) launched 15 demand-side management (DSM) programs on January 26, 2013. GMO is required to complete process and impact evaluations[1] to assess the progress of its DSM programs towards meeting the cumulative annual energy and demand savings targets[2] established by the PSC for these programs.

To meet these requirements, GMO contracted with Navigant Consulting, Inc. (Navigant) to conduct comprehensive program evaluations of its DSM programs during the three-year period of 2013 - 2015. In accordance with the Missouri Energy Efficiency Investment Act (MEEIA), the PSC's MEEIA Rules[3] and the Stipulation and Agreement approved November 15, 2012, Great Plains Energy Incorporated, on behalf of GMO, contracted with Navigant to evaluate, measure and verify the information tracked by GMO for its portfolio of 15 demand-side management programs (for years 2013-2015) (Navigant PY2013 EM&V Report, p. ix).

The goal of these evaluations is to comply with the requirements of 4 CSR- 240-22.070(8):[4]

> *"The purpose of these evaluations shall be to develop the information necessary to evaluate the cost-effectiveness and improve the design of existing and future demand-side programs and demand-side rates, to improve the forecasts of customer energy consumption and responsiveness to demand-side programs and demand-side rates and to gather data on the implementation costs and load impacts of demand-side programs and demand-side rates for use in future cost-effectiveness screening and integrated resource analysis" (p. 18).*

As presented in the three-year evaluation, measurement, and verification (EM&V) Plan[5], Navigant developed a multi-year evaluation strategy to provide GMO and stakeholders with the best information possible over the course of the program cycle within the available evaluation financial resources. Navigant's plan concentrates on those programs with the greatest contribution to overall portfolio savings.

For impact evaluation, Navigant evaluation activities begin with a comprehensive data and engineering review in year one to establish a data platform that accurately tracks *ex-ante* savings to serve as a foundation for focused measurement and verification research in years two and three. Evaluation activities are concentrated on those programs accounting for the largest portion of overall portfolio program savings to be most efficient with evaluation resources. For net-to-gross (NTG) and process evaluation, year one focused on establishing processes, including trade ally panels and fast-feedback surveys, for collecting data to provide GMO with on-going, directional information. As proposed by

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[1] 4 CSR 240-20.093(7) and 4 CSR 240-3.163(7).

[2] 4 CSR 240-20.094(3)(A).

[3] 4 CSR 240-3.163, 4 CSR 240-3.164, 4 CSR 240-20.093 and 4 CSR 240-20.094.

[4] A more complete citation of the requirements of 4 CSR 240-22.070(8) is in the Introduction section of this Report.

[5] Evaluation, Measurement, and Verification Plan: GMO Energy Efficiency and Demand Response Program 2013-2015 prepared by Navigant. October 2013.

Navigant and agreed upon by stakeholders, net-to-gross ratios for each program will be developed over the course of the three-year evaluation cycle and will not be finalized until after the third program year (Navigant PY2013 EM&V Report, p. ix).

In 2012, the PSC contracted with Johnson Consulting Group to serve as its EM&V Auditor[6] (Auditor) to review and comment on compliance with 4 CSR 240-22.070(8) and on the overall quality, scope and accuracy of the Navigant report. The EM&V Auditor Team Members' roles and responsibilities are summarized in Table E-1.

Table E-1: Roles and Responsibilities of the EM&V Auditor Team

Member	Role	Primary Areas of Responsibility
Dr. Katherine Johnson	Project Manager	Overall Report and Process Evaluations Review and Analysis
Mr. Scott Dimetrosky	Subject Matter Expert: Lighting and Market Effects	Residential Programs Review, NTG and Market Effects Model Review, Statistical Review and Analysis
Dr. Jim Bradford	Subject Matter Expert: M&V Issues and TRM	C&I Programs Review, Demand Response Programs Review, Impacts Summary Review, Cost Effectiveness Review
Ms. Gwen Mizell	Principle Investigator	Review Key Findings and Recommendations

EM&V Auditor Team completed its review and assessment of these reports in several ways. The Team reviewed each report's key findings, recommendations, and analytical techniques. Next, the key findings and recommendations were organized by topic areas to identify high-level themes and draw conclusions about the overall progress of the GMO's program portfolio.

Based on this review, the EM&V Auditor Team developed both short-term and long-term recommendations on ways to improve the evaluation reporting process. This analysis and the recommendations for improvement are based on the EM&V Auditor Team's collective experience with utility energy efficiency programs, EM&V best practices and professional judgment.

[6] 4 CSR 240-20.093(7) Evaluation, Measurement, and Verification (EM&V) of the Process and Impact of Demand-Side Programs. Each electric utility shall hire an independent contractor to perform and report EM&V of each commission-approved demand-side program in accordance with 4 CSR 240-20.094 Demand-Side Programs. The commission shall hire an independent contractor to audit and report on the work of each utility's independent EM&V contractor.

Overall, the final report stayed true to the work plan, was easy to follow, well written, well organized, and without numerous errors. The evaluator incorporated the recommended edits and clarifications into the final report and addressed these concerns in a satisfactory manner.

The evaluator expanded the findings to specifically address the requirements set forth in the CSR of 4 CSR 240-22.070(8) for both the process and impact evaluations. Based on the feedback from the EM&V Auditor, the evaluator did provide program specific responses to each of these criteria for both the process and impact evaluations. Going forward, however, these questions should be incorporated in the research objectives and survey design, rather than being developed after the fact.

Due to the preliminary nature of the findings, the actual savings values may be significantly different than those presented in the evaluation report. While the report follows the evaluator's EM&V plan it is important to recognize that so far, the results are based on *ex ante* values, implementer's databases, and unvetted deemed savings values. Additionally, to date the NTG values are stipulated rather than measured.

GMO's over reliance on Ameren Missouri's Technical Reference Manuals may lead to propagating the same errors reported in Ameren's PY2013 EM&V Reports. The evaluator's assessments of measure impacts were drawn, in large measure, from the Ameren Missouri TRM. The EM&V reports prepared by the third-party evaluators revealed that there are many unreliable deemed savings calculations. As a result, it is anticipated that the evaluation for 2014 and 2015 will find several over or understated savings values that may result in the reporting of inaccurate net savings, in any year applied, including the PY2013 year.

Recommendations to Improve Current and Future Impact Evaluation Reports

Future evaluation reports need to incorporate a more rigorous approach in the impact evaluations and conform to industry best practices for the process evaluations in order to provide results that clearly address the questions articulated in 4 CSR 240-22-070 (8) and provide credible savings estimates.

Similar to programs that received a more thorough database review due to higher participant levels, a basic review of the Multifamily and New Homes Programs database would have been preferred to offer insight into the database that should exist for these programs. As indicated for other programs database reviews, an early assessment of the database helps identify and target deficiencies in measure and household characteristics database fields that will be used to collect and store participant data. If the implementer did not develop nor have a complete database at the time of the evaluation, then including this detail in the report would suffice.

In future surveys Navigant should consider asking trade allies that install energy efficient measures outside of the program why those measures were not rebated, plus can ask about the program influence on these sales. Direct solicitation about non-program installs, since there appears to be a significant amount reported by trade allies, should be administered to understand program influence. A few of the surveys showed a significant number of non-program energy efficient installations. Regarding Navigant's spillover analysis, it was not clear how different measures were handled for trade allies, and whether Navigant focused on lighting only or if they included other measures for the C&I trade ally net-to-gross research (Navigant PY2013 EM&V Report, p**.** 80). Additionally, the report also showed a

surprising finding that 26 percent of the trade allies said half of their energy efficient equipment installations were done outside the program (Navigant PY2013 EM&V Report, p. 96).

Recommendations to Improve Future Process Evaluation Reports

Future process evaluations should include the following:

- Provide an updated process evaluation plan for review by the EM&V Auditor.
- Include in the research activities specific questions to address the key research issues listed in 4 CSR 240-22.070.
- Field a non-participant survey focusing on awareness, barriers to program participation, current energy efficiency actions, and key demographic characteristics.
- Include additional demographic questions regarding income, size of home, and income levels in future participant surveys.
- Update the process evaluations each year with interviews from program staff and implementers, and a review of key materials, and provide a status report on the progress of each recommendation.

Organization of This Report

This report is organized into the following sections to guide the reader through this summary of the key results:

- Section 1: Summary of Key Findings and Recommendations from the Impact Evaluations
- Section 2: Summary of Key Findings and Recommendations from the Process Evaluations
- Section 3: Summary of Cost-Effectiveness Findings
- Section 4: EM&V Auditor's Findings and Recommendations

Introduction

The passage of the Missouri Energy Efficiency Investment Act in 2009, and the PSC's approval of the Stipulation and Agreement in Case No. EO-2012-0009 signaled a new beginning of DSM program offerings to all GMO customer classes. These DSM programs were launched in January 2013. In accordance with 4 CSR 240-22.070(8), the electric utilities are required to complete process and impact evaluations to assess the progress towards meeting the energy savings targets.

To meet these requirements,

> According to 4 CSR 240-22.070(8), the electric utilities are required to complete process and impact evaluations.
>
> *…The purpose of these evaluations shall be to develop the information necessary to evaluate the cost-effectiveness and improve the design of existing and future demand-side programs and demand-side rates, to improve the forecasts of customer energy consumption and responsiveness to demand-side programs and demand-side rates and to gather data on the implementation costs and load impacts of demand-side programs and demand-side rates for use in future cost-effectiveness screening and integrated resource analysis.*
>
> *(A) Process Evaluation. Each demand-side program and demand-side rate that is part of the utility's preferred resource plan shall be subjected to an ongoing evaluation process which addresses at least the following questions about program design.*
>
> *1. What are the primary market imperfections that are common to the target market segment?*
>
> *2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?*
>
> *3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?*
>
> *4. Are the communication channels and delivery mechanisms appropriate for the target market segment?*
>
> *5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?*
>
> *(B) Impact Evaluation. The utility shall develop methods of estimating the actual load impacts of each demand-side program and demand-side rate included in the utility's preferred resource plan to a reasonable degree of accuracy.*
>
> *1. Impact evaluation methods. At a minimum, comparisons of one (1) or both of the following types shall be used to measure program and rate impacts in a manner that is based on sound statistical principles:*
>
> *A. Comparisons of pre-adoption and post-adoption loads of program or demand-side rate participants, corrected for the effects of weather and other intertemporal differences; and*
>
> *B. Comparisons between program and demand-side rate participants' loads and those of an appropriate control group over the same time period.*
>
> *2. The utility shall develop load-impact measurement protocols that are designed to make the most cost-effective use of the following types of measurements, either individually or in combination:*
>
> *A. Monthly billing data, hourly load data, load research data, end-use load metered data, building and equipment simulation models, and survey responses; or*
>
> *B. Audit and survey data on appliance and equipment type, size and efficiency levels, household or business characteristics, or energy-related building characteristics.*
>
> *(C) The utility shall develop protocols to collect data regarding demand-side program and demand-side rate market potential, participation rates, utility costs, participant costs, and total costs.*

In 2012, the PSC contracted with Johnson Consulting Group to serve as its EM&V Auditor to review and comment on compliance with 4 CSR 240-22.070(8) and on the overall quality, scope and accuracy of these reports.

This review consisted of the following components. The EM&V Auditor Team Members read the program's draft evaluation report in its entirety, and summarized the key findings and recommendations made by program by topic area. Organizing the findings at this level allows for a comprehensive review of the important trends among the programs and identifies issues that are important at both the program and portfolio level. The EM&V Auditor Team Members also made additional recommendations based on the EM&V Auditor Team's collective experience with utility energy efficiency programs' EM&V best practices and professional judgment.

Lastly, the EM&V Auditor Team Members assessed the overall quality of the program evaluations completed by Navigant.

This report is organized into the following sections, to help guide the reader through this summary of the key results:

- Section 1: Summary of Key Findings and Recommendations from the Impact Evaluations
- Section 2: Summary of Key Findings and Recommendations from the Process Evaluations
- Section 3: Summary of Cost-Effectiveness Analysis
- Section 4: EM&V Auditor's Findings and Recommendations

To facilitate the reader, the specific program evaluations are referenced in the text by the program name, year of evaluation and specific page number (i.e., Navigant 2013 EM&V Report, 2013, p.1). In addition, percentages cited in parenthesis (%) are used to denote particular or significant findings from a particular evaluation finding and follow standard industry reporting conventions.

Section 1: Summary of Key Findings and Recommendations from the Impact Evaluations

This section summarizes the findings from these impact evaluations, while Section 4 provides the EM&V Auditor Team's assessment of the appropriateness of these savings estimates.

Navigant conducted impact evaluations to determine the savings estimates attributable to each program or measure. Navigant proposed and the utility approved a multiple year EM&V plan from PY2013 through PY2015. The current report for PY2013 was based on data collection from limited evaluation, measurement and verification activities and the results were not sufficient to support estimating the achieved net savings for each program. In particular, the Net-to-Gross factors were not applied to calculate the program achieved net savings. Instead, the evaluator used "an overarching and significant assumption in this analysis that NTG factors are 1.0 for all programs except the Appliance Turn-in Program. The Appliance Turn-in Program uses NTG factor of 0.52." (Navigant 2013 EM&V Report, p. xv).

As part of the EM&V Auditor' review, team members summarized the data from both the individual program and program portfolio evaluations.

The GMO DSM programs are a mix of new programs started in PY2013 and programs that have been operating in the GMO territory since 2008. To assess these programs, Navigant used five evaluation methods with varying levels of rigor and different objectives for evaluating impacts (see Table 1).

For all programs with participation, Navigant conducted a review of the electronic database and the supporting deemed savings assumptions used for *ex ante* savings reporting. However, the Multifamily Rebate Program and ENERGY STAR® New Homes Program did not receive a database and deemed savings review because each program paid only one rebate in PY2013.

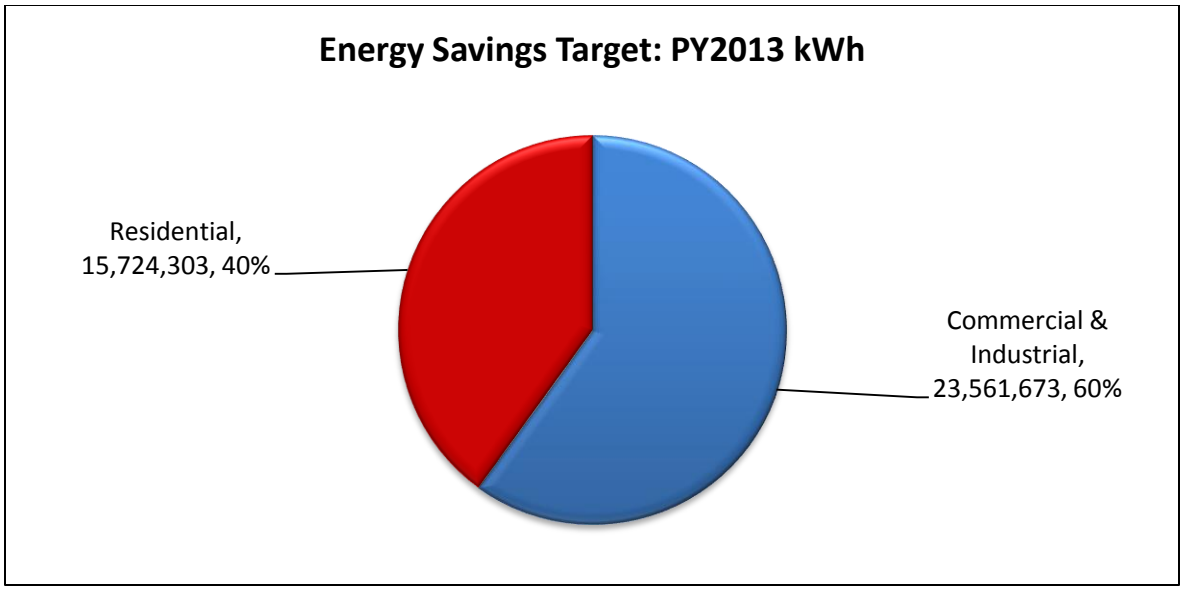
1.1 Summary of Impact Evaluation Findings

Portfolio Level Findings

This section summarizes the key energy savings estimates for both demand kilowatts (kW) and energy kilowatt-hours (kWh) across GMO MEEIA program portfolio.

Figure 1 summarizes the energy savings goals by sector for kWh for PY2013. The kW target was not presented in the evaluation report and so is not provided here yet[7]. The total goal for PY2013 energy savings is 39,285,976 kWh. Of note, 60 percent of total energy goals in 2013 was in the commercial and industrial (C&I) sector while the residential sector accounted for 40 percent of the energy savings goal.

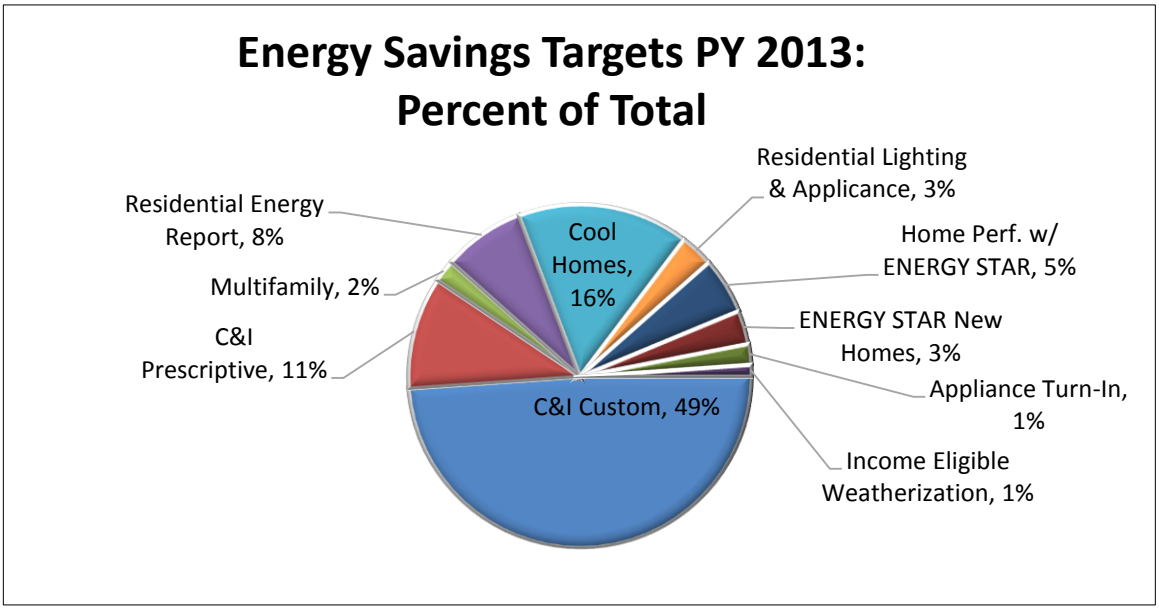
[7] These tables will be revised once the EM&V Auditor Team has the proper energy savings targets from the tariff filings.



(Sources: Navigant PY2013 EM&V Report, p. xiv and GMO MEEIA Filing)

Figure 1: Energy Savings Target by Sector: PY2013 kWh

The Commercial & Industrial Custom Rebate Program accounts for approximately half (49%) of the total energy savings target in 2013. Cool Homes Program has the second highest goals, accounting for 16% of all savings targets. These results are summarized in Figure 2.



(Sources: Navigant PY2013 EM&V Report, p. xiv and GMO MEEIA Filing)

Figure 2: Energy Saving Targets: Percent of Total

Table 1 shows the GMO energy efficiency targets, gross savings *ex ante* values, gross savings *ex post* values, net savings *ex post* values, and percent of target achieved (net achievement compared to the targets for energy savings). To ensure clarity, these terms are defined as follows:

- **Energy Savings Targets** – Target values are annualized savings targets for the residential, commercial, and industrial sectors.
- **Gross Savings Ex Ante** – *Ex ante* gross savings are annualized savings either reported by GMO MEEIA programs, or as calculated by applying tracked program activity to TRM savings values.
- **Gross Savings Ex Post** – *Ex post* gross savings are annualized savings as calculated and presented by the evaluator, which is generally known as "Realized kWh Savings" or "Achieved Savings" in the report.
- **Net Savings Ex Post** – *Ex post* net savings is the *ex post* savings multiplied by the net-to-gross (NTG) ratio, which accounts for free ridership, spillover effect, and market effects. In the report, an NTG ratio of 0.52 was used for the Appliance Turn-In program and an NTG ratio of 1.0 for all other programs.

Since the Net-to-Gross (NTG) ratios are stipulated, the savings presented are actually more accurately characterized as gross savings, Additionally, in accordance with the Navigant EM&V plan, the evaluation focused on ensuring systems are in place to properly apply the Technical Reference Manual (TRM) and other deemed savings values so the *ex post* savings may be characterized as validated *ex ante* savings. The Navigant plan is set up such that more detailed evaluation of NTG and *ex post* savings are planned for 2014 and 2015.

Table 1: GMO Portfolio Energy Savings in PY2013, kWh

Program	Energy Savings Targets 2013	Gross Savings Ex Ante	Gross Savings Ex Post	Net Savings Ex Post: 2013	% of Target Achieved
C&I Custom	19,394,851	16,114,523	16,068,199	16,068,199	83%
C&I Prescriptive	4,166,822	5,095,227	5,109,045	5,072,594	122%
Multifamily	833,364	1,131	118	118	0%
Residential Energy Report	3,048,049	2,695,254	2,695,254	2,695,254	88%
Cool Homes	6,398,183	2,417,759	3,017,339	3,017,339	47%
Residential Light & Appliance	1,250,047	3,238,908	654,559	654,407	52%
Home Performance	2,108,136	397,149	395,499	395,499	19%
ENERGY STAR® New Homes	1,264,882	704	704	704	0%
Appliance Turn-In	400,015	1,322,621	1,095,304[8]	569,558	142%
Income Weatherization	421,627	48,893	47,353	47,353	11%
Mpower	0	0	0	0	N/A
Energy Optimizer	0	0	0	0	N/A
Total	**39,285,976**	**31,332,169**	**29,083,374**	**28,521,025**	**73%**

(Source: Navigant 2013 Program EM&V Report, p. xiv)

[8] Navigant applied a stipulated realization rate of 52%.

As Table 1 shows, the total gross savings reported *ex ante* is 31,332,169 kWh. The evaluation studies report a total gross savings of 29, 083,374 kWh, implying a gross realization rate of 93 percent. The total savings estimated, after applying the stipulated NTG ratios, is 28,521,025 kWh (see Figure 3). The net savings are nearly identical to the gross savings since the MEEIA stipulation and agreement NTG values were 1.0 for all programs except the Appliance Turn-in program, which had a stipulated NTG ratio of 0.52 (see Figure 4).

Table 1 also shows total net energy saved (after applying the NTG ratio to accounting for free ridership, spillover and market effects) relative to the 2013 targets, by programs. Across all programs, only the C&I Prescriptive Rebate program exceeded its target in terms of net savings, achieving 122 percent of its target. All other programs achieved less energy savings than their targets; especially, the Multifamily Rebate Program, Home Performance with Energy Star® Program, and Income Eligible Weatherization Program only achieved a small portion (<20%) of the targets. The portfolio realized 72 percent of energy savings targets for PY2013.

Table 2 shows the gross savings *ex ante*, gross savings *ex post* and net savings *ex post* for demand reductions for PY2013. This table suggests a total demand reduction realization rate of 99.5 percent from the gross savings *ex ante* to gross savings *ex post*. The NTG ratios are all 1.0 except the Appliance Turn-in Program that uses a 0.52 NTG ratio. Overall, the reported demand savings is 76 percent of the target saving values.

Table 2: GMO Demand Reductions in PY2013, kW

Program	Demand Savings Targets 2013[9]	Gross Savings Ex Ante	Gross Savings Ex Post	Net Savings Ex Post: 2013	% of Target Achieved
C&I Custom	2,634	2,547	2,939	2,939	112%
C&I Prescriptive	858	1,166	913	913	106%
Multifamily	56	0	0	0	0%
Residential Energy Report	469	631	631	631	135%
Cool Homes	3,743	1,357	1,493	1,493	40%
Residential Lighting & Appliance	636	515	77	77	12%
Home Performance	971	185	184	184	19%
ENERGY STAR® New Homes	386	2	2	2	1%
Appliance Turn-In	-	175	178	93	NA
Income Weatherization	30	32	33	33	110%
Mpower	14,308	13,428	13,373	13,373	93%
Energy Optimizer	2,977	619	728	728	24%
Total	**27,068**	**20,657**	**20,551**	**20,466**	**76%**

(Source: Navigant PY2013 EM&V Analysis)

[9] Per 1st Revised Sheet No. R-63.01.

The PY2013 Net-to-Gross (NTG) evaluation activities are preliminary, directional estimates of net-to-gross components (free ridership, spillover and market effects) and included the following programs:

- Commercial and Industrial Programs:
  - C&I Prescriptive Rebate Program
  - C&I Custom Rebate Program
- Residential Programs:
  - Cool Homes Program
  - Residential Lighting and Appliance Rebate Program
  - Appliance Turn-In Program
  - Home Performance with ENERGY STAR® Program

Navigant is planning on developing the net-to-gross ratios for each program over the course of the three-year evaluation cycle and will not be finalized until after the third program year. This approach is used to permit capturing a range of different data using multiple methods to capture not only free-ridership, but also spillover and market effects information over the course of the three-year program cycle.

The basis for most of the NTG surveys was the customer self-report approach, based off the "fast feedback" approach used by Research Into Action and Energy Trust of Oregon (ETO).[10] The Appliance Turn-in Program leveraged the methodology based on the Uniform Methods Project (UMP) Appliance Recycling protocol[11] to estimate free ridership. Findings from the first year NTG research, including free ridership and spillover rates from both the participant and trade ally surveys are included in Table 3.

[10] Peters, J. and Bliss, R. (2013). *Common Approach for Measuring Free riders for Downstream Programs*. Research Into Action Team.

[11] The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures, Chapter 7: Refrigerator Recycling Evaluation Protocols, National Renewable Energy Laboratory, March 2013, http://www1.eere.energy.gov/wip/pdfs/53827-7.pdf.

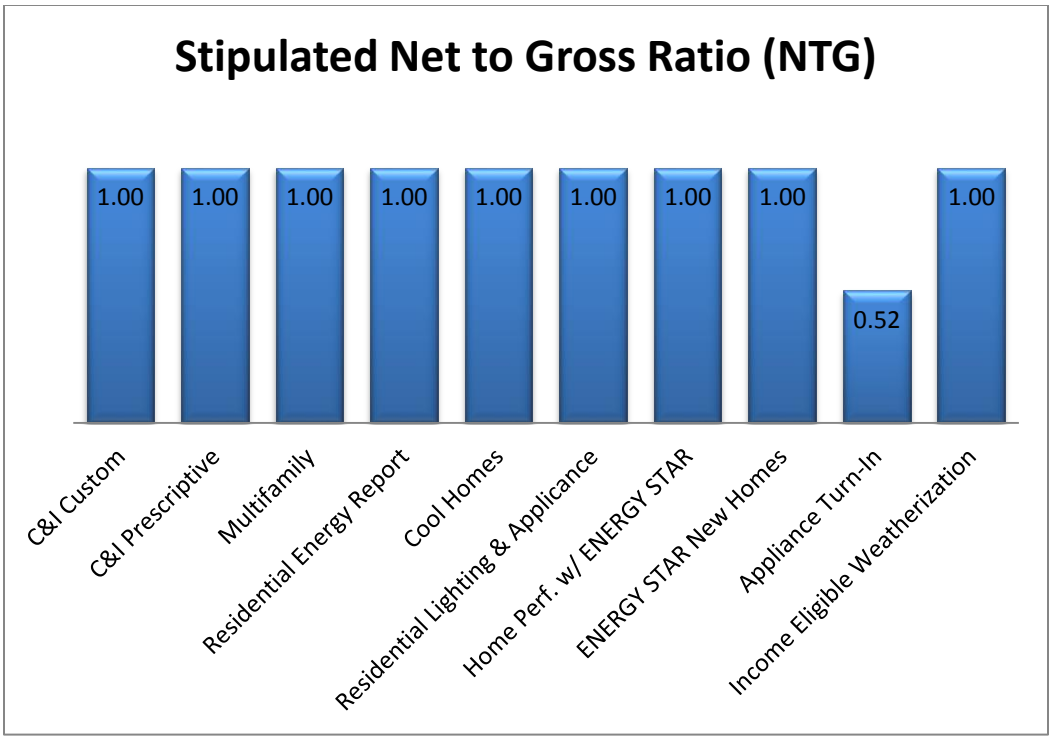
Table 3: Estimated Free Ridership, Spillover, and Market Effect Rates for Each Program

Program	Estimated Free Ridership Rates	Estimated Spillover Rates	Trade Ally Free Ridership Estimate	Trade Ally Spillover Estimate	Estimated Market Effects
C&I Custom	0.14	0.08	0.22	0.17	Unclear**
C&I Prescriptive	0.06	0.02			Unclear
Multifamily	NE*	NE	NE	NE	NE
Residential Energy Report	NE	NE	NE	NE	NE
Cool Homes	0.51	>0.0	0.34	0.04	Unclear
Residential Light &Appliance	0.48	0.12	NE	NE	NE
Home Performance	0.21	0.05	0.18	>0.0	0.00
ENERGY STAR® New Homes	NE	NE	NE	NE	NE
Appliance Turn-In	0.36	N/A	NE	NE	NE
Income Weatherization	NE	NE	NE	NE	NE
Mpower	NE	NE	NE	NE	NE
Energy Optimizer	NE	NE	NE	NE	NE

(Source: PY2013 EM&V Analysis)
(Note: *NE stands for "Not Evaluated." ** Unclear means that while the evaluation report did address the subject of market effects, but it does not provide sufficient information to obtain the values.)

Almost all of the preliminary NTG estimates are in line with Illinois SAG NTG values and when benchmarked against other recent studies are also well within an expected range. The preliminary estimates of the NTG components for the C&I programs do appear to be higher than the estimates from the Illinois SAG and the EM&V auditors expectations. Navigant did comment on the low free ridership for these programs and stated in the report that future work in 2014, including the planned end-of-year survey of C&I customers, will refine the GMO estimates further.

Table 3 did not include any preliminary findings from the market effects analysis. This is due to Navigant's focus on researching the existence of market effects for the C&I and Cool Homes programs without focus on developing an actual quantifiable estimate during the first year evaluation efforts. Future versions of the trade ally surveys will seek to develop a more precise estimate of market effects, and a methodology for attributing energy savings to these effects will be developed and discussed with stakeholders. Figure 3 summarizes the stipulated NTG values reported from this evaluation.



(Source: Navigant Analysis from PY2013 EM&V Report)

Figure 3: Stipulated NTG (Net-to-Gross) Ratios by Programs for EM&V PY2013

Program Level Findings

The following section summarizes the overall program performance by program.

C&I Custom Rebate Program

The C&I Custom Rebate Program has been in operation since 2008. The program provides rebates for installing qualifying high-energy efficiency equipment or systems in new or retrofit situations. Equipment may include, but isn't limited to HVAC, motor, lighting, pumping, and/or other qualifying equipment. New construction projects and retrofit projects not offered under the C&I Prescriptive Rebate program are eligible. The *ex ante* savings for this program are from custom calculations by the program implementer. Table 4 summarizes the C&I Custom Rebate Program PY2013 results. The three-year cumulative energy savings show the program accounts for 39 percent of the three-year portfolio target.

Table 4: Summary of C&I Custom Rebate Program Impact Findings

	Energy (kWh)	Demand (kW)
2013 Target	19,394,851	2,634
Three-year Cumulative Target	59,180,562	8,038
Ex Ante Gross	16,114,523	2,547
Ex Post Gross	16,068,199	2,939

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4, and Per 1st Revised Sheet No. R-63.01)

The C&I Custom Program is not meeting its target savings goals. C&I Custom Rebate Program realized 99.7 percent of its *ex ante* savings, based on Navigant's evaluation and analysis to the actual PY2013 participation. However, the program achieved only 82.8 percent (16,068,199 kWh) of its proposed savings target presented in the GMO MEEIA Stipulation and Agreement (19,394,851 kWh). The current NTG ratio was applied an assumed value of 1.0.

The program has a high reported realization rate (99.7%) for energy savings and an even higher realization rate (115%) for demand reduction, with a reasonable rate of free ridership (14%) and spillover rate (8%). Navigant's evaluation activities included review of the tracking system and database, project-level engineering review of algorithms and assumptions, and phone verification for a nested sample of desk-reviewed projects. The evaluation found that the program contributed more than 100 MWh per project of ex ante savings. The evaluator made several suggestions for potential program improvements.

Navigant indicated, in the future, it would evaluate the sampled projects using standard EM&V methods including field verification, monitoring of select measures, telephone interviews, and engineering reviews to calculate the ratio between the verified savings and the reported savings (i.e., realization rate), and will use that ratio to extrapolate to the entire program.

C&I Prescriptive Rebate Program

The C&I Prescriptive Rebate Program encourages GMO's C&I customers to install standard energy-efficient measures in existing facilities. The program provides incentives to facility owners for the installation of high-efficiency equipment and controls. In addition, the program provides a marketing mechanism for electrical contractors, mechanical contractors, and their distributors to promote energy- efficient equipment to end users. Prescriptive incentives are provided for the following measure end-use categories: 1) lighting and controls, 2) air conditioning, heat pumps, and chillers, 3) pumps and variable frequency drives, 4) appliances, 5) process measures, 6) business computing, and 7) food service and refrigeration.

The C&I Prescriptive Rebate Program PY2013 impact results are summarized in Table 5. The C&I Prescriptive Program accounts for 14 percent of the three-year portfolio target.

Table 5: Summary of C&I Prescriptive Rebate Program Impact Findings

	Energy (kWh)	Demand (kW)
Target	4,166,822	858
Three-year Cumulative Target	21,464,957	4,419
Ex Ante Gross	5,095,227	1,166
Ex Post Gross	5,109,045	873

.Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp. 13-14), and Per 1st Revised Sheet No. R-63.01)

The majority of *ex ante* energy savings for the C&I Prescriptive program reportedly comes from the lighting and lighting controls measures (87 percent) followed by VFDs (11 percent) and HVAC (2 percent) measures.

Lighting savings account for approximately 89 percent of ex post savings, and therefore drive the overall realization rate for the program. Linear fluorescent T8 and T5 fixtures account for approximately 80 percent of the program's energy and coincident demand savings.

The C&I Prescriptive Program exceeded its energy savings goals. The C&I Prescriptive Rebate Program had gross energy savings realization rate of 100 percent and gross demand reduction realization rate of 75 percent. With the assumed NTG ratio of 1.0, this program achieved net energy savings of 5,109,045 kWh, 123 percent of the energy savings target for PY2013. For gross energy savings, one measure, HVAC, only had realization rate of 24 percent. Meanwhile, for gross demand reduction, two measures' realization rates were below 50 percent: (1) VFD, and (2) HVAC. The HVAC realization rate is primarily driven by three projects that were assigned ex ante values that were ten times the savings assigned to other projects of the same measure. The evaluator believes these are data entry and/or tracking errors. Additionally, several other HVAC projects were assigned ex ante energy and demand savings that are higher than the values from the Ameren TRM. The evaluator suggests using the Ameren TRM approach with the updated EFLH (1,010 for the cooling season and 1,379 for the heating season) and CF values (91.3%) (Navigant PY2013 EM&V Report, pp. xiv-xv, 33, 34).

The overall realization rates for energy and coincident demand savings for VFD measures are 96 percent and 36 percent, respectively. A demand savings factor (DSF) accounting for the peak load and therefore accounting for a coincidence factor was assumed to be 14.95 percent for VFD measures by the evaluator, which corresponds to an average of the values for water pumps on HVAC applications.

The evaluator determined a free ridership ratio of 14 percent and spillover factor of two percent through a fast feedback survey to the participants. However, through a survey of trade allies, the evaluator reported a high level of free ridership (22%) and spillover of (17%) for combined C&I custom and prescriptive programs (Navigant PY2013 EM&V Report, p. 113).

The evaluator recommended implementing several changes to the program tracking database and *ex ante* calculations, which are described in Section 2.2.

1.2 Demand Response Programs Impact Evaluation

MPower Program

MPower is a seasonal, event-based DR program that provides customers monetary incentives to reduce demand during peak load periods. The program is open to current GMO C&I electric customers with a load curtailment capability of at least 25 kW during the curtailment season (June 1–September 30) and during designated curtailment hours (12 PM–10 PM).

GMO may call up to ten curtailment events during any curtailment season. Events may last from a minimum of two hours up to eight hours. Participants may choose the maximum number of events for which they are willing to commit.

There were no curtailment events in PY2013, so the evaluation was limited to a desk review examining the expected savings for program participants. *Ex ante* savings for the program is the customer's curtailable load (CL), summed over all active participants.

There were 25 participants, and if they all participated at *ex ante* values, an aggregated verified peak demand savings 13,373 kW would occur. This compares to reported savings of coincident demand of 13,428 kW resulting in a 100 percent realization rate. Energy savings are not claimed for the MPower program although such savings likely occurs, and therefore could be included in the savings calculations.

The bulk of the savings comes from just two segments: Manufacturing (46%) and Data Centers (39%) (Navigant PY2013 EM&V Report, p. 83).

Energy Optimizer Program

Energy Optimizer (EO) is a voluntary Direct Load Control (DLC) program for residential and small commercial customers with central AC or heat pump systems. The program is designed to reduce system peak loads by cycling participants' HVAC compressors on and off during peak demand periods. There are no rebates or incentives offered for participating in the Program other than the free communicating programmable thermostat and free installation that participants receive when they enroll. In exchange, participants agree to participate in a load management program where GMO can broadcast a paging signal to participants' thermostats that triggers switches on their HVAC compressors to begin cycling on and off at 15-minute intervals. Events may be called on weekdays during the Curtailment Season (June 1–September 30). Events last for a maximum of four hours, and are most likely to be called during peak demand hours (3 PM–6 PM).

No curtailment events were called during 2013, so the evaluation needed only a review of program tracking systems and databases. Thus the evaluator relied exclusively on data reported by GMO or provided by the program implementer,

The evaluator reported an incremental addition to the EO Program's DR savings capacity in PY2013 of 728 kW, and an overall Program DR savings capacity of 16.1 MW. GMO reported an incremental addition of 619 kW of savings capacity resulting in a realization rate of 118 percent (Navigant PY2013 EM&V Report, pp. 86-88).

Residential Programs Impact Evaluation

The following tables include the results of the residential impact evaluation efforts.

For the Residential Multifamily Program, Navigant adjusted the savings for the single rebate paid for an ENERGY STAR® refrigerator (this is also consistent with the issue and adjustments made for refrigerators within the Residential Lighting & Appliance program). The savings for this single measures was consistent with savings for refrigerator recycling, not a new refrigerator. Given the comparatively small contribution to overall portfolio savings, the evaluation team did not recommend an impact evaluation for PY2013, beyond a database review. Navigant's verification methods indicated an energy realization rate of 10 percent (Navigant PY2013 EM&V Report, p. 45).

Table 6: Summary of Multifamily Impact Findings

	Energy (kWh)	Demand (kW)
Target	833,364	56
Three-year Cumulative Target	4,292,991	288
Ex Ante Gross	1,131	0
Ex Post Gross	118	0

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp.13-14), and Per 1st Revised Sheet No. R-63.01)

The presence of a single rebate did not provide Navigant with sufficient resources for a data review of every measure in the Multifamily Program. Navigant plans to continue its data and deemed savings review in future program years (2014 and 2015) as activity and participation increase. The findings are summarized in Table 7.

Table 7: Summary of Residential Energy Reports Impact Findings

	Energy (kWh)	Demand (kW)
Target	3,048,049	469
Three-year Cumulative Target	11,180,029	1,720
Ex Ante Gross	2,695,254	631

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp. 13-14), and Per 1st Revised Sheet No. R-63.01)

A typical analysis for a Residential Energy Report Program includes three parts: a) statistical validation of the randomized controlled trial, b) billing records analysis to estimate program savings, and c) estimation of joint savings with other EE programs. The Navigant team conducted part "a" in program year 2013, and will conduct parts "b" and "c" in program years 2014 and 2015, since this program was only in place for the latter portion of 2013 (Navigant PY2013 EM&V Report, pp. xiii, 47-51).

Given that the differences in average energy usage for the treatment and control groups were not statistically significant in 11 of the 12 months, the data are consistent with a randomized controlled trial. Therefore, Navigant did not have any recommendations for altering the current program implementation model. However, Navigant did find that the difference in mean usage during the winter months is significant. Navigant will apply appropriate statistical methods to account for these

differences when evaluating program impacts in program years 2014 and 2015. The *ex post* savings is therefore equal to the *ex ante* savings for this program and the realization rate is 100 percent.

For the Cool Homes Program evaluation, Navigant calculated project-specific savings based on unit size, contractor-measured operational energy efficiency ratio (EER) data, nameplate seasonal energy efficiency ratio (SEER), and GMO-specific full load hours and coincidence factors for early retirement of HVAC measures. The tracking database was missing only one variable necessary for accurate impact analysis (residence type), otherwise the database was sufficient for estimating impacts. The previous evaluation showed that there were approximately 20 percent heat pumps rebated, though the current database only showed a single instance of heat pumps. The database also lacked sufficient SEER precision (i.e., the SEER was rounded to a whole number only). The tune and repair measure EER was not usable, which left Navigant having to use deemed savings values. The remaining useful life (RUL) was updated to 7.2 (not 6 which is one-third of the life based on IL TRM) based on actual age of retired unit. Table 8 summarizes the key impact findings from the Cool Homes Program.

Table 8: Summary of Cool Homes Impact Findings

	Energy (kWh)	Demand (kW)
Target	6,398,183	3743
Three-year Cumulative Target	19,921,194	11,661
Ex Ante Gross	2,417,759	1,357
Ex Post Gross	3,017,339	1,493

Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp.13-14), and Per 1st Revised Sheet No. R-63.01)

For lighting (CFL) measures, Navigant included waste heat factors and an installation rate in savings calculations for compact fluorescent lamps (CFLs) and applied a blended baseline bulb wattage to account for increased efficiency standards due to the Energy Independence and Security Act of 2007 (EISA) for CFLs. Navigant's verification methods indicated an energy realization rate of 125 percent and demand realization rate of 110 percent.

Table 9 summarizes the findings from the Residential Lighting and Appliances program. For this program, Navigant adjusted refrigerator savings based on ENERGY STAR® calculator assumptions, resulting in a realization rate of 10 percent for both energy and demand savings for this measure (same issue as multifamily program – the database had incorrectly been assigned recycling deemed savings). Navigant also adjusted savings calculations for non-DR, programmable thermostats based on simulated GMO-specific cooling loads, and revised energy savings factor and an in-service rate consistent with Navigant's approach used in the KCP&L DSM Potential Study.[12]

[12] Navigant's Demand-Side Resource Potential Study Report 2013 for Kansas City Power and Light.

Table 9: Summary of Residential Lighting and Appliances Impact Findings

	Energy (kWh)	Demand (kW)
Target	1,250,047	636
Three-year Cumulative Target	6,439,487	3,275
Ex Ante Gross	3,238,908	515
Ex Post Gross	654,407	77

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp. 13-14), and Per 1st Revised Sheet No. R-63.01)

Navigant's verification methods indicated an energy realization rate of 20 percent and demand realization rate of 15 percent. These low rates are almost entirely due to the incorrect assignment of refrigerator recycling being applied to new ENERGY STAR® refrigerator measure savings (Navigant PY2013 EM&V Report, pp. xiii, 64-70)

Table 10 summarizes the key impact findings from the Home Performance with ENERGY STAR® program.

Table 10: Summary of Home Performance with ENERGY STAR® Impact Findings

	Energy (kWh)	Demand (kW)
Target	2,108,136	971
Three-year Cumulative Target	6,432,670	2,964
Ex Ante Gross	397,149	185
Ex Post Gross	395,499	184

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp. 13-14), and Per 1st Revised Sheet No. R-63.01)

The evaluator found that the tracking database lacked specifications of the pre-retrofit conditions and the post-retrofit conditions. Such information, if practical to obtain, could support a more thorough evaluation of the installed measures. *Ex ante* savings are tracked on a per-home basis; thus, all participants are assigned the same savings value regardless of differences among participants' homes and the measures that were installed. The *ex ante* savings estimate is sourced from findings of the previous EM&V report,[13] which determined program savings through a billing analysis. Navigant's verification methods indicated an energy realization rate of 100 percent and demand realization rate of 100 percent (Navigant PY2013 EM&V Report, pp. xiv-xv, 70-72).

The ENERGY STAR® New Homes program paid one rebate in 2013. Navigant verified that the savings claimed in the GMO Annual Progress Report for this project are consistent with the *ex ante* values provided in the previous EM&V report and does not recommend adjustment of the *ex ante* value. Navigant's verification methods indicated an energy realization rate of 100% and demand realization rate of 100 percent.

[13] GMO Home Performance with ENERGY STAR® Program Evaluation, Prepared by Opinion Dynamics Corporation.

Table 11: Summary of ENERGY STAR® New Homes Impact Findings

	Energy (kWh)	Demand (kW)
Target	1,264,882	386
Three-year Cumulative Target	3,859,602	1,177
Ex Ante and *Ex Post* Gross	704	2

(Source: Navigant PY2013 EM&V Report, pp. xiv-xv, 74)

For the Appliance Turn-in Program, Navigant adjusted savings based on program-specific mix of refrigerator capacities, vintage, and configuration (i.e., side-by-side, top/bottom freezer). The deemed savings updated based on the Michigan Deemed Savings database for room air conditioner and dehumidifier recycling. Navigant's verification methods indicated an energy realization rate of 83 percent and demand realization rate of 102 percent (see Table 12).

Table 12: Summary of Appliance Turn-In Impact Findings

	Energy (kWh)	Demand (kW)
Target	400,015	0
Three-year Cumulative Target	2,060,635	121
Ex Ante Gross	1,322,621	175
Ex Post Gross	1,095,304	178
Ex Post Net	569,558	114

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp.13-14), and Per 1st Revised Sheet No. R-63.01)

For the Income Eligible Weatherization Program, Navigant reviewed the NEAT software used to track income eligible project and discovered that the reports do not provide equipment or occupant specific information to support recalculating savings. The deemed savings value of 1,424 kWh and 0.10 kW per participant determined from the previous EM&V report is lower than 13 of the 20 savings values reported by the program. Navigant believes it is possible that the NEAT reports may be overestimating savings. Any differences in *ex ante* and *ex post* savings for these programs are based on differences between total program-level *ex ante* values sourced from GMO's Annual Progress Report, and Navigant's *ex post* analysis based on measure-level tracking data sourced from the Vision tracking database and other program files. Navigant's verification methods indicated an energy realization rate of 97 percent and demand realization rate of 103 percent. The impact findings are summarized in Table 13.

Table 13: Summary of Income Eligible Weatherization Impact Findings

	Energy (kWh)	Demand (kW)
Target	421,627	30
Three-year Cumulative Target	1,286,533	91
Ex Ante Gross	48,893	32
Ex Post Gross	47,353	33

(Sources: Navigant PY2013 EM&V Report, Table 2-3, 2-4 (pp.13-14), and Per 1st Revised Sheet No. R-63.01)

1.3 Summary of Impact Evaluation Recommendations

Recommendations to Improve NTG Estimates

Because the net-to-gross estimates are preliminary and will be based on the overall three-year evaluation activities, Navigant did not directly include recommendations for improving the net-to-gross outside of their planned activities over the next two years. Navigant is planning on revising the net-to-gross based on additional participant and non-participant surveys and more in-depth market effects analysis.

Recommended Updates to Data Tracking

There were numerous data tracking issues encountered by Navigant during their review of the VisionDSM database used by GMO. Following is a list of issues grouped by program. Note that there was no data tracking review performed for the Multifamily Rebate Program and the ENERGY STAR® New Homes Program due to lack of participants for these programs. There was also no data base review for the Residential Energy Reports Program due to the nature of the program.

- **Cool Homes Program**
  - Investigate quality control practices for Charge and Flow Repair measure performance data, specifically, operational EER both before and after the tune-up. Many records show a negative, zero, or negligible change in EER as a result of the tune-up.
  - Use project-specific data for calculating savings from the Early Retirement measure based on unit size and SEER before and after the retrofit. Use 850 for the equivalent full load cooling hours in the GMO territory, based on the DSM Potential Study for KCP&L estimates, which Navigant derived in 2012 from a simulated model that was built using GMO-specific building characteristics collected as part of the baseline characterization study and calibrated to GMO's customers' billing data
  - Update deemed savings values for the CFL Bulb Pack to account for updated baseline wattages, HVAC interactive factors (1.06 for energy and 1.11 for demand), an in-service rate of 98 percent, and a CF of 9.5 percent. Based on calculations using these values, Navigant recommends updated deemed values of 272.7 kWh and 0.02753 kW.
  - Navigant recommends modifying program requirements to track itemized project invoices to support the evaluation of incremental costs (Navigant PY2013 EM&V p. 63).
- **Residential Lighting & Appliance Program**
  - Navigant recommends updating measure-level *ex-ante* savings calculations to reflect values listed (Navigant PY2013 EM&V p. 71).
- **Appliance Turn-In Program**
  - Navigant recommends using deemed values as reported in report for all measures, and adjusting EUL to 8 from 10 based on Illinois TRM (Navigant 2013 EM&V p. 79).
- **Home Performance with ENERGY STAR® Program**
  - To support future evaluation activities, Navigant recommends tracking the data fields

listed in the Findings section for each participant in VisionDSM and providing the data as part of the electronic databases. Navigant recognizes, however, that collecting such information may be costly and may not be warranted based on the relatively small size of this program in the overall GMO portfolio (Navigant PY2013 EM&V p. 73).

- **Income Eligible Weatherization Program**
  - Navigant recommends: Track the installed measure specifications (i.e., type, efficiency, and size/capacity) and their quantities through the VisionDSM system to support an engineering review of the accuracy of NEAT savings estimates.
  - Use deemed savings from previous EM&V reports as a conservative estimate of program savings until future savings estimates are clarified.
  - Conduct interviews with program contractors to verify accuracy of savings derived from NEAT reports (Navigant PY2013 EM&V p. 82).
- **C&I Custom Program improvements**:
  - The database lacks of information to evaluate HVAC, refrigeration, and other non-lighting projects (GMO EM&V Report, p 16). Navigant recommends the documentation include algorithms underlying the input assumptions that support savings calculations (Navigant PY2013 EM&V Report, p. 27).
  - The program implementer employs a consistent approach for calculating *ex ante* savings for lighting projects across the C&I Custom and Prescriptive rebate programs.
- **C&I Prescriptive Program improvements**
  - Current *ex ante* saving calculations used the same coincidence factor and hours of use, no project-specific approach used to account for each customer's unique operation hours, facility type, and occupancy patterns.
  - Custom lighting measures' calculations do not include HVAC interaction factors to account for a reduced cooling load in summer and increased heating load in winter.
  - The evaluator recommended implementing the following changes to the program tracking database and *ex ante* calculations used for the C&I Prescriptive Rebate program:
    - Lighting measures
      - Include HVAC interactive factors in the energy and coincident demand savings algorithms
      - Calculate and track *ex ante* savings based on building type-specific hours of operation, coincidence factors, and interactive factors.
    - HVAC measures
      - Include size, efficiency, manufacturer, and model specifications of the system to support *ex post* savings calculations
      - Revise *ex ante* savings algorithms to account for cooling and heating season equivalent full load hours (EFLHcool and EFLHheat, respectively) by building type.
    - VFD measures
      - Use the deemed values derived by evaluator from the Illinois TRM of 1,041 kWh per HP and 0.08 kW per HP for all VFD measures (Navigant PY2013 EM&V Report, p. 43).

Section 2: Summary of Key Findings and Recommendations from the Process Evaluations

Overview of Process Evaluation

The types of process evaluation activities conducted across the GMO energy efficiency program portfolio and the key findings are summarized here.

2.1 Summary of Process Evaluation Findings

The primary objective of a process evaluation is to "*help program designers and managers structure their programs to achieve cost-effective savings while maintaining high levels of customer satisfaction."*[14] A process evaluation gathers information from a variety of sources, including program staff, market actors, trade allies, program participants, and non-participants. To increase the validity of the findings, it is necessary to gather data from multiple sources and then "triangulate" the data or compare it across multiple groups. This methodology increases the overall validity of the findings.

This section summarizes the key findings from the process evaluations for six of GMO's energy efficiency programs: the C&I Prescriptive Rebate, C&I Custom, the Cool Homes, Residential Lighting and Appliances, Appliance Turn-In and Home Performance with Energy Star (HPwES) programs (Navigant PY2013 EM&V Report, p. 133). It is based on a thorough review of the independent evaluator's report. References are provided throughout to aid the reader.

Customer Satisfaction

Overall satisfaction with GMO is very high. Generally, participant satisfaction with GMO[15] is high, with most of the participants indicating they were either "Extremely Satisfied" or "Very Satisfied" as the following table shows. However, the customer surveys did not provide any additional information regarding the basis for these high satisfaction scores. This question was not addressed in the C&I process evaluations.

[14] http://www.calmac.org/events/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf.

[15] Note that in the customer surveys, the utility was referred to as KCP&L even though it was for GMO customers.

Table 14: Summary of Participant Satisfaction Ratings

Program	Percent Reporting "Extremely Satisfied"	Percent Reporting "Very Satisfied"
Appliance Turn-In Program (n=46)	65%	24%
Cool Homes Program (n=52)	42%	46%
Residential Lighting & Appliance Program (n= 50)	42%	34%
Home Performance with ENERGY STAR® (n=26)	58%	19%

(Sources: Navigant PY2013 EM&V Report, pp. 156 187, 200, 213)

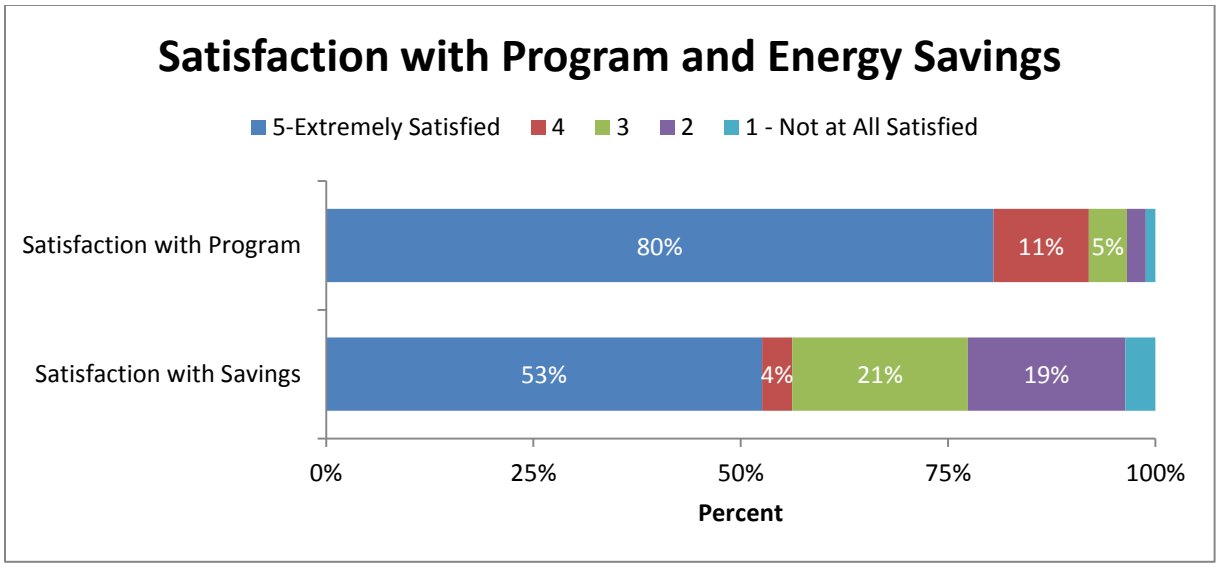
Customer satisfaction with the individual programs was also high. According to the customer surveys conducted, most respondents were satisfied with the program they participated in as Table 15 shows (Navigant PY2013 EM&V Report, pp. 172).

Table 15: Comparison of "Extremely Satisfied" Ratings Among Program Participants

Program	"Extremely Satisfied with Program"	"Extremely Satisfied" with Energy Savings
Appliance Turn-In Program (n=46)	96%	46%
Cool Homes Program (n=52)	77%	48%
Residential Lighting & Appliance Program (n= 50)	70%	38%
Home Performance with ENERGY STAR® (n=26)	62%	30%

(Sources: Navigant PY2013 EM&V Report, pp. 156 187, 200, 213)

However, there is a mismatch between customer expectations and experiences, which resulted in lower customer satisfaction rating regarding energy savings. Participating customers anticipated seeing much higher energy savings benefits from these programs; however the customer surveys indicated that savings were much lower across all of the residential programs. Nearly one quarter of respondents stated that they were not satisfied because they had not seen a reduction in their monthly bills (Navigant PY2013 EM&V Report, pp. 156-157). Table 15 and Figure 4 illustrate this disparity (p.157).



(Source: Navigant Analysis, GMO 2013 End-of-Year Surveys)

Figure 4: Comparison of Overall Respondent Satisfaction with Program and Energy Savings

This gap further complicates the relationship between installation of energy efficient measures and the corresponding reductions in energy use, which were not properly explained to residential customers (Navigant PY2013 EM&V Report, p. 157). The survey findings also reported that many customers found it difficult to estimate changes in their electricity bills because of a variety of factors including lack of information, or that the savings were offset due to rising cost of electricity (Navigant PY2013 EM&V Report, p. 213).

Customers without GMO account representatives were dissatisfied with their experience communicating with the program. The survey respondents seemed to have divergent experiences with program customer service, specifically being able to contact GMO when they had questions about or issues with the program process. The surveyed participants who had GMO account representatives whom they could contact directly with issues expressed high levels of satisfaction with their representatives. However, respondents who did not have GMO representatives and tried to contact GMO through the general call centers expressed high levels of dissatisfaction with their experiences communicating with the program (Navigant PY2013 EM&V Report, p. 145).

Trade Ally Satisfaction

Trade allies in the C&I Programs were satisfied; however the results were not reported for the residential programs. The process evaluation findings were inconsistent regarding trade ally satisfaction ratings as these ratings were only reported for the C&I Programs, based on feedback from 13 trade allies, and not reported at all for any of residential programs (Navigant PY2013 EM&V Report, p 152). However, the trade allies participating in the C&I Programs reported being "Extremely Satisfied" with both GMO overall (62%) and well as with the program (54%).

Sources of Awareness

Overall, most trade allies learned about the program via the program website. However, very few trade allies learned about these programs from direct outreach or through industry events (Navigant PY2013 EM&V Report, pp. 153).

Program respondents learned about the program from a variety of sources, depending upon the program. For example, for the Residential Lighting and Appliance Program, program participants recalled learning about the program through bill inserts and in-store displays (Navigant PY2013 EM&V Report, p.155)

But program participants in other programs learned about these opportunities from HVAC contractors, vendors or installers (i.e., the Cool Homes Program; 36%) (HPwES; 39%) (Navigant PY2013 EM&V Report, pp. 174, 187).

Marketing and Outreach

Most trade allies did not receive marketing materials from GMO. Only 23 percent reported they had received marketing materials from GMO related to the energy efficiency programs (Navigant PY2013 EM&V Report, p. 150)

However, trade allies preferred program information delivered monthly by email. Two thirds of the trade allies (66%) would like to receive information monthly and directly from GMO (Navigant PY2013 EM&V Report, pp. 145-146).

The process evaluations did not provide any information regarding the overall effectiveness of the marketing materials in the surveys with residential customers.

Most program participants are not aware of any other GMO programs. The surveys indicated that 75 percent of the survey respondents were not aware of other GMO programs (Navigant PY2013 EM&V Report, pp. 168, 182, 194).

There is little cross-program participation among current respondents. For example, 81 percent of respondents could not name another program in the GMO portfolio (Navigant PY2013 EM&V Report, pp. 168, 175). These findings are further summarized in the table developed by Navigant illustrating this program barrier.

Table 16: Awareness of Other GMO Programs

Program	Number of Respondents	Not Aware of Any Other Program (%)
Cool Homes	52	75%
Lighting and Appliance	50	60%
Appliance Turn-In	46	50%
Home Performance with ENERGY STAR®	26	54%
Grand Total	174	61%

(Source: Navigant analysis; GMO 2013 End-of-Year Surveys, pp. 168, 178)

The Use of ENERGY STAR® logo on a number of marketing materials is very effective. This technique is effective because it connects the program to another energy efficiency agency that is highly recognizable by consumers. Some materials only wrote out ENERGY STAR®, without including the logo. Using the logo consistently would help solidify this connection (Navigant PY2013 EM&V p. 185).

Overall the marketing materials are consistent with the best practices for developing effective communications and outreach materials. For example, The Cool Homes marketing materials rate well against the benchmarks from the study in that the program communicates through a variety of media channels (Navigant PY2013 EM&V pp. 172. 185, 197)

Program Design

For the most part, programs are well designed and implemented. The evaluator reported that GMO has leveraged successful program designs by contracting with nationally-known program implementers. This arrangement uses successful program designs from other jurisdictions and provides GMO with an effective set of programs. The evaluator further reported that there is little evidence of actionable design issues that should be addressed by GMO because the implementers have developed effective program implementation plans and an effective infrastructure for rebate processing (Navigant 2013 EM&V Report, p. 155).

Program Operations

Most trade allies reported the customers understood the application process. But, 25 percent of trade allies reported that their customers did not understand the application process, and suggested that the paperwork and the review process be streamlined. The customers were displeased with the fact that the website required them to register and complete a questionnaire before learning the details of the program (Navigant PY2013 EM&V Report, p. 207).

However, the C&I programs are experiencing delays in both the application and rebate processing. Participant and trade ally survey respondents reported that they were dissatisfied with the length of time between submitting the application and receiving the rebate. Navigant's review of the tracking database finds that the average time for participants to receive the rebate after submitting the application appears to be over 120 days for both programs (Navigant 2013 EM&V Report pp. 145-146).

Customers may be choosing the Custom program over the Prescriptive program because it offers an easier way to estimate the rebate. Therefore, this program is attracting customers who are likely better candidates for the C&I Prescriptive program (Navigant PY2013 EM&V Report, p. 149).

Trade allies offered positive comments about program administration. None expressed any concerns about either the program implementer or GMO for the C&I programs (Navigant PY2013 EM&V Report p. 109). However, the process evaluations did not provide any feedback regarding program operations from the residential trade allies or program participants.

Most C&I (85%) customers are aware of energy-efficient technologies. The majority of the C&I trade allies (77%) reported that their customers had become more aware of the energy-efficient equipment available over the past three years (Navigant PY2013 EM&V Report, pp. 97-99).

Most survey respondents (79%) reported receiving free CFLs through the program. However, the process evaluations did not indicate the disposition for respondents who did not recall receiving the free six-pack of CFL bulbs (15%) (Navigant PY2013 EM&V Report, p. 107).

All survey respondents reported at least one measure as part of their program participation in the HPwES Program (100%). Air sealing was the most frequently installed measure among survey participants (Navigant PY2013 EM&V Report, p. 212).

The current programs are not reaching customers across GMO's programs. The GIS analysis indicated that both the Cool Home and HPwES programs, highly dependent on trade allies, are not being served by the existing residential trade ally network. By increasing the trade ally coverage in some of the rural areas such as Warrenburg and Sedalia may also lead to increased participation in the Lighting and Appliance and Appliance Turn-in programs, as well (Navigant PY2013 EM&V Report, pp. 164, 178, 218).

The trade ally network did not grow and expand to meet current program needs. Rather, map analysis also highlighted the gaps in trade ally coverage in delivering GMO's current energy efficiency programs. The evaluators suggested that the current networks do not serve all of the GMO territory effectively, especially for the Cool Homes and HPwES programs. Participation for these two programs is clustered in metropolitan areas, while the northwestern territory does not appear to be served at all. With respect to the Home Performance with ENERGY STAR® program, there are no applicants outside of the ring of Kansas City suburbs and in the area surrounding St. Joseph (Navigant PY2013 EM&V Report, p. 164, 178, 218).

Most respondents who received the Home Energy Reports found them useful. Approximately 20 percent of the GMO's residential customers receive the residential home energy reports; while 10 percent serves as the control group. Most Lighting and Appliance survey respondents (69%) and the Appliance Turn-in (71%) survey respondents reported that the reports were useful (Navigant PY2013 EM&V Report, p. 164).

Respondents reported changing their energy use practices based on the information from the reports. Specifically, the evaluators found that the Appliance Turn-In survey respondents reported changes in behavior such as turning off the lights when they leave a room, changing the setting in their thermostat, and doing laundry when they have a full load. Respondents to the Home Performance with ENERGY STAR® program said the reports encouraged them to purchase CFLs to replace inefficient lamps as they burned out. However, the percentages quantifying these responses were not reported in the findings (Navigant PY2013 EM&V Report, pp. 164-165).

Quality Assurance/Quality Control Procedures

The C&I Prescriptive and Custom Programs lack procedures and criteria for on-site review of projects. Currently, the Prescriptive program does not conduct on-site verifications as project review is limited to desk review. For the Custom Projects, only a few large customers receive an on-site review post-installation. This exposes the program to avoidable risk (Navigant 2013 EM&V Report, p. 149).

The C&I Prescriptive Program also lacks a procedure to record application disputes. While the Custom program records application disputes in the VisionDSM database, the Prescriptive Program has no procedure for addressing and recording disputes. Navigant recommends that the Prescriptive Program record disputes in the VisionDSM database as the Custom Program does (Navigant 2013 EM&V Report, p. 149).

Contractor fraud was found in the Cool Homes Program. Two of the surveyed trade allies reported that other HVAC contractors were somehow falsifying CheckMe results and that some contractors guaranteed customers that they could make a unit qualify for replacement (Navigant 2013 EM&V Report, p. 168).

Key Impact Evaluation Recommendations

Areas for Program Improvement

Increase marketing and outreach activities. Both the survey respondents and trade allies recommended increased program marketing and outreach. The trade allies also emphasized the need to increase customer awareness of the program generally and to inform customers about who can provide qualifying services. The trade allies also suggested using direct mail or bill inserts to promote the program. An HPwES trade ally suggested offering customizable trade ally marketing materials (Navigant PY2013 EM&V Report, pp. 176).

Improve program application processing. The trade allies in the both the C&I and HPwES programs provided several suggestions on ways to streamline the application processing time, and provide more timely status reports regarding the application process, especially for those completed online (Navigant PY2013 EM&V Report, pp. 152).

Trade allies recommended providing low-interest loans or offer other ways to lower the first-cost barriers. Trade allies in both the C&I and HPwES programs recommended offering low-interest loans as a way to encourage customers to follow-through with the recommended improvements (Navigant PY2013 EM&V Report pp. 143, 145)

2.2 Summary of Process Evaluation Recommendations

The process evaluations identified more than 17 recommendations in the main section of each report, with additional suggestions provided at the end of each process evaluation activity. The major recommendations are summarized next. These recommendations were firmly based on the process evaluation findings and significantly improved from the draft report.

Key Process Evaluation Recommendations

The evaluation contractor provided several recommendations on ways to improve program operations.

Areas for Program Improvement

GMO should consider adding an upstream residential lighting program to its current portfolio. The evaluator concluded the current portfolio would meet a current gap by adding a residential lighting program (Navigant PY2013 EM&V Report pp. 155, 182).

GMO should investigate ways to promote cross-program participation as a well as build overall program awareness. Given that the vast majority (75%) of current participants are not aware of any other GMO programs, this suggests that the utility is missing significant savings opportunities. Moreover, the findings regarding the current marketing and outreach materials further suggest that GMO needs to revise, and update current marketing materials by finding ways in which trade allies can use these materials to promote the utility's full suite of energy efficiency programs (Navigant PY2013 EM&V Report, pp.155, 156, 168, 172, 173, 176, 182).

GMO could investigate opportunities to increase understanding of the magnitude of customers' expected energy savings and of the other factors that could influence a customer's energy consumption. The participant surveys illustrate the disconnect between customer satisfaction with the program overall compared to program savings. These findings suggest that GMO needs to communicate more effectively about the expected benefits of energy efficiency measures. Providing customers with a better understanding of the magnitude of savings that could be expected, as well as how other factors (e.g., weather) may influence their monthly electricity bill, may reset expectations, and improve customer satisfaction (Navigant PY2013 EM&V Report, p. 157)

GMO should consider expanding its trade ally networks to serve the eastern and northern portions of its territory. Specifically, the utility should focus on recruiting trade allies serving towns with 10,000. Effectively expanding the trade ally network would require providing training to contractors in the methods required by the Cool Homes and Home performance with ENERGY STAR® programs but given the potential for increased savings, this additional effort may be worthwhile (Navigant PY2013 EM&V Report p. 168).

GMO should implement better QA/QC inspection procedures for its C&I Programs. GMO may also consider random post-tune-up inspections, to ensure that the follow-up efficiency tests are not simply being done under more favorable conditions (i.e. in the evening when ambient temperatures are lower) (Navigant PY2013 EM&V Report p. 168).

Section 3: Cost-Effectiveness Analysis

Benefit-Cost Calculations

The evaluator calculated the five standard benefit-cost ratios: Total Resource Cost (TRC) Test, Societal Cost Test (SCT), Program Administrator Cost Test, Participant Cost Test, and Ratepayer Impact Measure Test, using formulation of the benefit-cost tests that followed the 2001 California Standard Practice Manual (SPM) and the subsequent 2007 SPM Clarification Memo.

The benefit-cost section of the report is quite in depth and nicely presented. Review of the methodology indicates that the evaluator included the appropriate costs. However, it is not perfectly clear the administrative costs include all costs such as EM&V, potential studies, and other non-program specific costs (Navigant PY2013 EM&V Report, p.144).

The administrator appropriately discusses early retirement issues in their cost benefits. It appears that that early retirement is only considered for Cool Homes Program (Navigant PY2013 EM&V Report, p. 144). There are likely other programs that have significant early retirement projects, and thus may be included in future evaluations.

Given the NTG values are stipulated for the 2013year and may not be accurate, the evaluator presented a sensitivity analysis wherein they considered cost-effectiveness for various NTG scenarios, low, medium and high (Navigant PY2013 EM&V Report, p. 152).

Despite the fact that owing to the limited data available for actual *ex post* savings and NTG values, the cost-effectiveness tests as presented in the report were detailed and appear to be generally complete and reliable in concept and methodology.

Results presented in the report (Navigant EM&V Report, pp. 147-148) show Navigant's evaluation of cost-effectiveness by program and cost test.

According to the evaluator, "The portfolio of programs is cost-effective in all but the rate impact measure test, as illustrated in Table 4-3. The portfolio-level ratios consider the following costs: 1) EE program costs, 2) DR program costs, 3) Educational program costs, 4) Market research and software development costs, and 5) EM&V costs" (Navigant PY2013 EM&V Report, p. 147).

The report includes benefit-cost ratios for EE programs and DR programs (Navigant PY2013 EM&V Report, p. 148). The evaluator points out that for each of these program groups, they "excluded all portfolio-level costs such as marketing research, software development, and EM&V to avoid complexities in allocating those portfolio-level costs across individual programs."

Section 4: EM&V Auditor Findings and Recommendations

As presented in the three-year evaluation, measurement, and verification (EM&V) Plan[16], Navigant developed a multi-year evaluation strategy to provide GMO and stakeholders with the best information possible over the course of the program cycle within the available evaluation financial resources. Navigant's plan concentrates on those programs with the greatest contribution to overall portfolio savings (Navigant PY2013 EM&V Report, p. 2)

In year one, for the impact evaluation, Navigant completed a detailed review of all data contained in the tracking system as well as the algorithms and/or deemed savings values used for *ex-ante* savings estimates. The methodologies used to complete this review are summarized in Table 17.

Table 17: Summary of Impact Evaluation Methodologies Used by Method

Program		Tracking System and Database Review	Measure-Level Engineering Review	Project-Level Engineering Review	Telephone Verification	Incremental Cost Research
C&I EE Programs	C&I Custom Rebate Program	✔		✔	✔	
	C&I Prescriptive Rebate Program	✔	✔		✔	
Residential EE Programs	Multifamily Rebate Program					
	Residential Energy Report Program Pilot*		✔			
	Cool Homes Program	✔	✔			✔
	Residential Lighting and Appliances Program	✔	✔			
	Home Performance with ENERGY STAR®	✔	✔			
	ENERGY STAR® New Homes					
	Appliance Turn-In Program	✔	✔			
	Income Eligible Weatherization	✔		✔		
Demand Response Programs	MPower Program	✔				
	Energy Optimizer Program	✔	✔			

(Source: Navigant PY2013 EM&V Report, pp. x, 9)

[16] Evaluation, Measurement, and Verification Plan: GMO Energy Efficiency and Demand Response Program 2013-2015 prepared by Navigant. October 2013.

Table 18 summarizes the range of process evaluation activities completed. As noted, several additional activities were added based on the feedback from the EM&V Auditor's Draft Report (June 9. 2014).

Table 18: Summary of Process Evaluation Methodologies Used by Method

Activity	Custom Prescriptive Rebate and Custom Programs	Cool Homes Program	Residential Lighting and Appliance Rebate Program	Appliance Turn-In Program	Home Performance with ENERGY STAR® Program
Interview Program Staff and Implementers	✔	✔	✔	✔	✔
Review of Marketing Materials[17]	✔	✔	✔	✔	✔
Develop Program Process Diagrams[18]	✔	✔	✔	✔	✔
Trade Ally Surveys (online)	✔	✔	✔	✔	✔
Survey Participants	✔	✔	✔	✔	✔
Mapping of Program Applications and Trade Allies[19]					

(Sources: Navigant PY2013 EM&V Report, p. 134)

Navigant's focus for this year's process evaluations was to:

- To address the MEEIA requirements set forth in 4 CSR 240-22.070(8)[20]
- To estimate customer satisfaction with the programs overall and individual program components, as well as to identify opportunities for program improvements (p. 133).

The EM&V Auditor's Draft Report (June 9, 2014) identified significant deficiencies in the process evaluations. The final evaluator's report addresses these deficiencies to the extent possible by revising and expanding the discussion of the process evaluation findings, and developing individual program flow diagrams to highlight program operations. In addition, the evaluator included in the main body of the report the findings from the program managers and implementers. However, several deficiencies that could not be corrected still remain regarding the trade ally and participant surveys. Specifically:

- The trade ally surveys provided inconsistent feedback regarding trade ally satisfaction, and did not sufficiently describe current program operations.
- The participant surveys focused only on two areas: awareness and satisfaction. Other key

[17] This review as added based on the recommendations of the EM&V Auditor's Draft Report June 9, 2014.
[18] Program flow diagrams were created based on the recommendations from the EM&V Auditor Draft Report June 9, 2014.

[19] This is not generally considered a process evaluation activity, but it did provide some valuable information regarding program reach and barriers to participation.
[20] This criterion was added based on the feedback and recommendations from the EM&V Auditor's Draft Report, June 9, 2014.

topics required to address in participant surveys included identifying barriers to program participation, effectiveness of marketing and outreach materials, and customer demographics to identify participation differences, were not addressed.

4.1 Summary of 4 CSR 240-22.070(8) Requirements

Impact Evaluation Findings

Based on the feedback from the draft EM&V Auditor Report, Navigant provided a more comprehensive discussion of the MEEIA in 4 CSR 240-22.070(8)Requirements. For calculating *ex post* savings for the 2013 evaluation, Navigant used method 1A to evaluate all energy efficiency and demand response programs (Navigant 2013 Final Report, p. xii). In 2014, Navigant plans to evaluate the Residential Energy Reports and MPower programs using method 1B only. The Cool Homes Program evaluation will utilize methods 1A and 1B. The remaining programs will be evaluated using method 1A only (Navigant 2013 Final Report, p. 11)

Process Evaluation Findings

To the extent possible, Navigant addressed the five key process evaluation questions required per the Missouri Code of State Regulations 4 CSR 240-22.070 (8) (Navigant 2013 EM&V Report, pp. xviii; 142). These responses, which were reported individually by program, are summarized next.

4 CSR 240-22.070(8) Issue #1: *What are the primary market imperfections common to the target market segment?*

As Table 19 shows, these six programs' goals are to address three fundamental barriers to program participation: the first cost barrier or incremental cost associated with premium energy efficiency technologies; the lack of awareness regarding the benefits of energy efficiency products and services, and the inability to locate qualified contractors specifically for the HPwES Program.

Table 19: Summary of Market Imperfections in the Target Market

Program	Summary of Finding
C&I Prescriptive Rebate & Custom Programs	First Cost Barrier and Limited Customer Awareness of new technologies (p. 142)
Cool Homes Program	Additional Incremental Cost (First Cost Barrier) and the length of the payback period (p. 167)
Residential Lighting and Appliances Program	Incremental cost associated with the premium energy efficient technologies (pp. 180-181)
Appliance Turn-In Program	The lack of momentum in customer decision-making and action, and lack of awareness of recycling procedures for large appliances (pp.192-193)
HPwES	The lack of customer awareness of the improvements that can be made to increase the energy efficiency of their home, the cost associated with energy efficiency projects and products, and the inability of customers to locate a certified HERS Rater (pp. 205-206).

Source: Navigant 2013 EM&V Final Report

4 **CSR 240-22.070(8) Issue #2:** Is *the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?*

Overall the GMO programs are correctly targeting the appropriate market segments. However, a few programs would benefit by opening up the market to new targets, specifically the small commercial customers.

Table 20: Summary of Target Market Findings

Program	Summary of Finding
C&I Prescriptive Rebate & Custom Programs	The target market for these two programs is all commercial and industrial customers within GMO territory, regardless of size or rate class. The Custom Program ensures that larger customers with more complex systems and energy efficiency needs are able to participate in the GMO program offerings. However, this target market might achieve better coverage by adding a small commercial program (p. 143)
Cool Homes Program	The target market segment for the Cool Homes programs includes residential customers with working inefficient HVAC systems. The program should consider opening up the program to very small businesses and multi-family complexes (p. 167)
Residential Lighting and Appliances Program	The program targets all residential customers within GMO territory who want to purchase new appliances. However, the program only reaches a small subset of the total residential lighting market (p. 180)
Appliance Turn-In Program	The program targets all residential customers as well but expanding the target market to include businesses would capture additional savings (p. 193).
HPwES	The program appropriately targets single family homeowners. However, the tracking system indicated that some 2013 participants live in multifamily units. Therefore the program should make the single-family home requirement clear on marketing material and applications and on all materials for trade allies (p. 206).

Source: Navigant 2013 EM&V Final Report

4 CSR 240-22.070(8) Issue #3: *Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?*

Overall, the evaluator found that the measure mix for each program is appropriate to serve the target market. Navigant did provide some suggestions on ways to better integrate lighting measures into both the C&I and residential programs, as well as considering offering a broader range of measures reflective of market changes.

Table 21: Summary of End-Use Measure Mix Findings

Program	Summary of Finding
C&I Prescriptive Rebate & Custom Programs	The Prescriptive program offers a wide mix of end-use measures. But despite the variety of end-uses included in the Prescriptive program, 2013 participants choose Custom over Prescriptive, even for lighting. However, the fact that the Custom program achieved more than twice the lighting savings achieved by the Prescriptive program (approximately 4.5 MWh) suggests that there may be barriers specific to the Prescriptive program that divert participation to the Custom program (pp. 143-144)
Cool Homes Program	The measure mix is appropriate as the program focuses on residential HVAC energy consumption by providing rebates for the purchase of high efficiency equipment as well as tuning existing units to their most efficient operating condition. GMO could consider expanding the program to incentivize other HVAC related measures (p. 167)
Residential Lighting and Appliances Program	The end use mix of appliances is sufficient. The program offers rebates for a wide mix of ENERGY STAR®-rated appliances. However, the program's offering of efficient lighting is limited to a free two-pack of CFLs. The program should expand to provide the consumer with a broader range of efficient lighting technologies, including CFLs and LEDs, and options (i.e., specialty lamps) (p. 181).
Appliance Turn-In Program	The mix of end-use measures included is appropriate as it serves homeowners and renters in single-family units as well as in multi-family units. GMO may consider offering additional measures such as CFLs or home energy efficiency kits for participating in the program to increase participant savings (p. 193).
HPwES	The HPwES program contains an appropriate mix of the standard building shell energy efficiency improvements. The program should continue to monitor advancements in energy efficiency, and include new measures in the program where appropriate (p. 206).

Source: Navigant 2013 EM&V Final Report

4 CSR 240-22.070(8) Issue #4: *Are the communication channels and delivery mechanisms appropriate for the target market segment?*

The evaluator also highlighted the current ways in which these programs are communicated to potential program participants. While the communication and delivery channels are appropriate, the evaluator also suggested providing more materials to support trade allies, given their critical role in promoting these programs to customers. Table 22 summarizes the key findings.

Table 22: Summary of Communication and Delivery Mechanisms Findings

Program	Summary of Finding
C&I Prescriptive Rebate & Custom Programs	The C&I Prescriptive and Custom programs use communication channels and delivery mechanisms that are appropriate for the target market. Navigant suggests these can be improved to increase program participation by expanding outreach efforts to trade allies, providing marketing materials for trade allies to give their customers, and providing program information to trade allies in monthly emails (p. 144)
Cool Homes Program	The program uses a variety of techniques to promote the program to their customers, and the breadth of the material offered is significant and appropriate. Navigant's research suggests that most participants learn about the program from their HVAC contractor, which reinforces the importance of supporting trade allies in promoting the program to customers (p. 168)
Residential Lighting and Appliances Program	The Residential Lighting and Appliance program uses communication channels that are appropriate for the target market. (p. 181).
Appliance Turn-In Program	The Appliance Turn-in program uses communication channels and delivery mechanisms that are appropriate for the target market. The program communicates from a variety of media including print, radio, bill inserts, and direct marketing (p. 193).
HPwES	The HPwES program is primarily promoted through portfolio-wide general marketing materials, such as the Black Friday promotion newsletter. Navigant feels that the program would benefit from a more comprehensive and expansive marketing campaign, specifically designed for the program (p. 206)

4 CSR 240-22.070(8) #5: What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?

Based on the process evaluation activities, Navigant made several recommendations on ways to improve and enhance the current program offerings. These recommendations, which are summarized in Table 23, include considering offering a financing program to C&I customers, and ways to streamline current program communications and enhance outreach to critical trade allies.

Table 23: Summary of Recommendations to Address These Issues

Program	Summary of Recommendation
C&I Prescriptive Rebate & Custom Programs	• Create set of increased incentives targeted at small commercial customers can help that segment overcome the first cost barrier of energy efficient technologies • Increase outreach efforts to contractors can increase trade ally participation • Provide marketing materials for participating trade allies to give to their customers can address barriers of limited customer awareness. • Create a type of financing program for all C&I customers to allow participants the opportunity to undertake more expensive and extensive energy efficiency projects that they would not be able to otherwise, thus increasing the program savings (p. 145)
Cool Homes Program	The Cool Homes program can overcome the market imperfections associated with the adoption of high efficiency HVAC units by growing and supporting the participating trade ally network. Navigant's mapping analysis indicates that the trade ally coverage in some populous parts of GMO territory is not sufficient, especially for a program that requires participant trade allies to promote and deliver the program (p. 168).
Residential Lighting and Appliances Program	To more effectively address the market imperfections, The Residential Lighting and Appliance program can consider the following program changes: 1. Move to an instant rebate process that minimizes paperwork and facilitates participation to increase participation. 2. Offer incentives of a variety of efficient residential lighting measures to all residential customers through an upstream lighting program (p. 182)
Appliance Turn-In Program	The Appliance Turn-in program can increase customers' awareness of the benefits of recycling large, inefficient appliances through program marketing activities. The program overcomes the lack of momentum to deal with customers' inefficient appliances by making the decision to recycle an old appliance an easy and convenient choice for homeowners. GMO may also consider working directly with appliance retailers to recycle units they pick up when they deliver new units. (p. 194)
HPwES	The HPwES program can more effectively overcome the market imperfections associated with home energy efficiency improvements by increasing the program marketing. To overcome all the barriers, the program marketing materials should promote and explain the program, the benefit of energy efficiency improvements, and the benefit of working with a HERS Rater. The program should also consider extending the timeline for participation in the program or allowing customers to complete the recommended improvements in stages. This will help participants overcome the cost of home improvement barrier (p. 206).

4.2 EM&V Auditor's Assessment of Impact Evaluations

C&I Programs

The evaluations appear to follow Navigant's EM&V plan. The reports, while in large measure preliminary, are well written and easy to understand.

While the report follows the evaluator's EM&V plan it is important to recognize that so far, the results are based on *ex ante* values, implementer's databases, and unvetted deemed savings values. Additionally, to date the NTG values are stipulated rather than measured. Because of the preliminary nature of the findings, the actual savings values may be found to be significantly different than those presented in the evaluation report and reviewers and the PSC need to be fully aware of this situation.

The evaluator's assessment of measure impacts was drawn, almost exclusively, from the Ameren TRM or other TRM's such as the Illinois Statewide TRM. While this was in compliance with Navigant's EM&V Plan, it is anticipated (based partially on finding from the Ameren evaluations) that there are many unreliable deemed savings calculations. As a result, it is anticipated that the evaluation for 2014 and 2015 will find several over or understated savings values that would negatively affect the net savings, even in PY2013 year.

For the C&I Prescriptive Program, lighting is reported to provide 87 percent of the program savings, and for the C&I Custom Program, lighting is reported at 71 percent of the savings.

The final report addressed a number of concerns raised by the EM&V Auditor in the draft report.

Residential Programs

Overall, the report was clean, easy to follow, well written, well organized, and without numerous errors, and most of the report tables matched the report text.

Navigant includes references to several TRMs, notably the Ameren, Illinois, and Michigan TRMs, as sources for deemed and verified savings estimates (Navigant PY2013 EM&V Report, p. 48). Though these TRMs may (or may not) be a reliable source for the savings estimates, there is no way (without verifying the actual TRM documents) to know if the ultimate source of the savings estimates were negotiated settlement-values or empirical research-based estimates, or something else. Furthermore, it was not clear why one TRM was referenced over the other (i.e., why Michigan was used for some measures, Illinois or Ameren's TRM for others).

Several residential programs only had a single participant, including the Multifamily and New Homes Programs, and therefore the evaluation activities excluded a database review. A database review was used for other programs to assess the extent and consistency of values and parameters included in the database tables, with recommendations offered to help GMO's implementer begin tracking critical EM&V required parameters, without which proper engineering reviews are compromised.

For the Residential Energy Report Program, Navigant observed that some of the differences between the control and treatment groups were "practically significant." The EM&V auditors are unfamiliar with this term and it is not clear whether the results are significant, not significant, and if significant, what degree of confidence they are significant.

Net-to-Gross

As Navigant touched on in their report, the next few years' focus on improvements to the NTG should be on the C&I programs. Not only do these programs represent the majority of portfolio savings, but the initial findings showed a relatively low free-ridership rate coupled with a high spillover rate which results in a NTG at parity. In contrast, the residential programs, representing only one-quarter of portfolio savings, the initial NTG estimates all seem reliable and within a reasonable range. Overall, Navigant used a fairly robust approach to researching net attribution, though the EM&V auditor team did uncover some issues and questions during our review of the report.

Recommendations to Improve Future Impact Evaluation Reports

The EM&V Auditor also developed several recommendations that should be incorporated into all future EM&V reports prepared for GMO. These recommendations are intended to ensure that the presentation of the impact evaluation findings will conform to industry standards and best practices.

Since TRMs play such an important role in the calculation of impacts and in program operation, the evaluators should be sure to closely couple evaluation activities and findings with any primary TRM in place in the GMO service territory. Studies and findings should be designed to not only asses program performance but to inform and facilitate the continual improvement of saving values and the TRM used to document and catalog approved savings values.

Similar to programs that received a more thorough database review due to higher participant levels, a basic review of the Multifamily and New Homes Programs database would have been preferred to offer insight into the database that should exist for these programs. As indicated for other programs database reviews, an early assessment of the database helps identify and target deficiencies in measure and household characteristics database fields that will be used to collect and store participant data. If the implementer did not develop nor have a complete database at the time of the evaluation, then including this detail in the report would suffice.

In future surveys Navigant should consider asking trade allies that install energy efficient measures outside of the program why those measures were not rebated, plus the surveys should also ask about the program influence on these sales. As noted previously, a few of the surveys showed a significant number of non-program energy efficient installations.

4.3 EM&V Auditor's Assessment of Process Evaluations

The EM&V Auditor's found that the revised and expanded process evaluations now conform to best practices for a limited process evaluation, as described in Appendix A. Furthermore, the key findings from the review of marketing materials were now included in the final report. Specifically, developing the program flow diagrams, and incorporating the feedback from both the program staff and implementers addressed many of the flaws identified in the draft process evaluation. Therefore, the process evaluations identified significant areas for improvement, especially regarding QA/QC issues that will ensure that the program operations improve next year.

The evaluator also addressed the other deficiencies in the process evaluation and these changes are now reflected in the final report. Specifically, the survey findings are now cited correctly and the process flow diagrams provide additional information about program operations. However, there were still some deficiencies in the process evaluation that should be corrected in future EM&V Reports. Specifically, these are:

There was a lack of sufficient discussion of key database findings regarding program operations. The review of the program databases are limited to the impact evaluations. Key information regarding program metrics such as a summary number of participating trade allies, distribution of measures, and distribution by customer demographics are still provided in sufficient detail to meet the requirements for a standard process evaluation.

There are flaws in the survey instruments. The customer surveys captured minimal customer demographic information, which was not presented in either the report or the appendices.

The survey findings did not indicate any significance testing for key questions regarding satisfaction or awareness. At a minimum, these tests should have been completed and it should have been indicated if there were any significant differences among or between customer groups.

Recommendations to Improve Future Process Evaluations

Future process evaluations should include the following:

- Provide an updated process evaluation plan for review by the EM&V Auditor.
- Include in the research activities specific questions to address the key research issues listed in 4 CSR- 240-22.070.
- Field a non-participant survey focusing on awareness, barriers to program participation, current energy efficiency actions, and key demographic characteristics.
- Include additional demographic questions regarding income, size of home, and income levels in future participant surveys.
- Update the process evaluations each year with interviews from program staff and implementers, a. review of key materials, and provide a status report on the progress of each recommendation.

4.4 Overall Conclusions from the EM&V Auditor Team

Overall, the final report stayed true to the work plan, was clean, easy to follow, well written and without numerous errors. The evaluator incorporated the recommended edits and clarifications into the final report and addressed these concerns in a satisfactory manner.

The evaluator expanded the findings to specifically address the requirements set forth in the CSR of 4 CSR 240-22.070(8) for both the process and impact evaluations. Based on the feedback from the EM&V Auditor, the evaluator did provide program specific responses to each of these criteria for both the process and impact evaluations. Going forward, however, these questions should be incorporated in the research objectives and survey design, rather than being developed after the fact.

Due to the preliminary nature of the findings, the actual savings values may be significantly different than those presented in the evaluation report. While the report follows the evaluator's EM&V plan it is important to recognize that so far, the results are based on *ex ante* values, implementer's databases, and unvetted deemed savings values. Additionally, to date the NTG values are stipulated rather than measured.

GMO's over-reliance on Ameren's Technical Reference Manuals may lead to propagating the same errors reported in Ameren's PY2013 EM&V Reports. The evaluator's assessments of measure impacts were drawn, in large measure, from the Ameren TRM. The EM&V reports prepared by Ameren Missouri's third-party evaluators revealed that there are many unreliable deemed savings calculations. As a result, it is anticipated that the evaluation for 2014 and 2015 will find several over or understated savings values that may result in the reporting of inaccurate net savings, in any year applied, including the PY2013 year.

Definition of Key Acronyms

As a first step to detailing the evaluation methodologies, the evaluators provided a glossary of terms:

- ASHP – Air-source heat pump
- C&I – Commercial and Industrial
- CAC – Central air conditioner
- CFL – Compact fluorescent lamp
- CDD – Cooling degree days
- Deemed Savings – A savings estimate for homogenous measures, in which an assumed average savings across a large number of rebated units is applied
- DLC – Residential direct load control
- ECM – Energy conservation measure
- EFLH – Equivalent full load hour
- EISA – Energy Independence and Security Act of 2007
- EM&V – Evaluation, measurement and verification
- *Ex Ante* – A program parameter or value used by implementers/sponsoring utilities in estimating savings before implementation
- Expected Savings - The saving calculated by the implementation contractor. These numbers are developed prior to the evaluator's analysis.
- *Ex Ante* Net Savings = *Ex Ante* Gross Savings x *Ex Ante* Free-Ridership Rate
- *Ex Post* – A program parameter or value as verified by the Evaluators following completion of the evaluation effort
- Ex Post Net Savings = Ex Post Gross Savings x Ex Post Free-Ridership Rate
- FAQ – Frequently asked questions
- Free Ridership – Percentage of participants who would have implemented the same energy efficiency measures in a similar timeframe absent the program.
- Gross Savings – Energy savings as determined through engineering analysis, statistical analysis, and/or onsite verification
- Gross Realization Rate = Ratio of *Ex Post* Gross Savings / *Ex Ante* Gross Savings
- HDD – Heating degree days
- HP – Heat pump
- HVAC – Heating, ventilation, and air conditioning
- ICF – ICF International
- ISR – In–service rate
- kW – Kilowatt
- kWh – Kilowatt-hour
- M&V – Measurement and verification
- MW – Megawatt
- MWh – Megawatt hour
- Net Realization Rate = Ratio of *Ex Post* Net Savings / *Ex Ante* Net Savings
- Net Savings –Gross savings factoring off free-ridership and adding in spillover.
- NTG – Net-to-gross

- NTGR – Net-to-gross-ratio = (1 – Free Ridership % + Spillover %), also defined as Net Savings / Gross Savings
- POP – Point-of-purchase
- QA – Quality assurance
- QC – Quality control
- ROI – Return on investment
- RR – Realization rate
- Realized Savings or Achieved Savings- The savings that have been verified by the EM&V contractor. This includes adjustments for equipment that may not have been installed, calculation errors, and differences in assumptions.
- Spillover – Savings generated by a program that are not incentivized.
- T&D – Transmission and distribution
- TRM – Technical Reference Manual
- VFD – Variable Frequency Drive

Appendix A – Process Evaluation Protocols from Arkansas TRM Ver. 3.0 Vol. 1

PROTOCOL C: Process Evaluation Guidance

Protocol Scope: This protocol provides guidance regarding the timing and scope for process evaluations of the Arkansas utility programs. Process evaluations focus on determining the overall effectiveness of program delivery, identifying opportunities for program improvements and assessing key program metrics, including participation rates, market barriers, and overall program operations.

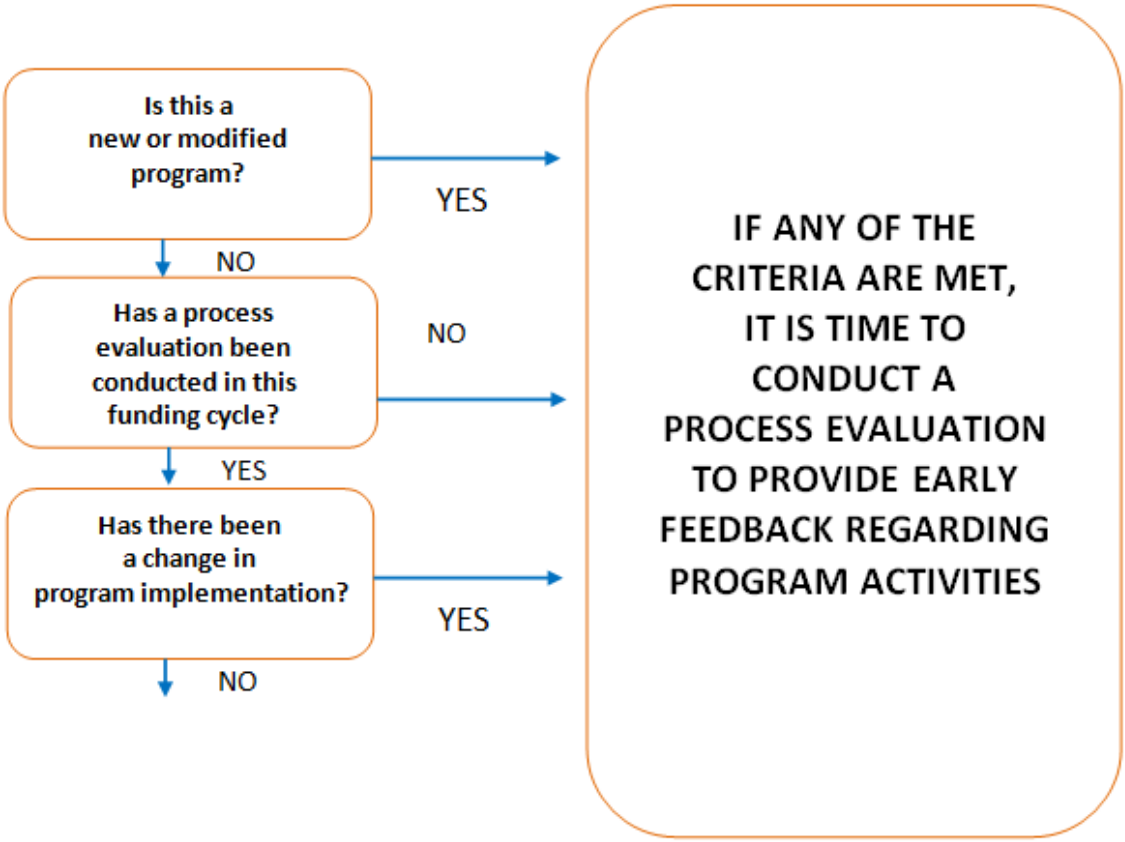
PROTOCOL C1: Process Evaluation Structure and Timing

- **Protocol Scope:** This protocol section provides additional guidance on how to best structure process evaluations at the state, portfolio, program, service, and market sector level. Process evaluations need to be structured to meet the specific goals and objectives at a particular point in time.
- **Customer Segments: All, except Self-Directing Customers**
- **Program Types: All**
- **Approach:** The process evaluation decision-maker, either the utility or third-party administrator, should determine if a process evaluation is needed based on any of the criteria described in Protocol C1 and C2, which summarize the two major criteria for determining if a process evaluation is necessary. The first criterion is to determine if it is time for a process evaluation; the second criterion is to determine if there is a need for a process evaluation. Figures 1 and 2 illustrate this decision-making process.
- **Keywords:** "timing; portfolio level evaluations; process evaluation structure; diagnostic process evaluations; under-performing programs; programs not meeting targets"

Protocol C1: Determining Appropriate Timing to Conduct a Process Evaluation
1. New and Innovative Components: If the program has new or innovative components that have not been evaluated previously, then a process evaluation needs to be included in the overall evaluation plan for assessing their level of success in the current program and their applicability for use in other programs.
2. No Previous Process Evaluation: If the program has not had a comprehensive process evaluation during the previous funding cycle, then the Program Administrator should consider including a process evaluation in the evaluation plan
3. **New Vendor or Contractor**: If the program is a continuing or ongoing program, but is now being implemented, in whole or in part, by a different vendor than in the previous program cycle, then the administrator should consider including a process evaluation in the evaluation plan to determine if the new vendor is effectively implementing the program.
• **If any of these criteria are met, it is time to conduct a process evaluation.** • **If none of these criteria are met, then the evaluation decision-maker should proceed to Step 2 in the Process Evaluation Decision Map**

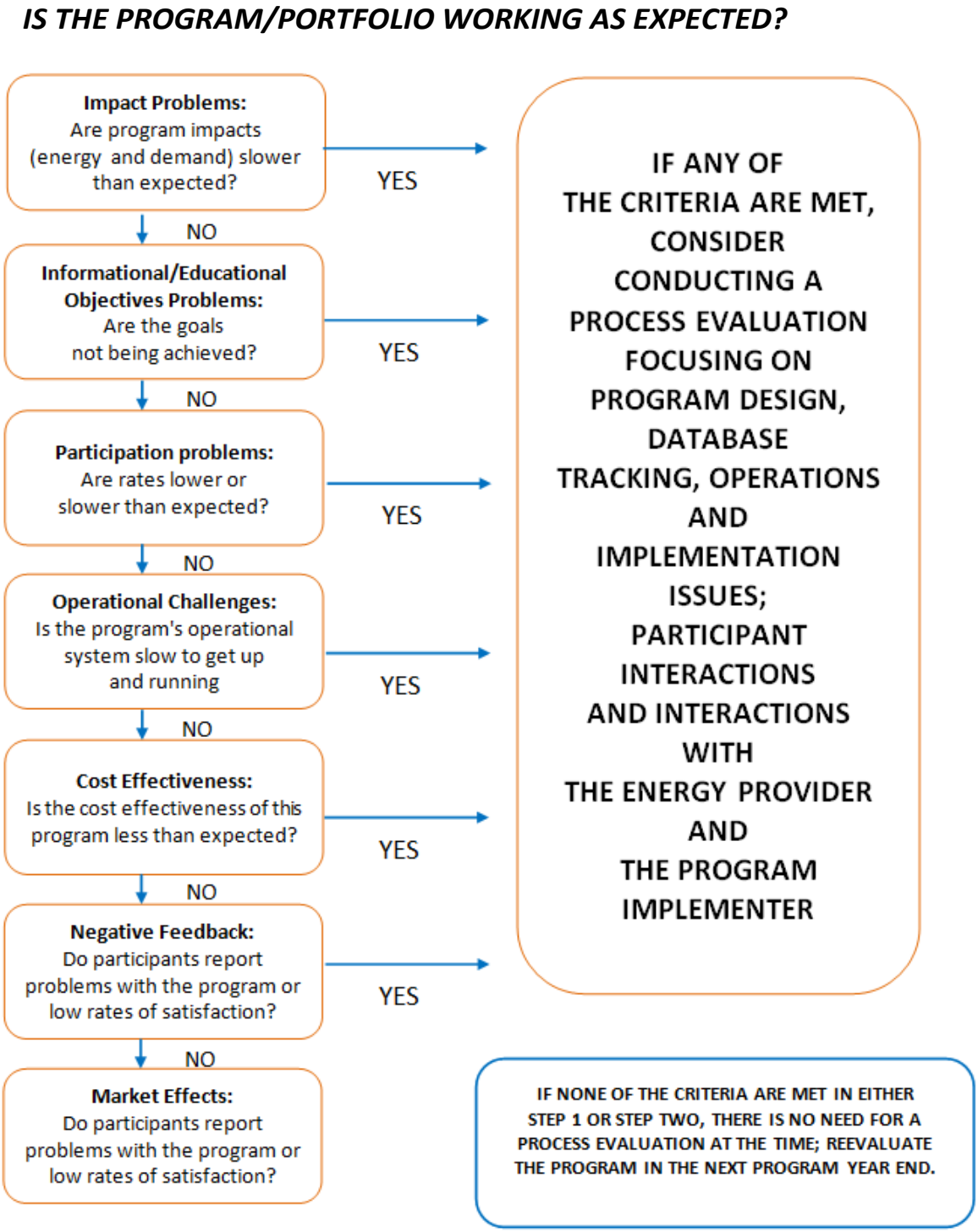
Protocol C1: Determining Appropriate Conditions to Conduct a Process Evaluation
Process evaluations may also be needed to diagnose areas where the program is not performing as expected. These conditions may include the following:
1. Impact Problems: Are program impacts lower or slower than expected?
2. Informational/Educational Objectives: Are the educational or informational goals not meeting program goals?
3. **Participation Problems:** Are the participation rates lower or slower than expected?
4. **Operational Challenges:** Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?
5. Cost-Effectiveness: Is the program's cost-effectiveness less than expected?
6. **Negative Feedback:** Do participants report problems with the program or low rates of satisfaction?
7. Market Effects: Is the program producing the intended market effects?
• **If any of the criteria is met, a process evaluation is needed to identify ways to address and correct these operational issues.** • **If none of these criteria is met in either Step 1 or Step 2, then a process evaluation is not needed at this time. Re-evaluate the need for a process evaluation at the end of the program year.**

IS IT TIME FOR A PROCESS EVALUATION?



Source: Johnson & Eisenberg 2011, p. 21.

Figure 3: Determining Timeline for a Process Evaluation



Source: Modified from Johnson & Eisenberg 2011, p. 22

Figure 4: Determining Need to Conduct a Process Evaluation

Additional Guidance for Conducting Limited/Focused Process Evaluations

- In all cases, the evaluator should conduct a limited or focused process evaluation consisting of a review of the program database and staff interviews to determine each program's progress throughout the evaluation cycle. The findings from these activities will serve to:
- Provide progress reports on the status of the recommendations for program improvement from previously conducted evaluations
- Identify the progress made towards achieving the objectives as described in the Commission Checklist and
- Identify any issues that may need to be explored more fully in future program evaluations.

PROTOCOL C2: Process Evaluation Planning

- **Protocol Scope:** This protocol provides guidance on the key issues that should be addressed in process evaluations. It is especially important to focus on the aspects of program operations to address any deficiencies identified in the Process Evaluation Decision Map, Figure 2.
- **Customer Segments: All except Self-Directing Customers**
- **Program Types: All**
- **Approach:** The process evaluation plan should use the following outline to identify the key researchable issues that must be addressed in the process evaluation. This outline applies to process evaluations conducted at the program, portfolio, and state level.
- **Keywords:** "process evaluation planning; EM&V plan process evaluation timing; portfolio level process evaluations; process evaluation structure; process evaluation components; process evaluation scope"

Protocol C2 : Recommended Elements of a Process Evaluation Plan
Introduction: Description of the program or portfolio under investigation; specific characteristics of the energy organization providing the program including current marketing, educational or outreach activities and delivery channels.
Process Evaluation Methodology: Process evaluation objectives, researchable issues, and a description of how specific evaluation tactics will address the key researchable issues including the proposed sampling methodology for program/third party staff, key stakeholders, trade allies/vendors, and customers. The sampling methodology should be clearly explained with specific targets of completed surveys or interviews clearly described in the EM&V Plan.
Timeline: Summarized by key tasks identifying the length of the process evaluation and key dates for completion of major milestones
Budget: Costs of conducting the process evaluation by specific tasks and deliverables.

(Source: Modified and Expanded from the California Evaluators' Protocols - TecMarket Works 2006).

While Protocol C2 provides a general outline of the key elements that should be included in a process evaluation plan, Protocol C3 provides more detailed information regarding the key areas for investigation that need to be addressed in a process evaluation. Protocol C3 also identifies those areas that are most applicable to new programs or pilot programs, those areas that should be investigated when the program is

experiencing specific operational issues or challenges, and those topic areas that should be covered in all process evaluations.

PROTOCOL C3: Recommended Areas of Investigation in a Process Evaluation

Protocol C3: Recommended Areas of Investigation in a Process Evaluation	
Program Design	**Additional Guidance**
• Program design and design characteristics, and program design process	This area is especially important to address in first-year evaluations and evaluations of pilot programs.
• The program mission, vision and goal setting and goal setting process	
• Assessment or development of program and market operations theories	
• Use of new or best practices	
Program Administration	**Additional Guidance**
• The program management process	This area should be covered in all process evaluations, but it is especially important to address in those evaluations where operational or administrative deficiencies exist.
• Program staffing allocation and requirements	
• Management and staff skill and training needs	
• Program tracking information and information support systems	
• Reporting and the relationship between effective tracking and management, including operational and financial management	
Program Implementation and Delivery	**Additional Guidance**
• Description and assessment of the program implementation and delivery process,	This is critical to gathering the information necessary to assess the program's operational flow
• Program marketing, outreaching, and targeting activities	This is an area that should be addressed if the program is not meeting its participation goals or if the program is under-performing.
• Quality control methods or operational issues	
• Program management and management's operational practices	
• Program delivery systems, components and implementation practices	
• Program targeting, marketing, and outreach efforts	The process evaluator should request copies of all marketing and outreach materials and include an assessment as part of the document review task
• Program goal attainment and goal-associated implementation processes and results	These areas should be addressed in all process evaluations, but are especially important if the program is under-performing regarding savings or participation rates
• Program timing, timelines and time sensitive accomplishments	
• Quality control procedures and processes	

Protocol C3: Recommended Areas of Investigation in a Process Evaluation	
• Documentation of program tracking methods and reporting formats	This is a key element of the review of the program database and the evaluator should request copies of the program records or extracts along with the data dictionary
• Customer interaction and satisfaction (both overall satisfaction and satisfaction with key program components, including satisfaction with key customer-product-provider relationships and support services)	These topics should be investigated in the customer surveys and should be a priority if the program is experiencing negative feedback or lower than expected participation rates or energy savings.
• Customer or participant's energy efficiency or load reduction needs and the ability of the program to deliver on those needs	
• Market allies interaction and satisfaction with the program	
• Reasons for low a level of market effects and spillover	
• Intended or unanticipated market effects	

The process evaluation report should include the following reporting requirements:

1. Detailed Program Description. The process evaluation report should present a detailed operational description of the program that focuses on the program components being evaluated. The use of a program flow model is highly recommended. The report should provide sufficient detail so that readers are able to understand program operations and the likely results of the recommended program changes.
2. Program Theory. The process evaluation should include a presentation of the program theory. If the program theory is not available, or cannot be provided in time for the evaluation report due date, the evaluator should include a summary program theory built from the evaluation team's program knowledge. It should be complete enough for the reader to understand the context for program recommendations, but does not need to be a finely detailed program theory or logic model.
3. Support for Recommended Program Changes. All recommendations need to be adequately supported. Each recommendation should be included in the Executive Summary and then presented in the Findings text along with the analysis conducted and the theoretical basis for making the recommendation. The Findings section should also include a description of how the recommendation is expected to help the program, including the expected effect that implementing the change will have on the operations of the program.
4. Detailed Presentation of Findings. A detailed presentation of the findings from the study is essential. The presentation should convey the conditions of the program being evaluated and should provide enough detail so that any reader can understand the findings and the implications of the overall operations of the program and its cost-effectiveness (Modified from the CA Evaluators' Protocols 2006).