Finding Strength in Diversity: How Utility Differences Affect Efficiency Program Outcomes

Shawn Bodmann, Wendy Todd and Lisa Stefanik, DNV GL

ABSTRACT

Energy efficiency program administrators in many states have worked together to create uniform statewide programs. Consistent rules and incentives reduce confusion, lower participation costs for customers and trade allies, and introduce economies in procuring program delivery services. Massachusetts has largely standardized the energy efficiency programs offered by the five electric and six gas utilities ("Program Administrators" or PAs) throughout the Commonwealth. Despite standardized offers, the various PAs are achieving different savings levels and experiencing different levels of administrative costs. With relatively uniform program tracking data, this situation provides an excellent setting to explore the effect of differences among administrators in terms of market characteristics, past program activities and outcomes, and detailed program operations on results achieved.

For this study we combined several large data sets, including billing and rebate tracking data from all of the Massachusetts Program Administrators for multiple years and the results of a statewide building characteristics survey. The objectives include the following:

- Examine how differences in market characteristics affect efficiency program outcomes.
- Provide information and insights into best practices among various program administrators who have differing program processes.
- Highlight the benefits and illuminate the pitfalls of working with large, comprehensive data sets built from multiple sources.

The findings presented in this paper will equip program planners and managers with strategies to increase participation and savings in their commercial programs.

Introduction

The five electric and six gas utilities ("Program Administrators" or PAs) in Massachusetts are charged with implementing consistent efficiency programs across the Commonwealth and have several processes in place to ensure that this occurs. Even with these processes, the PAs and state regulators have observed that some PAs achieve higher or lower savings than others, and that the cost to achieve those savings also varies among the PAs. A question of interest is to explain why those differences exist.

This paper will present results of a study undertaken by the PAs and Energy Efficiency Advisory Council (EEAC) consultants to identify the factors that lead to differences in savings and the cost to achieve those savings. The scope of the study discussed in this paper is significant and it is not possible to include details on the entire analysis. Instead, we focus on the electric service territories and present selected findings that we felt were significant and/or of particular interest to conference attendees in order to limit scope. The full report will be publically available once finalized by the PAs and the EEAC.

Massachusetts Geography

To give readers who may not be familiar with Massachusetts some context, we provide two maps that show the electric PA service territories (Figure 1) and population densities (Figure 2). National Grid and NSTAR are the only PAs serving the Metro Boston area, with NSTAR serving the areas with the greatest population density. Conversely, WMECo serves relatively low density areas in the western half of the state. Cape Light Compact (CLC) serves only the Cape, which has moderate population density. Finally, Unitil has a very small service territory in the northern part of the state. It should be noted that there are a number of municipal electric providers in the state as well, these municipalities are exempt from participation in the statewide energy efficiency programs and therefore are not considered in the evaluation discussed in this paper.

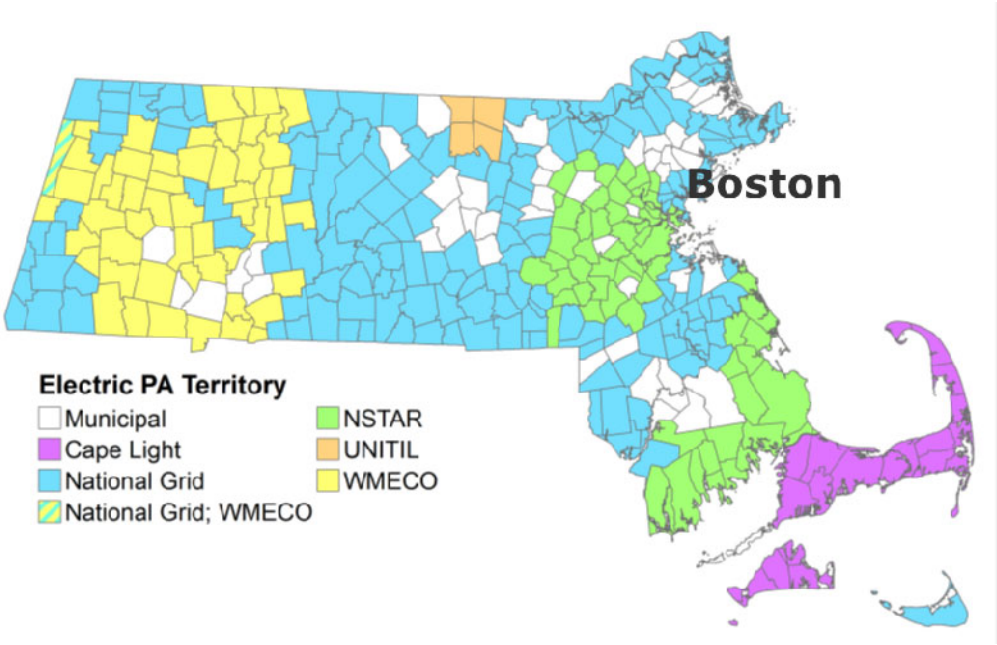

Figure 1. Electric service territory map. *Source*: MassGIS data – Public utility service providers.

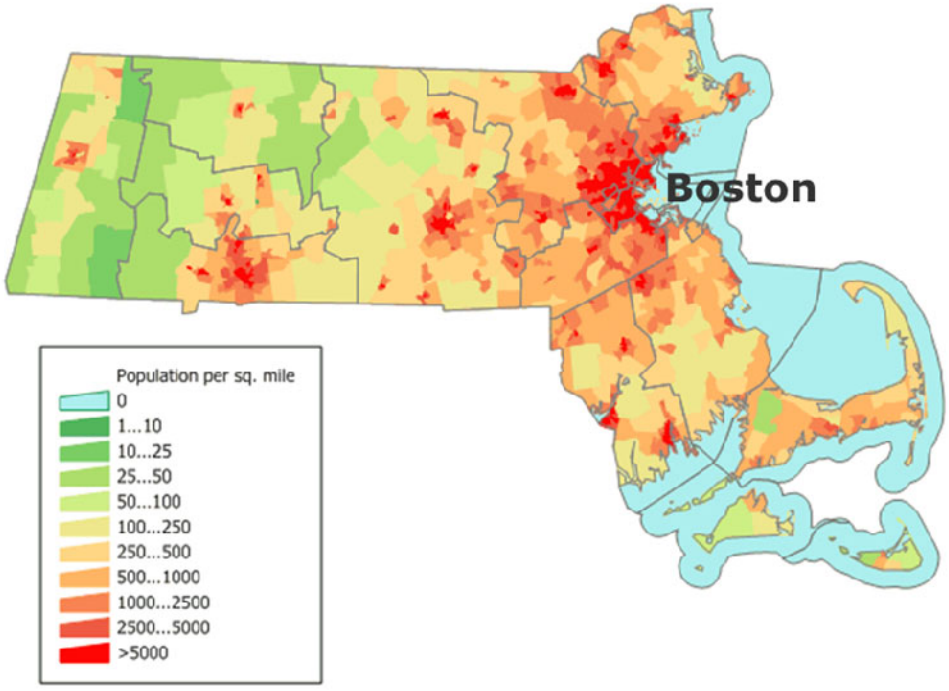

Figure 2. Population density map. *Source:* U.S. Census Bureau Census 2000 summary file 1 population by census tract.

Study Methodology

The factors that lead to variation in program outcomes can be divided into two categories:

- Differences outside PA control (e.g.: service territory characteristics such as demographics, firmographics, and prevailing economic conditions)
- Differences within PA control (e.g.: e.g. incentive levels, market segmentation, and staffing levels)

Understanding the market characteristics specific to each PA will help the PAs and the EEAC ensure that the program designs and strategies in any given territory are the most effective. For example, some customer engagement practices are better suited to specific customer segments, the mix of which varies by PA. Figure 3 provides a visual summary of the study goal.

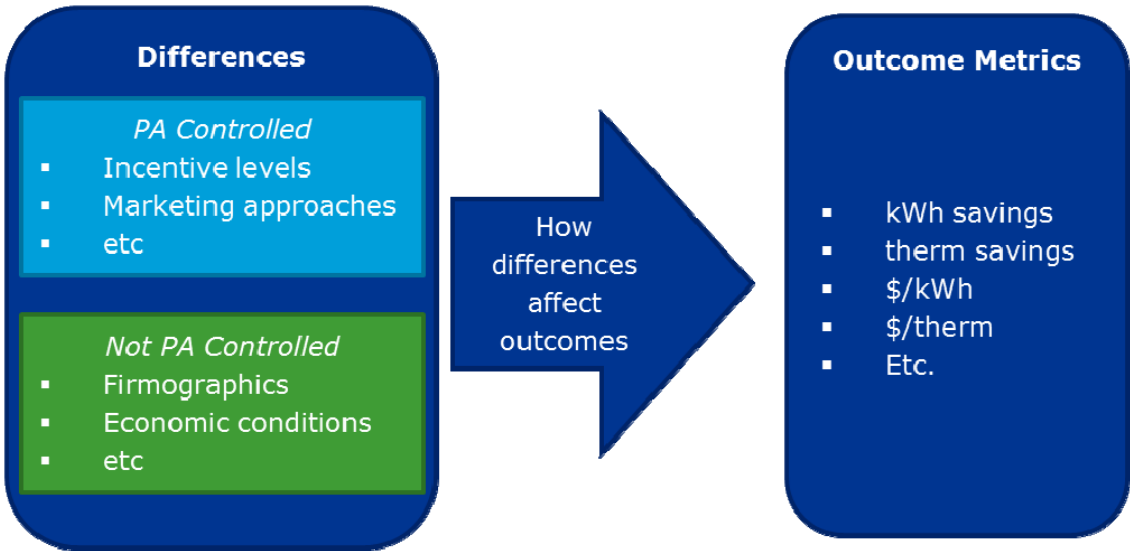

Figure 3. Project goal visual.

The data sources for the study are varied and include in-depth interviews with PA staff, PA project and customer data for 2011 and 2012, telephone survey data of approximately 850 commercial and industrial customers, and third party data including GIS, Census and CBECS. For the full report, we considered 40 difference measures and 10 outcome metrics.

Select Research Findings

As noted above, the scope of the evaluation is significant, so we present and discuss select research findings in this paper. First, we show the total electric (kWh) savings achieved by each PA and per participating customer. Then we focus on how building type affects electric savings and the mix of building types within each PA. Finally, we present a more detailed investigation of the end-use categories within the healthcare building type.

Savings Outcomes

Table 1 shows each PA's total number of nonresidential electric customers, the percent who participated in at least one efficiency program, the total savings achieved by those participants, and the savings per participant. As one would expect, PAs with more customers have greater total savings and participation rates. The savings per participant are not closely related to the total number of customers.

Table 1. Electric customers and savings by PA

PA	Total # Customers	% Partici-pating	Total kWh Savings	Savings / Participant
National Grid	70,589	4.3%	212,208,489	89,201
NSTAR	57,290	3.4%	205,407,921	70,782
Western Mass Electric Company (WMECo)	11,897	5.1%	27,227,048	46,943
Cape Light Compact (CLC)	9,675	2.7%	10,334,380	24,902
Unitil	1,319	4.9%	3,756,538	107,330

Savings by Building Type

Building types were defined based on NAICS codes and grouped to approximate the categories used in the U.S. Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS). If a NAICS code was unavailable, we put the customer into the "Unassigned" category.

Table 2 shows the total number of customers, percent participating, total electric savings, and average participant savings for each of 12 building types, sorted by average savings. A few important observations from this table include:

- Healthcare and manufacturing/industrial have by far the greatest savings per participant. Average savings for healthcare are especially high.
- Retail, office, and food service are the three most populous building types (excluding unclassified), but all have relatively low average participant savings.
- The unclassified building type is the second most populous, but has the worst participation rate. This is partially due to a database artifact – the NAICS codes were well-populated in the participant data, but poorly populated in the overall billing data. This artifact inflated the total number of unassigned customers and decreased participation rate because total unassigned was the denominator for that ratio.

Table 2. Electric customers and savings by building type

Building Type	Total # Customers	% Participating	Total kWh Savings	Savings / Participant
Healthcare	6,091	2.8%	89,642,077	521,175
Manufacturing/Industrial	5,306	8.0%	117,793,063	277,814
Education	7,565	6.5%	45,110,839	92,251
Lodging	2,062	4.3%	6,835,590	76,804
Warehouse	249	40.2%	6,398,015	63,980
Unclassified	36,962	0.9%	20,681,626	61,008
Office	25,003	5.2%	73,216,584	56,019
Food sales	3,076	11.6%	18,840,810	52,775
Other	2,792	3.2%	4,570,468	51,937
Public assembly	3,209	6.0%	5,458,340	28,136
Retail	47,767	4.4%	57,330,292	27,248
Food service	10,688	6.1%	13,056,674	20,149

A PA's choice of targeting techniques and program delivery methods will influence how much savings they achieve in a given year. If a PA wants to maximize savings, they can devote their limited resources to pursuing the customers who generate relatively large savings per site. However, those targeting choices are constrained by each PA's individual customer mix. They can only pursue the customers that they have. PAs with a relatively large portion of healthcare and manufacturing/industrial populations in their customer mix may have an easier time generating electric savings in any given year based on the significant savings/participant observed in this business type. In contrast, the second observation suggests that PAs with a relatively large portion of retail and food service populations in their customer mix may have a more difficult time generating savings in a given year based on the smaller savings/participant observed in that building type. With these implications in mind, the next step in the analysis is to examine the distribution of each PA's customer bases by building type.

PA Customer Mix

Table 3 shows the distribution of building types for each PA. As expected, National Grid and NSTAR, the two PAs with the greatest savings and savings per participant, have much larger customer bases in the healthcare and manufacturing building types than the other PAs. The fact that National Grid and NSTAR have about the same proportion of healthcare and manufacturing customers as the other PAs suggests that the critical factor is the size of customer base rather than proportions of customers who fall into those two building types.

The second implication – that PAs with greater numbers of customers in office, retail, and food service building types will have a harder time generating savings – is not immediately supported by Table 3. National Grid and NSTAR have the greatest number and generally higher proportions of these building types than the other PAs, yet, as shown in Table 1, they are getting greater savings overall compared to other PAs in the state. This potentially suggests that the two large PAs still have enough healthcare and manufacturing customers to draw from to counteract their higher ratios of the worse-performing building types. In contrast, the smaller PAs may lack a significant enough portion of high-performing customer base, and therefore must rely on the

building types that generate lower per customer savings in order to generate their annual savings goals.

Table 3. Number and percent of customers by building type

	National Grid		NSTAR		WMECo		CLC		Unitil	
Building Type	# Cust-omers	% Cust-omers	# Cust-omers	% Cust-omers	# Cust-omers	% Cust-omers	# Cust-omers	% Cust-omers	# Cust-omers	% Cust-omers
Hlthcare	2,613	4%	2,577	4%	655	6%	213	2%	33	3%
Mnf/Ind	2,245	3%	2,183	4%	832	7%	30	0%	16	1%
Office	8,624	12%	13,031	23%	2,004	17%	1,132	12%	212	16%
Retail	32,077	45%	11,324	20%	3,180	27%	989	10%	197	15%
Fd Srvc	3,201	5%	6,058	11%	752	6%	577	6%	100	8%
All other types	21,829	31%	22,117	39%	4,474	38%	6,734	70%	761	58%
Total	70,589	100%	57,290	100%	11,897	100%	9,675	100%	1,319	100%

Healthcare and Manufacturing Savings by PA

Based on the discussion above, it is apparent that healthcare and manufacturing/ industrial are the two most impactful building types with the greatest savings per participant in the Commonwealth. Further, a closer inspection of the average participant savings in the healthcare and manufacturing buildings (Table 4) yields both additional insight and additional questions.

- Not only do National Grid and NSTAR have larger healthcare customer bases to draw from, they are also getting bigger projects out of those customers. This is likely due to the type of healthcare facilities in each territory. Both National Grid and NSTAR serve the Metro-Boston area and consequently most of the Commonwealth's large hospitals. In contrast, the healthcare buildings in the other PA territories are mainly smaller clinics and regional hospitals that have limited savings opportunities and resources compared to large hospitals.
- Further, the average savings for healthcare at National Grid is an order of magnitude greater than NSTAR. However, this is puzzling when one considers that the largest hospitals in Massachusetts are actually NSTAR electric customers.

Table 4. Average savings (kWh) by PA

Building Type	National Grid	NSTAR	WMECo	CLC	Unitil
Healthcare	1,092,887	175,843	39,377	11,806	0
Manufacturing / Industrial	184,980	469,864	83,938	80,938	655,527

While there may be a number of possible factors affecting savings and saving potential such as facility age, presence of remodeling projects, energy "champions", and PA targeting practices, an investigation of the end-uses from which each PA's healthcare customers got savings in 2011 (Table 5) helps explains why National Grid's average healthcare savings in that year is so high. National Grid had a single, very large combined heat and power (CHP) project in healthcare in 2011. Large CHP projects are infrequent, and without them, National Grid's healthcare savings begin to look more like other PAs.

Table 5. Savings from End-Use by PA – Healthcare only

End-Use	Metric	NGRID	NSTAR	WMECo	CLC
Overall	# part.	69	77	14	12
	kWh/part.	1,092,887	175,843	39,377	11,806
CHP	# part.	3	1	0	0
	kWh/part.	22,606,882	1,036,308	0	0
Lighting	# part.	56	66	13	9
	kWh/part.	86,801	64,380	27,082	11,590
HVAC	# part.	9	22	1	4
	kWh/part.	50,271	374,403	407	9,067
Refrigeration	# part.	2	4	0	1
	kWh/part.	2,418	1,092	0	1,092
Motors	# part.	4	2	0	0
	kWh/part.	20,703	6,651	0	0
Other	# part.	0	0	1	0
	kWh/part.	0	0	198,798	0

Note: Unitil had zero healthcare participants.

Table 5 shows that after removing the rare CHP savings, lighting comprises the majority of savings for the healthcare buildings overall. This situation is not unique to the healthcare building type -- most of the savings across the Commonwealth in 2011 and 2012 came from lighting. It should be noted that the HVAC savings for NSTAR are significantly higher than the other PAs. Absent a large project similar to the CHP project in National Grid's territory, there are a number of possible factors that can affect savings including process differences in the PA's approach to the customer type and or end-use.

Process Differences – PA Point(s) of Contact

Finally, we turn to a description of some of the program administration differences that are within the PAs' control. Even as the PAs are mandated to deliver consistent programs across the Commonwealth in terms of program offerings and incentives, the processes for delivering the programs varies. These differences reflect the diverse operating conditions for each PA and they can affect program outcomes.

It is difficult to establish the extent to which PA practices change outcomes because of the lack of relevant counterfactuals for comparison. However, we can describe some of the variations in delivery methods and discuss how they relate to other PA differences. Table 6

presents the differences in program delivery specifically related to point(s) of contact with the customer.

Table 6. Customer point(s) of contact with electric PAs

PA	Direct Install Vendors	Account Representative	C&I Program Staff[1]	Project Expediter[2]	Customer Call Center
National Grid	Yes	Yes	No	Yes	Yes
NSTAR	Yes	Yes	No	Yes	Yes
WMECo	Yes	Yes	Yes	No	Yes
CLC	Yes	No	Yes	No	Yes
Unitil	Yes	No	Yes	No	Yes

[1] PA staff who work with nonresidential customers, but are not dedicated to specific accounts.
[2] Contractors who bridge the gap between PAs and customers by helping customers identify efficiency opportunities

Differences in the mode by which the PA interacts with the customer may be driven by necessity. For example, a large PA like National Grid or NSTAR has thousands of nonresidential customers and must prioritize which customers or groups of customers receive individual contact. Conversely, a small PA, like CLC or Unitil has a small enough customer base that they are able to interact individually with each customer during a given year.

- All electric PAs have contracts with at least one direct install vendor. These vendors provide energy assessments (and install some measures) to customers with less than 300 kW peak demand. They are the main point of contact for customers under the 300 kW threshold, particularly for National Grid and NSTAR who have very large customer bases.
- National Grid assigns account representatives to all customers with greater than 750 kW peak demand. National Grid also assigns account representatives to select customer groups (‘sweet spots’) of customers who have demand between 300 and 750 kW. The PA loosely define these ‘sweet spots’ as customers in industries such as injection modeling, where energy is a relatively high cost consideration, and had average load factors of 80%-90%. Targeting of specific industries is required because the number of accounts with demand between 300 and 500 kW is too great for internal staff to serve. Furthermore, the contractors working with larger customers may lack the training to adequately serve the needs of customers in the targeted sweet spot industries.
- NSTAR classifies all customers greater than 300 kW peak demand as mid-size to large and assigns them to account management teams based on industry and consumption levels. The account management teams include Project Expeditors, who are third party contractors that help identify the needs of the more diverse smaller accounts. NSTAR believes the project expeditors, plus the industry specific account teams, provide sufficient resources to address the large and mid-size customer needs. WMECo recently merged with NSTAR and will begin to adopt these practices.

- NSTAR also organizes their efficiency marketing teams along functional lines (end use or business type). For example, one of their teams targets hospitals. Another team targets municipals. This difference may be partially responsible for NSTAR's greater success generating HVAC savings.
- Unitil markets to all large customers as a group, which they define as customers with peak demand of 200 kW or more. Given the relatively small customer base, the PA reports having intimate knowledge of their customers, and work directly with them to develop solutions.
- Cape Light Compact indicated that it typically does not subdivide the 300 kW and up customer group due to very limited numbers of customers in this range.

Conclusions

This section presents findings in three broad categories: how market differences affect outcomes, implications for best practices, and the challenges of working with large data sets.

How Market Differences Affect Outcomes

Total savings correlates with the number of customers in a PA. The volume of certain types of customers also affects savings. The large PAs (National Grid and NSTAR) have a critical mass of customers in high impact building types (healthcare and manufacturing). They also have policies to help identify projects in those market sectors. The smaller PAs, have small enough customer bases to provide individual attention to most customers but they lack the critical mass in the high impact sectors to match the average participant savings of the large PAs on an annual basis.

Implications for Best Practices

Benchmarking against neighboring utilities to identify best practices can be a successful approach, but it comes with a risk. It is important to understand the context in which those practices were developed and operate in order to increase the chances that the best practices are applicable.

Finding high impact projects from certain building types (healthcare and manufacturing) is easier than others (office, retail, food service). However, success may depend on having a critical mass of such customers to draw from, and customer contact strategies to identify and pursue those opportunities help National Grid and NSTAR accrue savings from the high impact building types year over year.

On the other hand, the office, retail, and food service building types make up the majority of customers across all the PAs, so it may be necessary to achieve deeper savings from these types of customers to continuously improve the PAs' efficiency portfolios. Furthermore, these customer types are particularly important to the smaller PAs who have few healthcare and manufacturing customers.

Challenges of Working with Large Data Sets

Despite efforts to standardize programs and offerings across the Commonwealth, each of the five electric PAs continues to maintain their own billing and tracking databases. While these

databases contained similar information, they are organized and labeled differently. Combining these databases was a significant task that took hundreds of analyst hours. The analyses presented in this study would have been impossible without this basic set up.

Further, the NAICS codes provided are not necessarily accurate, especially for mixed-use buildings. In addition, these codes were usually assigned only in the participant records and not in the billing records resulting in an inflated number of "Unassigned" buildings in the overall customer base. Assigning building types to the entire customer base was beyond the scope of the evaluation, and there are enough unassigned records in the overall customer base that the true building types could skew these results.

The results for the Unclassified segment demonstrate one of the challenges of working with these databases. This category clearly shows that important data are missing for a large proportion of the data. Balancing these concerns can be difficult when dealing with analysis of large data sets such as the billing and tracking data for the PAs.

Finally, making generalizations from single year data, even from large data sets, is perilous. The results for CHP in National Grid healthcare buildings shows the importance of digging deeper into data to better understand results. In this case, our outside knowledge about the large hospital customers in Boston (in NSTAR territory) helped us realize that something was odd in these data. It is also important to remember that factors affecting the outcome of interest may not be represented in the data you are examining. Supplementing with external data or information may yield richer, more nuanced conclusions.

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