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Energy audit impacts delivering sustained savings

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Abstract

A recent evaluation of an energy audit program performed by the authors in the United States revealed energy efficiency measure adoption rates of over 65 % at accounts that received investment grade energy audits. These results run counter to a belief held by some that energy audit programs do not sufficiently support efficiency implementation goals.

While audits remain part of some service portfolios for rate payer funded efficiency programs in the US, there is a tendency to regard them as expensive and inefficient marketing devices used to introduce the concept of energy efficiency. The findings of this study show, however, that audit programs can be more effective than previously understood. A particularly surprising result is that measure adoption continues long after audit completion – up to 7 years, with much of the adoption occurring without additional financial incentive from the program administrator. All of these factors support a conclusion that well-designed audit programs can be a powerful resource acquisition tool.

In addition to identifying which types of measures were installed, this paper will share the evaluation results for measure adoption rates and will identify the program design characteristics of the NYSERDA FlexTech program that make it so successful. Specifically:

- The program requires 50 % cost sharing, which screens out uncommitted customers.
- Customers select the audit provider themselves.
- The program targets larger customers, who may be better positioned to invest in efficiency measures.
- There are no audit completion goals that encourage ineffective audits.
- Audit quality is high, as the pool of providers is seasoned, and applicants can select their own audit firm.
- The program design encourages a market-driven process connecting customers and vendors.

Introduction

Energy audits have been used in many jurisdictions around the world to encourage and inform actions to implement new technologies and best practices for energy consuming systems. Audit programs have a long history and have targeted the full range of facilities from residential to large industrial. To evaluate and understand these programs, more than a few papers have been written delving into to why and how people respond and act when presented with audit findings. Some of these papers have focused on the motivations for and roadblocks against action, while others have focused on the overall impacts and savings contributed by the audit recipients. In this paper we are not looking into motivations; rather, we are seeking to understand if and when recipients adopt the measures recommended in the audit they received. Whether correctly or not, in the US there is often the impression that audit programs are more of an educational tool than a truly useful resource acquisition tool. The New York State Energy Research and Development Authority (NYSERDA) Flexible Technical Assistance Program (FlexTech) provides objective and customized energy studies to commer-

cial and industrial customers, which identify and encourage the implementation of energy efficiency measures, peak-load curtailment, combined heat and power (CHP), and renewable generation. Roughly one hundred studies are completed in a typical year, and while there is no specific limit or boundary to the size of a facility that can receive an audit, the focus tends to be medium to large commercial and industrial facilities. In the program studied, the median projected implementation cost per measure across all recommended measures is about $300,000. The average projected cost is almost $1,000,000, a figure that was skewed so high by a handful of very large projects.

Participants may use either their own independent consultants or an approved FlexTech program consultant. Program consultants are competitively selected by NYSERDA and provide a statewide geographic distribution of needed technical services. Funding is cost-shared, with NYSERDA typically paying 50 % of the study cost. While it is not the focus of this paper, for reader edification we note that there were financial incentives offered for many of the technologies recommended in the studies, and 19.3 % of all measures implemented received some level of incentive toward the cost of implementation.

The FlexTech program has been evaluated multiple times to determine savings attributable to the program. However, this paper does not address that fact, nor does it probe the motivation to implement or not. Rather, the sole focus of this paper is on if and when recommended measures were implemented by study recipients. This measure adoption rate (MAR) does reflect energy savings and is a ratio expressing the percentage of study-recommended energy unit savings that customers chose to actually adopt. MAR was chosen because this factor solely addresses whether the study recipient installed the measure. This paper does not consider or discuss actual savings relative to projections (a.k.a. savings realization rate) or the program's level of influence in decision-making (a.k.a. net-to-gross factor).

Measure Adoption Rate Research Methodology

Engineers conducted a telephone survey of facility managers or engineers to determine the MAR and date of adoption for measures recommended in a sample of studies completed between January 1, 2003 and September 30, 2009. Surveying started in May 2010 and continued for 3 months. A second round of calls regarding other than definitively resolved measures followed a year later, in May 2011. "Definitively resolved" means that the customer either installed the measure, decided not to install the measure, or partially installed the measure and decided not to install more of it for the foreseeable future. Data was analyzed as a function of time lapsed since study completion and by study completion year.

SAMPLE DESIGN AND SURVEY DISPOSITION

The sample design for the survey used stratified random sampling. The sampling unit was the total energy savings on a source-equivalent basis.[1] The sample was selected to estimate the MAR for electric and natural gas measures at the study level and for upstate and downstate within the 90/10 confidence/relative precision standard. The population was stratified by age of study in years, geographic location (upstate/downstate), and by source-equivalent energy savings.[2]

The sample frame was the 657 FlexTech studies, which had been completed between January 1, 2003 and September 30, 2009. Of these studies, 225 were considered to be in the "too small to measure" stratum. Savings for such projects were so small that the consequence of excluding them from the MAR analysis was negligible. This left 432 studies eligible for interviews. Engineers attempted calls to 411 study recipients and in so doing successfully completed 301 interviews and 303 questionnaires.[3] The final outcome ultimately was determined for 2,452 unique measures. The sample weights were adjusted for nonresponse by region (upstate and downstate), size stratum, and fuel type (studies with either gas measures in combination with electric measures or gas-only measures versus electric-only measures).

CALL PREPARATION

Engineers conducted the telephone surveys with facility managers. The evaluation team provided extensive training on interviewing techniques to ensure accurate and unbiased data with maximum customer consideration in an ethical fashion. The training, led by Megdal & Associates,[4] addressed such issues as the identification of who to interview and how to contact them, effective leading questions, proper attitude and tone, informed consent, appropriate probing techniques, translation of open-ended responses into data that can be tabulated, and interview time management. Each interviewer completed at least two mock interviews before calling actual respondents.

Preparation typically required 2 hours per study and sometimes included pre-loading responses that were already known. Prior FlexTech evaluation surveys completed in 2005 and 2007 and a third smaller study completed in 2008 included MAR data from some of these same participants (Osei-Antwi and Gowans, 2005 and Gogte and Gowans, 2007). This evaluation's engineers used the previously determined MARs where appropriate to avoid re-interviewing study recipients regarding information already provided to prior callers. Specifically, the engineers completed the relevant sections of the questionnaire in advance for all measures that were definitively resolved.

Up to ten measures per interview were manageable for a 30-minute conversation. In the case of studies that offered a greater number of recommendations, the interviewer either grouped measures or used a random sampling tool to select ten measures for query.

1. To convert to source MMBtu, the kWh savings for the electric measures were adjusted to account for savings at the source of generation. This approach avoids the potential pitfall of ending up with a sample that contains a disproportionate number of natural gas studies. The source factor provided by NYSERDA of 9,949.2 Btu/kWh was based on a 3-year average (2006, 2007, and 2008) and includes a line loss factor of 7.2 %. The number is based on natural gas, as natural gas represents the fuel source on the margin in New York State. Additional energy use from measures such as fuel switching was not considered for the purpose of sample weighting.

2. There were two studies in the sample for which the MAR results were already known for all measures, for a total of 303 completed MAR questionnaires.

3. Ibid.

4. The firm of Dr. Lori Lewis. Megdal & Associates employs experts on social science research including energy efficiency program attribution and other fields that require telephone-based data collection. Megdal & Associates also was the prime contractor for the portfolio of programs subject to impact evaluation.

TELEPHONE MAR SURVEY EXECUTION

The interviews and subsequent MAR analysis focused on recommended measures as opposed to those measures that were studied but not recommended and those measures recommended for further investigation. For each measure the survey engineer inquired about measure status (fully, partially, or not installed), collected sufficient data to quantify the measure as "partially installed" if necessary, and categorized the measure by equipment type (verifying program tracking system data) and primary type of energy saved (electricity or fossil fuel). Estimated date of installation was important to collect as well. Other categorizations (upstate versus downstate, electric utility provider, etc.) were made outside of the interview process.

The prospect of partial implementation was one of the reasons evaluators chose to use engineers to administer the survey. The concept of partial implementation is straightforward and easy to quantify for some technologies and applications. With lighting, for example, it is easy to ascertain if the customer installed fixtures on three of the recommended four floors of a regular building. But the concept also could get complicated quickly, even with lighting. The interviewer could not simply ask "How many of the recommended 9,843 fixtures actually were replaced?" The floors in the aforementioned example might have had different areas, there could be a mixture of one-for-one and two-for-one replacements, or different blends of technologies installed than were recommended (standard versus high performance T8s, bi-level switching but not dimming, installing three-lamp instead of two-lamp fixtures, etc.). With boilers, for example, a study might have recommended that the customer upgrade three boilers from 80 % efficient to 96 % efficient condensing boilers. But if the customer chose to upgrade only two of the boilers and chose 92 % efficient units, then the engineer assigned a MAR of 50 % (two-thirds boilers × 75 % recommended efficiency gain). For complex technologies such as reciprocating engine CHP, the ability of the facility to capture the several different waste heat streams was variable. In all cases, the engineer endeavoured to quantify the percentage of the measure's installation as designed, without regard to actual day-to-day loading, hours of use, or other factors that are part of a savings realization rate calculation. Evaluators found that 12 % of the installed measures were partially installed.

During the initial 3-month survey each measure was classified as unresolved or definitively resolved. A follow-up survey was conducted about a year after the initial survey on all unresolved measures. This survey did not reveal material differences in the MAR compared to the original survey.

ON-SITE FOLLOW-UP

Telephone response accuracy was a concern, especially in those instances where the interviewer talked with somebody other than the original study recipient. Another weakness of the telephone survey was that respondents were asked about measures recommended in studies conducted as many as 8 years prior to the call. To address these concerns and assess MAR response quality, the engineers also performed site visits for a subsample of MAR respondents. Inspections and in-person interviews revealed that a material proportion of the MARs reported by respondents in the telephone survey were incorrect. It is believed that a combination of the complexity of the questions and elapsed time since the audit were the most likely sources of the discrepancies and that the erroneous responses would have been even greater without technical interviewers. Furthermore, having the same engineer conduct the interview and visit the site enabled coherent interpretation and correction of responses when necessary.

ANALYSIS

The study-level MAR represents the percentage of energy savings from measures recommended in completed studies that have been installed. An MAR of 1.0 or 100 % indicates that a customer installed all recommended measures in their FlexTech study. This factor does not consider motivations or actual realized savings relative to projections.

Analysts aggregated the MAR results in two distinctly different ways. The first method of analysis estimated MAR as a function of time elapsed (in years) since study completion and is the method on which this paper is focused. This information is powerful because it enables analysts to review the results over a long period of time and to combine the results from multiple study years into a single result, which tempers any boom or recession effects that may influence the implementation rate associated with particular calendar years. It also focuses the analysis on market activity over multiple program administration cycles. Analysts used the sample design's expansion weight associated with the study multiplied by the source equivalent energy savings to represent the relative influence of each measure on the results. Results are separable by upstate/downstate, energy efficiency, measure technology category, and on-site generation.

The second method of aggregation uses the same data but combines it differently, aggregating results using the sampling units and stratification basis in the sample design. The unit of classification regarding time is the study completion year, not elapsed time. The result of the second method is an estimate of the MAR for each program year's studies at the time of evaluation. This second method of analysis is important because study year is a parameter that was identifiable in advance of the research and a basis of sampling. The second method allowed the evaluation team to report on the confidence and relative precision of the responses and variance of the data.

The final step in MAR analysis was to develop a correction factor based on the observed/telephone interview-based adoption rates in the savings realization rate (SRR) sample. The correction factor, which was kept distinct from the SRR analysis, was calculated based on the weighted average percentage of source-based savings that was corrected in the SRR sample. The MAR was then multiplied by this correction factor.

Results

Respondents were able to report the measure installation status associated with more than 97 % of the measures. The site visits, however, did reveal that the telephone-based MAR responses were not always accurate. Engineers identified forty-seven incorrectly reported measure statuses out of 151 measures in the on-site subsample through on-site inspection, in-person interviews, and spot metering. About half of the incorrectly reported MARs were binary, meaning a measure declared during the phone interview to be installed (1.00 MAR) was not installed at all (0.00 MAR) or, in one case, the reverse. While the site visits were designed precisely to capture any misreporting, the

MAR study did not attempt to find an exact answer as to why information was misreported; the focus was on accounting for the misreporting so as not to overstate or understate results. Four of the resulting adjustments increased the MAR, and forty-three reduced it. After weighting and combining natural gas and electricity savings measures using the common source-based Btu factor, the net overall site-based MAR adjustment factor was a downward 7 %. This in turn resulted in an overall downward adjustment, across the full MAR study, to the percentages of the measures that were installed. The telephone-based MAR results were multiplied by 0.93 to account for this correction.

Figure 1 shows the program overall adoption rate as a function of time elapsed since study completion. The dashed line is the percentage of recommended savings adopted each year after study completion; the solid line depicts the cumulative percentage adopted.

About 38 % (25 % MAR out of a total MAR of 65.3 %) of the adopted measures were installed within 1 year of study completion. The average time to adopt was 1.5 years, and 70 % of the adopted measures were installed within 3 years. While 90 % of the measures had been adopted after 4 years, measures continued to be adopted even in the 6th year following study completion before plateauing. The exception to this is CHP. As Figure 2 illustrates, most CHP studies required 2 to 3 years to implement. Two large CHP projects in the sample required 3 and 6 years to complete. In the legends of Figures 2 through 4, "n" refers to the number of unique measures for which interviewers gathered adoption data.

Figure 3 further disaggregates the measure adoption rates by the technology for nongeneration measures. Controls savings were by far the most frequently adopted measure type by study recipients. More than 25 % more controls measures were adopted than the next most readily adopted technology, lighting. Furthermore, energy studies included controls measures 25 % of the time for nongeneration measures, which is more than any other technology. This high controls adoption rate is an interesting finding, as lighting often is perceived as the

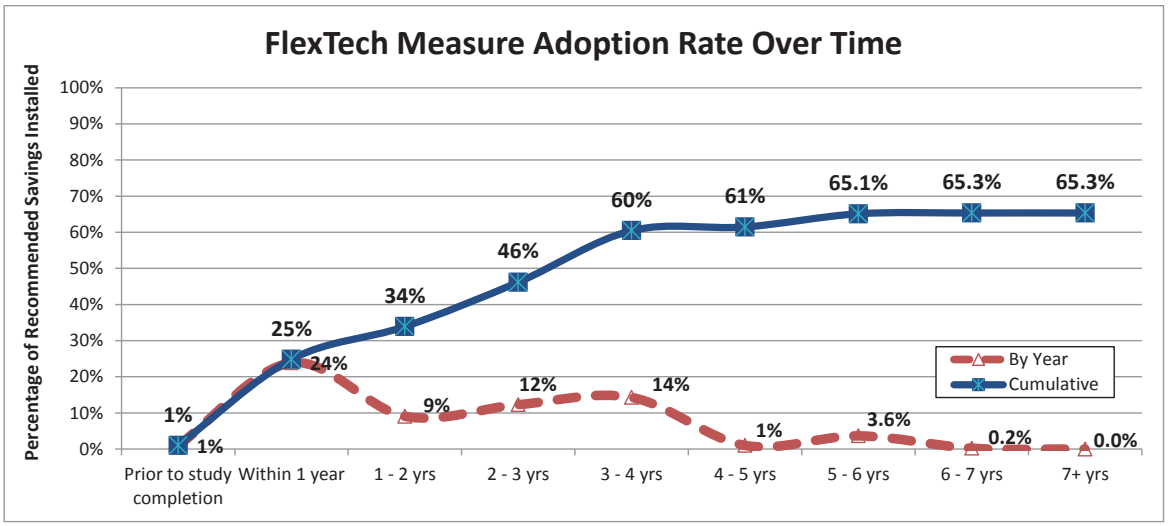

Figure 1. Measure Adoption Rate Over Time, All Measures.

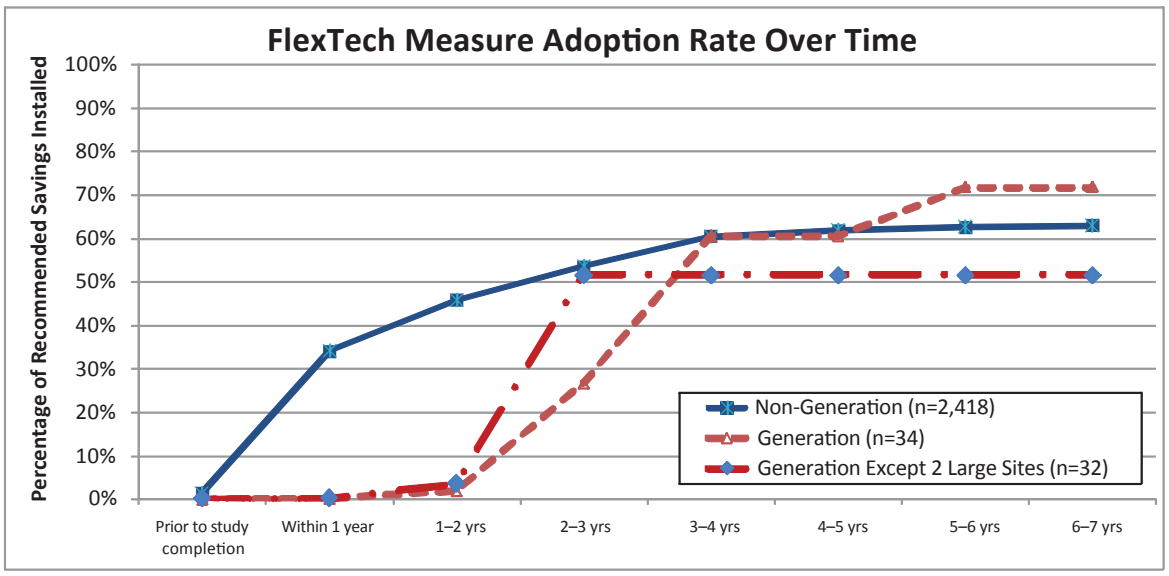

Figure 2. Measure Adoption Rate Over Time, Separate for Generation and Nongeneration Technologies.

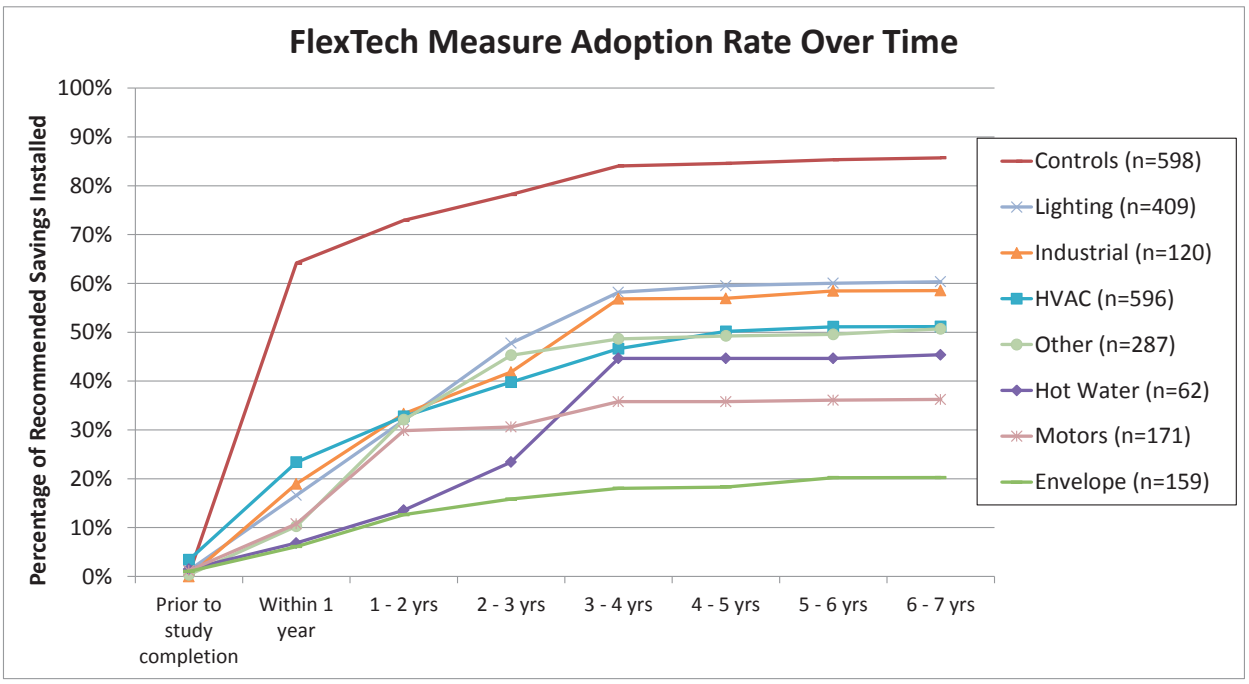

Figure 3. Program MAR Over Time, Separately for Type of Nongeneration Technologies.

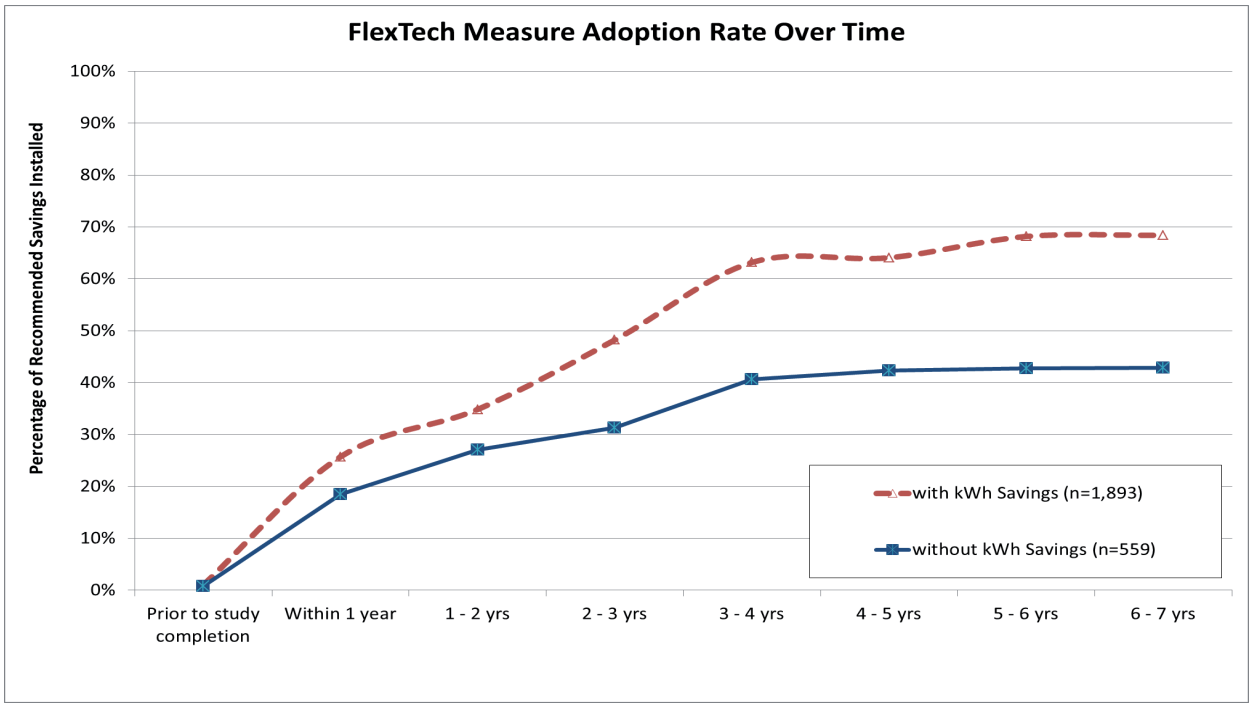

Figure 4. Program MAR Over Time, Separately for Measures with and without Electricity Savings.

most common and readily adopted opportunity due to low uncertainty and lack of complexity. The pattern can likely be explained by the relatively low cost and fast payback time of many controls measures, but it also indicates customer willingness to implement measures that tend to be more complex. Envelope measures were the least adopted. Any measure related to process (e.g., compressed air) has been labelled "industrial."

Figure 4 shows the adoption rates separately for measures that had electric energy savings and those that did not. For tabulation purposes, any measure that reported electric savings was classified as such; the other 559 measures saved only fossil fuel energy, according to study authors. There was substantial divergence in the ultimate MAR for these two categories. Historically, natural gas efficiency measures have received less attention and incentive funding but this is gradually changing in New York State and elsewhere.

Table 1 summarizes the projected long-term MARs from the prior figures.

The results had little sampling error, as might be expected for a survey that completed 303 interviews out of 411 attempts

Table 1. Projected long-term MARs.

Measure Type	Long-Term Projected Measure Adoption Rate
Electric energy efficiency	0.68
Non-electric energy efficiency	0.43
On-site generation	0.72
Overall	0.65

Table 2. Results associated with the second method of analysis.

	Electric Energy			Natural Gas			On-Site Generation Electricity Only	Total Excluding Natural Gas Generation
Parameter	Upstate	Downstate	Total	Upstate	Downstate	Total		
MAR as of summer 2010	0.64	0.60	0.63	0.26	0.60	0.31	0.72	0.56
Number of studies in frame	506	149	655	298	60	358	41	655
Total sample	236	67	303	141	25	166	31	303
Standard error	0.017	0.026	0.014	0.029	0.004	0.025	0.015	0.014
Relative precision at 90% confidence	4.07 %	6.64 %	3.48 %	17.58 %	1.03 %	12.44 %	3.15 %	3.73 %
Coefficient of variation	0.380	0.330	0.369	1.269	0.031	0.975	0.106	0.485

in a population of 432 studies. Relative precision was less than 4 % at the 90 % confidence level for each of upstate and downstate samples on electric energy measures, downstate natural gas, and statewide on-site generation. The relative precision for natural gas upstate, and consequently the statewide natural gas relative precision, exceeded 10 %, predominantly because of low MAR. Table 2 shows the results associated with the second method of analysis that allowed the statistics calculations.

Other Findings around the World

Before comparing our results, we thought we would open with a quote that is indicative of the general opinion toward energy audits in the US: "Energy audits are widely promoted by energy solution providers as well as utility, university, and government programs. Nevertheless, the implementation rate for energy saving programs based on energy audits remains discouragingly low. While the very best programs may achieve 50 % implementation, rates in the 20 %–30 % range are more typical."[5]

With that quote as a backdrop, the overall long-term MAR of 65 % as reported here is considerably higher than the "typical" 20 %–30 % and even exceeds the "very best" found elsewhere in the United States. Table 3 highlights some of the data that supports the quote and shows MAR results as reported in other evaluations in the US. We have also included references to similar studies in Europe and Australia. It is important to note here that the other studies we have looked at do not appear to have tracked the timing of the implementation related to when the audit occurred. Further, to the best of our knowledge none of them include the site-based correction factor adjustment, nor did they make the MAR calls so long after study completion. And finally, the program designs, target markets, and goals differ. For example, a small business audit program is unlikely to have as high an MAR as a large business program.

We need to keep these differences in mind when looking at the data and drawing our conclusions; however it is clear from the data that MAR values of 12 %–40 % are indeed quite typical with the highest being 53 % as reported for the US industrial assessment center (IAC). We have found that while the time period in studies of programs in Finland, Germany, Sweden, and Australia is also unclear, the reported MAR values in general tend to be higher than in the US. Table 3 summarizes published MARs from other research.

Conclusion

The first step toward building our conclusion is to understand the high MAR. The fact that this evaluation found so much more measure adoption than other studies of audit programs, especially in the United States, begs the question: What explains the difference – is it the evaluation method or is it the program design and execution? The authors believe that both factors contribute.

POINTS ON THE MAR CURVE

One might expect that after 2 or 3 years the energy study might be seen as no longer relevant and would be shelved. This evaluation showed that such an assumption is definitely not the case for the FlexTech program, and the results suggest that such an assumption should be challenged for other audit programs. Looking at the FlexTech MAR at a point on the curve after 2 years, the value is just under 40 %, which is more in line with reported MARs from other US programs. While we do not know the timing of the US studies, the study from Germany that reports 40 % clearly indicates that it was done 2 years after the program started. Placing that point at the 1- to 2-year point

5. Promotional material for AEE-sponsored real-time distance learning seminar *Converting Energy Audits to Business Plans*. Viewed 3/27/13 and 6/22/11. http://www.aeeprograms.com/realtime/EABP/.

Table 3. Published MARs from other research.

Location	Audit Program Type	Measure Adoption Rate
USA		
Wisconsin Public Service[1]	Small Business	12 % to 39 %
California Public Utility Company[2]	Nonresidential	14 % to 30 %
Xcel Colorado[3]	Small Business	15 %
Public Service of New Hampshire[4]	Large Commercial and Industrial	25 % implemented through incentive programs 40 % overall estimated
California PG&E[5]	Agricultural Energy Management Services	±30 % approximate
Ontario, Enbridge Gas Distribution[6]	Industrial Steam Traps	42 %
National, Industrial Assessment Centers[7]	Small to Medium Industrial	53 %
Finland[8]	Industry and Service Sectors	60 % to 70 %
Germany[9]	Small to Medium Enterprises	40 %
Sweden[10]	Small to Medium Enterprises	40 % includes ”planned” measures
Australia[11]	Small to Medium Enterprises	81 %

[1] *Carroll, Xavier, and Kumar, 2010, 4–26.*

[2] *ERS internal data.*

[3] *Carroll, Xavier, and Kumar, 2010, 4–27.*

[4] *Moray, 2011.*

[5] *“More than 20 % (±3 %)” of audit participants had a pump retrofit or adjustment after receiving an audit; 15 % went on to participate in PG&E’s equipment incentive programs in the 2 years after receiving the study. “Approximately 20 % (±3 %)” adopted a capital intensive measure after receiving an audit and outside the equipment incentive programs. The paper does not indicate percentage of savings of all recommended measures that were implemented. Mancuso and Dimit, 1996.*

[6] *Griffin and Johnson, 2006, 7 as cited in Thumann, Younger, and Niehus 2009, 436.*

[7] *Anderson and Newell, 2003, 11 and 31.*

[8] *Khan, 2006, 22.*

[9] *Fleiter, Schleich, Ravivanpong, 2013, 21.*

[10] *Thollander, Danestig, Rohdin, 2007.*

[11] *Harris, 2000.*

on Figure 4 would be a close fit. The study for Finland that reports a 60 % to 70 % MAR implies that the MAR of 60 % for industrials is cumulative over 8 years. Interestingly enough this would fit somewhat closely onto our curve as well. We are not aware of other MAR-type studies that have reported the MAR as a function of elapsed time, nor do we know of one that has surveyed recipients as late as 8 years after study completion. The novel technique of tracking elapsed time between study completion and installation reveals MAR curves that steadily increase over a long period of time with a clear pattern of adoption. The pattern holds for thousands of measures. It does so for every stratification of measure characterization attempted, which is strong evidence that the phenomenon is real and not an anomaly. The adoption rate curves show that if the survey had been conducted nominally 2 or 3 years after studies were completed, the findings would have shown an adoption rate closer to 45 %. We therefore are confident that the evaluation method contributes to the disparity in results between this and other known studies.

PROGRAM DESIGN MATTERS

Specific program design and execution features may offer lessons for other program administrators that aspire to higher adoption rates as well. Based on many years of experience in the auditing field across a wide range of program styles, it is the opinion of these authors that a few key attributes make a big difference. First and foremost, the program requires 50 % cost-sharing for most studies. This requirement has the powerful effect of screening out customers that are “just curious” as well as those free-rider customers who are already certain to implement measures. Cost-sharing also means that there are no free audits thrown at customers to placate high bill complaints or to burnish a customer-friendly image. Second, the program explicitly targets larger customers, who may be more financially sophisticated or likely to have funds to invest. And third, there is no single audit service provider with goals to complete a certain number of audits. The pool of providers is seasoned, the customer is free to select whomever they choose, and they can even bring in their own preferred supplier. The evaluation engineers generally found the audit quality to be high. Collectively, the program design seems oriented to finding customers who need help and giving them the help they need in a market-driven fashion. Overall it is likely that program design also contributed to the disparity in results between FlexTech and other programs’ MAR.

The authors know of several other audit programs (NSTAR, PacifiCorp, Excel) that employ substantial screening of participants in lieu of a cost share ahead of delivering investment grade audits and technical support. These programs appear to enjoy high measure adoption rates as well. Anecdotally we sur-

mise that the in-depth screening process has the same effect as cost-sharing. Subjecting these and other audit programs to a similar evaluation as the one FlexTech received would reveal and, we suspect, confirm that program design contributed to the disparity in results.

In summary, this research examined adoption rates as a function of time, in some cases more than 7 years after study completion and with follow-up site visits to validate telephone survey data. The evaluators found an overall long-term adoption rate of 65 % for all measures recommended in the energy studies and found that the audit report was being used for guidance more than 6 years after delivery. Controls measures were the most commonly recommended measure type (598 occurrences for 25 % of all measures), and with an MAR approaching 85 % they were by far the most likely to be adopted. Lighting was the second most popular, and adoption reached 60 % and accounted for 17 % of all measures recommended. Unsurprisingly, at 20 %, envelope measures were least implemented. When adjusted for overlap with direct incentive programs,[6] FlexTech remains a cost-effective contributor to NYSERDA's energy savings portfolio. To the authors not only is it clear that evaluators should measure program adoption rates over a long period of time to provide an accurate assessment of the true impact of audits, but a more important conclusion is that program administrators should look to use audit programs as a means of engaging customers and as a catalyst to drive savings for the long term.

More than educating the customer, investment grade audits are all about providing these customers with the technical advisory support they need and thereby creating the opportunity for deep, continued, and meaningful engagement with the customer. Further, the adoption behaviour highlighted by the cumulative MAR graph produced by the time-based tracking of this study identifies ongoing natural engagement points. Very steep rates in the early years begin to flatten after 3 years and while adoption continues, this point of slowed adoption could provide opportunities for re-engagement with the customer including updating the study, refreshing their measure options, and keeping them on a path of aggressive adoption.

If these findings hold true for other programs then the disparagement that has been heaped on audit programs as expensive marketing tools without much impact is flawed, and substantive unrecognized real savings might have been left on the table throughout North America.

6. The majority of the measures recommended in the FlexTech studies were implemented without further funding from NYSERDA or other incentive programs. NYSERDA credits all such savings to the FlexTech program. Some measures did receive installation incentive funding. To avoid double counting of savings in multiple programs, NYSERDA funded research to quantify measure and savings overlap. This investigation is not in the scope of the research of work addressed in this paper. For readers' interest however, the authors note that the overlap research found that 19.3 % of FlexTech's energy efficiency measure savings ultimately received incentives from NYSERDA core energy efficiency installation incentive programs (Parlin and Megdal, 2008).

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