

Health Care Best Practices Study

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EXECUTIVE SUMMARY

This paper describes the results from a study conducted by the Massachusetts EEAC Technical Consultants with input from the Massachusetts Program Administrators (PAs). The study purpose was to investigate key factors affecting the health care market and to identify program elements that effectively advance energy efficiency in the health care sector¹ for consideration as potential best practices. The current Massachusetts programs are very strong in achieving savings with large hospitals, and expansion of existing programs and adoption of new strategies identified in this study could help the Massachusetts PAs achieve higher levels of participation and savings in mid-sized and smaller facilities in this critical sector.

The study finds several program elements that could be implemented or expanded to enhance savings in the health care sector:

- Comprehensive support including audits, scoping, project management, and incentives
- An enhanced approach to Memoranda of Understanding²
- Educating facility managers on building a business case for energy efficiency projects
- Continuous engagement and outreach through organizations such as the American Society of Healthcare Engineering (ASHE)
- Using market specialists for outreach in the sector
- Cost sharing between PAs and customers for a Resource Conservation Manager (RCM). An RCM would be an employee of the hospital whose job it would be to identify and implement energy savings measures, with a focus on low- and no- cost measures.
- Working collaboratively with representatives from multiple facilities to create a shared set of goals and technical resources
- Raising incentive amounts for small to medium sized facilities to achieve higher savings and increased participation

This study takes the initial step at identifying practices which have potential to further advance energy efficiency in Massachusetts. Additional research into the potential for integrating new practices into the existing PA programs includes as developing estimates of costs and savings potential, gathering more detailed information of specific implementation criteria for elements of interest and trying practices with a limited customer group will be necessary before state-wide adoption of these practices occurs. In some cases the study identified best practices that are already in use in Massachusetts and recommends expanding the application of those successful practices to more of the market which will also require PA analysis to identify and articulate the thresholds beyond which the strategies will not be applied and the rationale for those thresholds.³

This study did not explicitly explore the cost effectiveness of implementing these practices. However, all of the practices identified in the study are in use by PAs in other states. The PAs who employ these effective program elements consistently reported that the practices are cost effective and are meeting the needs of the health care market.⁴ For the most part, evaluation data on the specific program elements is not available, as they are integral parts of larger efficiency programs, or new programs that have not yet been evaluated.

The approach used in the report, therefore, relies on the combined experience of the PA/Consultant Team to come to a consensus on which practices have the greatest potential to provide the desired benefits of increased cost effective savings and higher levels of participation across the Massachusetts health care sector.

¹ The study initially considered looking across the full health care market including large, medium and small hospitals, continuing care facilities, and medical office buildings. The working group determined that these sub-segments were too diverse to study comprehensively within the time and budgetary limitations of this study and selected medium/small hospitals as the primary area of focus for the study.

² Currently in place for largest electric customers served by National Grid and Northeast Utilities

³ A commonly cited rationale for not expanding resource intensive practices such as MOUs to smaller customers is cost effectiveness limits.

⁴ The process for identifying potential effective practices included interviews of the PAs using the practices and their assessment of the effectiveness and cost benefit of the practices was used to screen for the practices with the "best" potential for inclusion or expansion in MA.

INTRODUCTION

The health care sector is notable for its high energy use intensity, long operating hours, and unique barriers to energy efficiency. As a result of these factors, the Massachusetts Energy Efficiency Advisory Council Consultant Team (Consultant Team) and the Massachusetts PAs identified this sector as a target research area with the goal of identifying the best approaches for advancing energy efficiency in the health care market. The study was led by the Consultant Team and was performed with input from the Massachusetts Program Administrators (PAs). The results of this report can help optimize the current Massachusetts programs to best address market barriers in all health care facilities in the Commonwealth, regardless of size, while generating reliable savings and meeting cost effectiveness requirements.⁵ While much of the research and interviews were focused on acute care hospitals, the results can reasonably apply to other health care facilities, especially non-acute hospitals and long-term care facilities due to their significant similarities to acute care hospitals, including:

- High energy use intensity
- Specific and diverse space temperature and humidity requirements
- Low profit margins
- Similar market barriers to efficiency investment, including capital fund competition with health care upgrades, and limited staff resources

MARKET CHARACTERIZATION

General Market Description

The Massachusetts health care market segment explored in this study includes hospitals, extended care facilities/nursing homes, and to a lesser degree, medical office buildings; the primary study focus is on acute care hospitals.⁶ Acute care hospitals are defined as locations where patients are treated for a brief but severe episode of illness, disease, or trauma. Non-acute hospitals tend to have the majority of beds allocated for rehabilitation, chronic, psychiatric, or substance abuse issues. Acute care hospitals are the most energy intensive, but other health care facility types also have high energy consumption due to special equipment, specific HVAC needs, and 24/7 operation. There are currently 68 acute care hospitals and 27 non-acute hospitals in Massachusetts. The 68 acute care facilities have a combined 14,732 acute care beds. Medical office buildings (MOB) may best be treated somewhat differently to hospitals and long-term care facilities, as they have load profiles more similar to those of other office buildings. However, many MOBs are owned by hospitals and therefore when addressing the customer holistically, the PAs may find that some program elements wrap around all of the health care buildings under a single ownership structure.

According to Energy Star data, US hospitals have a median energy use intensity (EUI) of 197 kBtu/sf, long-term care facilities use 126 kBtu/sf, and medical office buildings use only 44 kBtu/sf. The energy use intensity of MOBs depends on the services provided; outpatient rehabilitations and physical therapy centers have a higher EUI of 63 kBtu/sf.

Massachusetts has a Health Policy Commission which is working to advance the Commonwealth's goal of "bringing healthcare spending growth in line with growth in the state's overall economy through the development of evidence-based policy and the identification of collaborative solutions."⁷ Advancing energy efficiency in Massachusetts' hospitals is highly consistent with this objective because savings in energy costs flow directly to the bottom line. Although profit margins range from nearly 9% in the Berkshires and Fall River area to a low of 0.5% on the Lower North Shore, the average total margin for Massachusetts hospitals in 2013 was 4.1%.⁸ This means that every \$1,000 in energy savings has the same bottom line impact as \$25,000 in revenue from additional patient services (\$25,000 in patient services revenue multiplied by a 4% profit margin yields \$1,000 in profit). Familiarity with the margins and solvency of individual hospitals will help PA account representatives gauge the relative value of energy savings for each institution; the Center for Health Information and Analytics

⁵ Draft Market Sector Profile: Small and Medium Healthcare. Prepared by DNV GL. 4/28/14

⁶ This market segment also includes healthcare related laboratories. Because these laboratories are similar in ownership, operations and end uses to other laboratories, the working group determined that they would not be explicitly included under this investigation.

⁷ <http://www.mass.gov/anf/budget-taxes-and-procurement/oversight-agencies/health-policy-commission/>

⁸ CHIA Massachusetts Acute Care Hospital Financial Performance FY 2013

(CHIA) Massachusetts Acute Care Hospital Financial Performance FY 2013 Study provides this information by hospital for both operating and total margin.⁹ Long-term care facilities seem to have a similarly low total margin. While there are no Massachusetts specific data available, a DNV GL study¹⁰ found an average margin of 1.2% in 2012, while a California study found an average nursing facility profit margin of 5.9%.¹¹

Some hospitals may benefit from energy efficiency investments to an even greater degree. Disproportionate Share Hospitals (DSH) are hospitals receiving 63% or more of gross patient service charges from Medicare, Medicaid, other government payers, and the Health Safety Net. In 2013 Massachusetts had 31 DSHs. DSH hospitals tend to have lower total margins on average and may lack the resources to undertake energy efficiency projects. A list of DSH hospitals and their share of service charges from the sources listed above is included in Appendix C. These hospitals may need more significant technical and financial assistance in order to successfully implement efficiency measures. Because these hospitals care for a much higher proportion of economically disadvantaged patients, serving these hospitals also can indirectly benefit low income residents and economically disadvantaged communities.

According to the Massachusetts department of Public Health, 62% of acute care hospital beds are found in small and medium sized hospitals (bed count of less than 300).¹² Hospital bed count, the typical size metric used in the industry, is likely to have a good correlation with peak electric demand, a typical PA metric used to determine customer size. While the large hospitals present significant energy savings opportunities, small and medium sized hospitals cumulatively have more beds than large hospitals, and thus present a very important opportunity for savings. A study of 13 northeast hospitals by the Building Commissioning Association found that a typical hospital uses 100,000 kWh per bed per year.¹³ This means that there is approximately 951 GWh of annual electric consumption at the 9,514 beds in small and medium sized Massachusetts hospitals, excluding hospitals with more than 300 beds. It is clear from this estimate that a large savings potential exists at small and mid-sized hospitals.

In addition to hospitals, there are a significant number of extended care and medical office facilities that fall into the health care market segment, most of which would be characterized as small or medium sized facilities. The Massachusetts Department of Public Health (MDPH) website lists licensed and unlicensed health care facilities in the state and they report approximately 800 extended care operations, including nursing and rest homes, hospices, and assisted living facilities. In addition, MDPH lists well over 1,000 medical office buildings. The total number of facilities identified by MDPH is about 10% of the number of total electric health care sector customers found in the 2012 Customer Profile Report, which looks at customers in the PA billing database.¹⁴ It is unclear why this discrepancy exists.

The 2012 Customer Profile Report found that the 2011 consumption of buildings characterized as health care was 1,851 GWh and 53.8 million therms annually (6% and 4% of all C&I consumption respectively).¹⁵ The study also found that in 2012 in the electric customer participation rate in the sector was low relative to other sectors (1.7% for electric and 1.9% for gas and that savings for the sector were higher than most other sectors indicating the participants tend to be large customers with large projects. The 2012 Customer Profile did not evaluate year-over-year participation at the sector level, which, based on the current PA approach to the sector, is anticipated to show a high rate of repeat participation, especially for the largest customers that are account managed and/or have long-term memoranda of understandings (MOUs). The study did find that a significant percentage of health care participants implemented projects that addressed multiple end uses; all 2012 Cape Light Compact health care projects addressed multiple end uses, National Grid had a weighted average of 49% and NStar showed 70% of 2012 projects addressing multiple end uses for electric customers. Statewide, health care projects with multiple end uses made up 50% of savings for small facilities and 63% of the savings for large facilities.

Extended care facilities are a growing sub-segment of this market, as are outpatient and community care facilities. Medical office space is often leased, causing it to fall into both the health care and commercial real estate market

⁹ <http://www.mass.gov/chia/docs/r/qtr/2013-09-30/2014-04-29/fy13-hospital-financial-report.pdf>

¹⁰ <http://www.phca.org/docs/financial-crisis-studies-avalereport.pdf>

¹¹ <http://www.chcf.org/~media/MEDIA%20LIBRARY%20FILES/PDF/L/PDF%20LTCReadyForTomorrowsSeniors2013.pdf>

¹² MA Department of Public Health, Division of Healthcare Quality, *Massachusetts Licensed or Certified Healthcare Facility/Agency Listing*, April 8, 2014

¹³ http://www.bcxachapters.org/northeast/presentations/villani_nebca%20rcx%20summit%20healthcare%20retro-commissioning.pdf

¹⁴ <http://ma-eeac.org/wordpress/wp-content/uploads/CI-Year-2012-Customer-Profile-Final-Report.pdf>

¹⁵ <http://ma-eeac.org/wordpress/wp-content/uploads/CI-Year-2012-Customer-Profile-Final-Report.pdf> Tables 5-12 and 5-14.

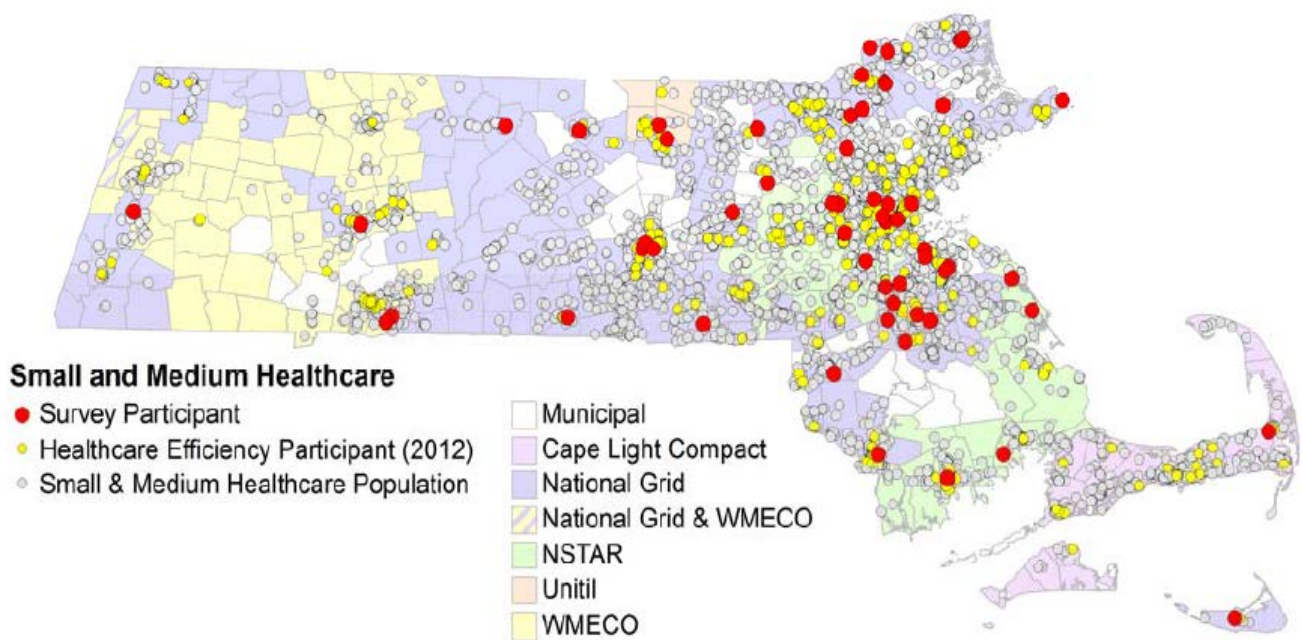
segments. The PAs will need to determine the best way to categorize these customers to ensure that the suite of services offered is optimized to address the split incentives that come from leasing issues as well as organizational structures such as who to target for marketing to facilities that are leased by larger health care organizations. According to Small and Medium Healthcare Market Profile, 29% of small and 19% of medium health care facilities lease their space.¹⁶

One industry trend that may affect the future face of health care service delivery is a move to reduce institutionalized care in favor of community-based care in order to help control health care costs. In the past three years, Massachusetts has received over \$200 million to fund pilot efforts that seek to advance this objective. If effective, this approach would likely reduce occupancy rates for hospitals and extended care facilities, resulting in fewer services over which these facilities could allocate their operating costs. This could potentially lower hospital margins even further, making energy efficiency an even more attractive value proposition, but may also limit hospitals' ability to fund capital improvements and secure financing. This approach could also result in a reduction of total operating hospital square footage in the Commonwealth. This may reduce the opportunity for energy efficiency, as total energy load could decrease over time, but may create additional opportunities in helping hospitals consolidate in an energy efficient manner. For example, Boston Medical Center is in the process of consolidating operations at its two hospitals that are separated by a city block. The project is expected to save \$30 million by eliminating redundancies, including significantly reducing energy expenditures.

Small to Mid-Sized Health Care Customer Needs

One theme that emerged during the interviews conducted to inform this study was that, while larger hospitals reported being very well served by the efficiency programs and were aggressively implementing efficiency projects, small- and medium- sized hospitals were not as engaged. This anecdotal evidence is backed up by several recent studies performed in Massachusetts. For example, the low participation rate for the sector reported in the 2012 Customer Profile study as shown in Figure 1. In addition, statewide health care market profile data shows that 60% of small health care facilities and 50% of medium sized health care facilities have not made any capital expenditures on their building systems since 2011, compared to only 29% of large hospitals.¹⁷

Figure 1 | MA Small & Medium Health Care Population and Program Participation (2012)



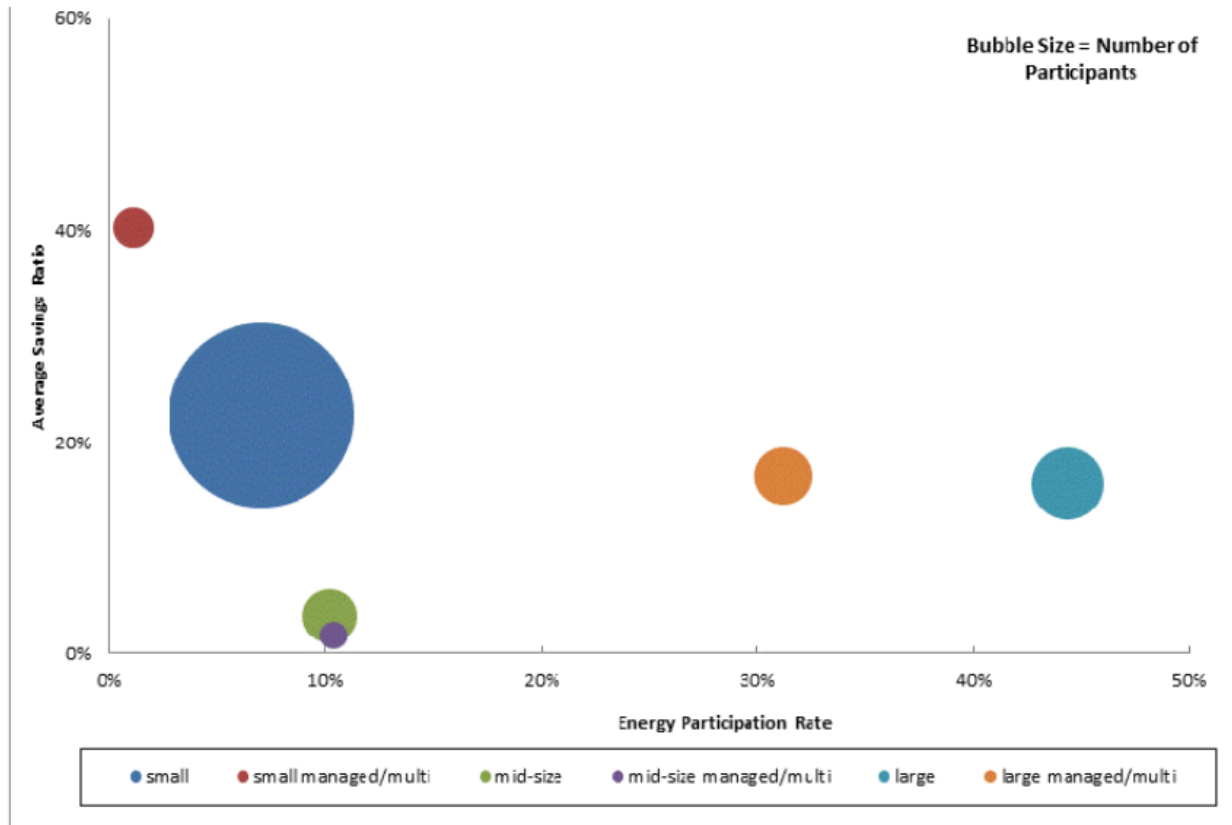
In addition to the above, the Mid-Sized Customer Needs Assessment, released in December 2013 and based on data from the 2011 program, found that mid-sized health care customers are participating less and saving less than either small or large customers. The figure below shows the participation rate of each size class of health

¹⁶ <http://ma-eeac.org/wordpress/wp-content/uploads/Small-Medium-Healthcare-Market-Sector-Profile-Final-Report.pdf>

¹⁷ MA Healthcare Market Data v3.

care facilities on the horizontal axis, the percent savings on the vertical axis, and the absolute number of customers by the size of the bubble. As the green and purple bubbles show, savings achievement at mid-sized facilities is significantly lower than for either small or large facilities, and the participation rate is significantly lower than for large customers.

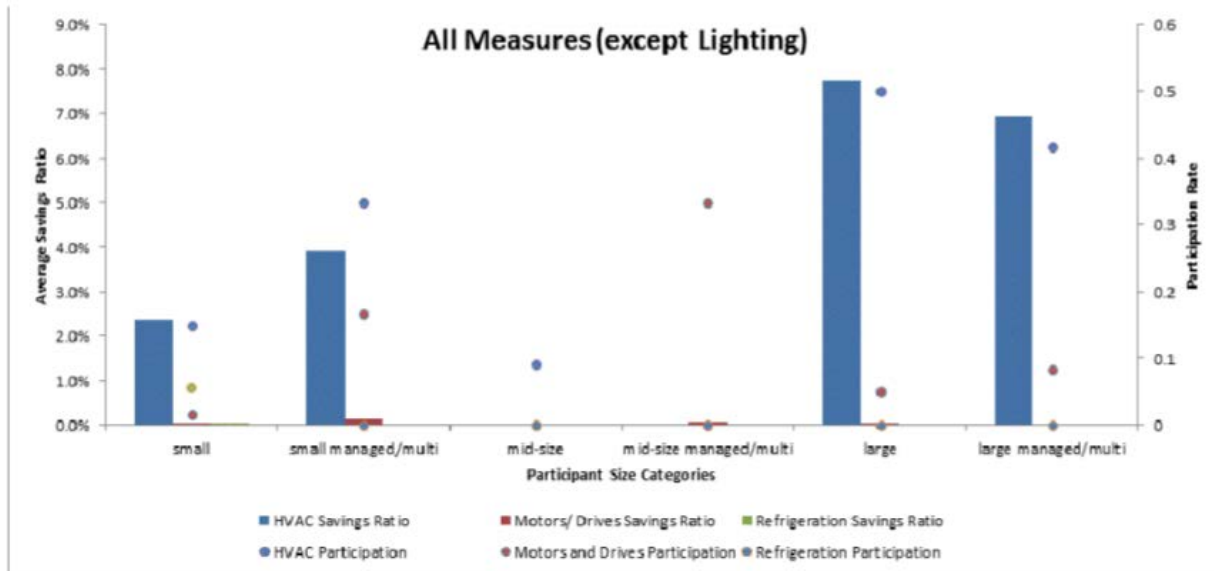
Figure 2 | Small & Medium Health Care Savings and Participation Rates (2012)



The Mid-Sized Customer Needs Assessments also looked into participation by measure type. The figure below shows savings by non-lighting measure type and customer size. Both small and large health care facilities have achieved fairly significant non-lighting savings, particularly in HVAC, compared to almost no non-lighting savings in mid-sized health care facilities.¹⁸ This suggests that mid-sized health care facilities are not getting the type of comprehensive support needed to identify and implement more complicated non-lighting efficiency opportunities.

¹⁸ These data are for a single year of participation; mid-sized healthcare customers may have completed HVAC measures during other years. However, it is reasonable to look for annual achievement of participants in this sector undertaking HVAC measures.

Figure 3 | Health Care Sector Installed Measures (2012)



Results of Stakeholder Interviews

The research included interviews with high level facility staff members from six Massachusetts hospitals of varying size. These interviews explored the most important barriers to efficiency at each facility, the facilities’ experience working with Massachusetts energy efficiency programs, and any additional actions that would help enable higher levels of efficiency savings. The interviewees reported the following barriers:

- Efficiency projects often compete for the same pool of capital as new medical equipment, with the medical equipment taking priority
- Both facility staff and building management are extremely busy with other priorities such as life safety, building comfort, and maintaining consistent operations
- Building comfort complaints by building users (e.g., doctors or other medical staff) will often lead to disabling controls such as night setback temperatures
- Savings from efficiency projects may be absorbed into the general budget, which obscures the value of those savings as compared to their investment costs
- Senior management may not trust the projected benefits and savings from efficiency investments, or engineers in facility management may not know how to effectively sell efficiency to senior management in business terms
- Most facilities cannot afford the staff resources required to ensure savings persistence

During the interviews, a definite split emerged between hospital customers who were committed to advancing energy efficiency and were undertaking multiple large scale projects (typically larger hospitals) and those who agreed that efficiency was important but felt that *it was hard to elevate it as a concern due to limited staff time* and other higher priorities. Multiple facilities pointed out that, with hospitals’ low margins, every dollar saved on utility bills is equivalent to a significant amount of new revenue. At least one facility staff member that raised this point felt that success in implementing energy efficiency at his hospital was in large part due to help he had from his PA in learning how to express this very attractive value proposition to the CFO using a business vocabulary. Multiple interviewees felt that the “language barrier” between facility engineers and CFOs was a significant obstacle, both at their hospital and more broadly in the sector. However, it was mostly reported that once senior management is sold on the benefits of EE, it becomes much easier to finance and implement projects. Projects that are expressed in the terms that CFOs use to evaluate the overall business such as total cost of ownership, net present value, and return on investment will have a much higher likelihood of receiving financial support and moving forwards.

The majority of interviewees gave high marks to current PA programs, calling the PAs “great partners.” However, one stated that the contractors designing their project did not fill out the paperwork required by the program,

making it a difficult burden for himself, and another felt that the electric and gas integration could be improved to create a more seamless experience. Further, a few of the interviewees who said that PAs were great partners also felt that the program focus was on large capital projects, while there was significant opportunity in no/low-cost operational projects as well.

Interviewees were largely enthusiastic about the idea of a partially funded Resource Conservation Manager, whose job it would be to focus on identifying and implementing efficiency measures (see discussion below), and especially operational efficiency measures. However, two of the six interviewees did not feel that approach could work in their hospital, even if the position was fully funded.

PROCESS

The concept for this study was introduced at the C&I Management Committee (CIMC) in the fall of 2013. A research group was formed consisting of representatives from the Consultant Team, the PAs, and the PAs' consultants.¹⁹ A work plan was developed and approved--after extensive input from the PAs--in late May 2014 (Appendix E). As outlined in the work plan, the group developed a set of criteria that would be used to identify potentially effective practices. The criteria were established through an iterative process which included PA input.

The Consultant Team provided the PAs with draft interview plans for review prior to implementing the interviews, and discussed PA comments and desired additions to the proposed interview guides. Edits were made to the interview guides based on PA comments, and the guides were finalized for obtaining input from PAs in other states, Massachusetts health care senior management, Massachusetts health care facility staff, and third party organizations. The interview guides are provided in Appendix F.

The PAs and the Consultant Team mutually established a list of EE programs from other jurisdictions that do a particularly good job reaching the health care sector. After input from both the PAs and the Consultant Team, this list consisted of PSE&G, Efficiency Vermont, NEEA, Centerpoint Energy, and Southern California Edison. The Consultant Team proceeded to reach out to program managers in each of these jurisdictions, and using the approved interview guide as a basis, spoke to each person about their respective program. The Consultant Team summarized each interview on the periodic joint teleconferences with the Health Care Best Practice Working Group, and provided opportunity for the PAs to clarify results and request additional information. The interviews allowed the team to establish a solid understanding of a variety of successful approaches to the health care industry. See Appendix C for more detailed descriptions of each of the programs examined. As approved in the work plan, individual elements from these programs were identified as potential best practices, to be ranked by the PA and Consultant Team.

A matrix was developed with rows being the elements identified as potential best practices and the columns as the agreed upon ranking criteria. The matrix included a column that identified which PAs use the practices and, after some feedback from the PAs, included a brief description of each program element. The original idea was that each person in the working group would rank the criteria, and that the resulting data would support a robust ranking process. The PAs decided to provide an aggregate ranking. In order not to unfairly bias the final ranking, the Consultant Team also aggregated their rankings into a single ranking for each element. For all ranked elements, the average PA and Consultant Team score was the final score.²⁰ Both the PAs and Consultants considered some elements as sub-sets of the MOU process and did not rank those elements. The original elements, original element descriptions, and rankings for the PAs, the Consultant Team, and aggregate rankings are included in Appendix B.

The rankings are based on the professional judgments of the working group which was comprised of PAs and consultants with substantial knowledge and expertise in the subject areas of both health care and EE program design. Explicit quantitative data relating to the identified elements was not available because these elements are components of larger energy efficiency programs and have not been separately evaluated. These rankings are intended to identify elements that merit further study and/or initial programs that could help determine cost-effectiveness before full implementation.

¹⁹ Team members include: Jennifer Chiodo and Cliff McDonald (Consultant Team); Dave Gibbons (NG), Nelson Medeiros (NU), Paul Giguere (CG), Sneha Sachar (NG), Tom Palma (Unitil), Erik Mellen (NU), Naomi Mermin, (PA Consultant), Doug Baston (PA Consultant),

²⁰ Three program elements were not scored by the PAs and 3 were not scored by one member of the consultant team. The reasons for not scoring elements was typically because those elements were seen as similar to or part of other elements. The PAs did not provide a ranking for one element

Further, interviews were conducted with seven Massachusetts stakeholders (six senior staff at hospitals and one non-profit organization that works with hospitals). These interviews proved very difficult to schedule, and over 15 different hospitals were contacted by email and phone before we were able to successfully schedule 6 calls. These interviews supplemented the information gathered in the PA program interviews by providing valuable insights into the specific needs and challenges of hospitals and health care facilities in Massachusetts, how effective current PA programs are in serving their needs, and what additional services may be helpful in achieving deeper savings and increased participation in the sector.

FINDINGS

Based on the research and rankings, the group identified the following programs elements that should be investigated for applicability in serving Massachusetts hospitals and potentially expanded to other health care institutions. The program elements below reflect the top six ranked elements based on the average scores (these reflect all of the top PA ranked elements) and additional elements that were ranked in the top 5 of by the consultants, but were ranked lower or not ranked by the PAs. Appendix B provides a full list of program elements and their scores.

Table 1 | Top Ranked Program Elements

Overall Rank	Element Description	Notes
1	Comprehensive support including audits, scoping, project management, and incentives	An MOU component with broader market potential
2	Focus on long-term, all encompassing strategic energy plans	MOU/SEMP for MA Large Hospitals
3	Provide cost sharing for a Resource Conservation Manager	
4	Educate facility managers on how to build a good business case	An MOU component with broader market potential
5	Outreach through ASHE type organizations	
6	Hire market specialists that focus on outreach to the healthcare sector	An MOU component with broader market potential
7	New construction initiative with aggressive EUI goals (60% reduction)	
2c	Work closely with affiliate organizations to get hospital executives to agree to a working group w/ shared energy goals	Consultants ranked 2nd overall; PAs did not score this element
3c	<i>Reduce</i> project paybacks by up to 7 years through higher incentives to overcome financial barriers	Consultants ranked 3rd overall; PAs ranked 11 of 17

The Massachusetts PAs include the MOU element (2) and the associated elements for the largest hospitals. The application of these practices varies between the PAs (NU and National Grid are the only PAs that currently employ the MOU/SEMP strategy.) The high ranking of these existing program elements reflects the quality of the current offerings for the largest health care customers in Massachusetts and the fact that those providing the ranking already know these elements are effective. The success of these elements was reinforced by the stakeholder interviews, in which the large hospitals had high accolades for the MOU approach.

This study indicates that there is potential to expand current best practices already in use in Massachusetts to reach more customers and to incorporate new practices. These practices are discussed in detail in the following section.

POTENTIAL HEALTH CARE SECTOR PROGRAM ELEMENTS

The following narrative discusses the top ranked elements and how they could be further expanded or incorporated into the existing Massachusetts customer retrofit program to better serve the Health care Sector. There are several steps that are required before final decisions can be made regarding program changes. These are discussed within the program element narratives below and in the *Next Steps* section following the program narrative.

Provide Comprehensive Support Including Audits, Scoping, Project Management, and Incentives

Commensurate with the best practice findings, the Massachusetts PAs provide a high level of support to their largest customers both for MOU participants and for large customers who are active but are not engaged in the MOU process. Extending similar levels of support to medium and small hospitals and extended care facilities will increase participation rates and help to improve the overall energy efficiency of the Massachusetts health care sector. As described earlier in the report, the interviews and the 2012 Massachusetts market profiles all indicate that health care facilities that are not large enough to have an account manager are not currently served as effectively as larger facilities. Most health care facilities with 24/7 occupancy are not good candidates for Project Expeditor vendors or the existing Direct Install program because of the complexity of systems, the high level of code requirements, and the limits on down time. These facilities require customized engineering-based services from providers with experience and expertise in health care design, operations and energy efficiency.

As is done in other jurisdictions, comprehensive support could be cost-effectively extended to facilities that are too small to merit the full MOU approach. This level of support would likely involve either a comprehensive audit or an audit at the facility with a specific scope so as to narrow the focus to a particular building system or activity that is causing trouble at the facility. This audit would identify specific opportunities as well as the associated project costs and projected savings. The PAs would then continue to work with the customer as needed to get the projects approved by senior management, sent out to bid, and implemented. As discussed below, this process would be very effectively supplemented by a cost-shared Resource Conservation Manager who can work as a champion for the projects, ensure that the projects are implemented correctly, and make sure the measures persist after installation.

Enhanced Memoranda of Understanding (MOUs)

National Grid and Northeast Utilities are currently using Memoranda of Understanding (MOUs) with their largest customers, including large hospitals in Massachusetts.²¹ An MOU is a multi-year plan for engagement between the PA and the health care facility with targets for both investments and resulting energy efficiency savings. The MOU approach provides a significant level of customer service including:

- Dedicated account representatives who are knowledgeable about hospital energy opportunities, decision making, and financing, both in general and at the specific customer organizations
- Significant consulting and engineering support (commensurate with the top ranked strategy)
- Communication with a “champion” within the organization to identify and implement efficiency upgrades
- Frequent customer engagement to fully understand and support institutions in addressing internal barriers and processes

Benefits to MOU customers include:

- Provides engineering staff with language that bridges the knowledge divide between departments such as providing language for engineering to use in communicating the benefits of energy efficiency to the CFO.
- Sets energy goals and provides the organization with a roadmap defining an orderly process towards those goals

²¹ National Grid refers to these as Strategic Energy Management Plans (SEMPs) which have been described as being consistent with MOUs. For ease of reading this study refers to both MOUs and SEMP as MOUs.

- Co-ordinates actions between the many decision-makers (facilities, doctors, senior management, IT, etc.) who affect resource use
- May commit hospitals to evaluating projects from a lifecycle cost perspective
- Encourages adoption of efficient standards for group purchasing contracts and routine equipment purchases
- Enables hospitals to set specific resource goals and hold staff accountable for achieving quantified goals
- Enables hospitals to holistically examine potential for other non-energy operational savings such as water, reduction of waste stream, and efficient processes for capital projects.

This is a similar approach as that used by the Northwestern Energy Efficiency Alliance (NEEA). NEEA is currently on track to have 40% of the region's hospital beds under hospitals with a strategic energy management plan (SEMP), an agreement similar to the MOUs in Massachusetts. NEEA places strong emphasis on a comprehensive SEM, impacting every area of hospital interactions including procurement practices, O&M, IT, and non-energy efficiency. The stakeholder interviews conducted with Massachusetts Hospitals indicate that the large hospitals are very pleased with the utility efficiency programs and the MOU approach. However, as noted earlier in the report, other health care institutions are not being served as well as the large facilities. This is largely due to the fact that MOUs are resource intensive for the PAs and require large facilities with significant savings potential for them to be cost effective.

As a result of this research, we recommend that the PAs explore the boundaries of customer size for which MOUs are appropriate. The PAs could set a similar goal as the NEEA initiative, which has achieved MOU/SEMP agreements for hospitals representing 40% of the beds in the region. This exploration could include increasing the number of large hospitals with MOUs, as well as piloting MOUs with mid-sized hospitals while tracking the cost/benefit for the expanded MOU health care customer base and the success rates of meeting the MOU commitments. Where MOUs are found not to be cost effective and/or not successful, the PAs will have the opportunity to identify and address specific barriers within the industry. One of the most important of these barriers for many health care facilities is internal staff resources. Therefore, in order for a more comprehensive approach to be successful with smaller or less well funded institutions, it will likely be critical to include some funding for an internal staff position at those hospitals as discussed below.

Provide Cost Sharing for a Resource Conservation Manager (RCM)

There was near universal agreement among the interviewed stakeholders that constraint on staff time is one of the biggest barriers to investing in energy efficiency. The RCM was ranked first by the Consultants and 5th by the PAs. The PAs are currently testing a similar approach for industrial customers.

The RCM is intended to address resource constraints of institutional staff. The day-to-day focus for hospital administrators and facility management staff is on patient needs, staffing, using lean processes, nursing units, operating room conditions, and more. Among all these more urgent matters, utility bills can just seem like noise, and longer-term lower priority efficiency projects often get delayed so more immediate needs can be addressed.

In order to deal with this issue, NEEA's health care program includes providing cost sharing for a Resource Conservation Manager (RCM). The RCM is an employee of the institution, but the program reimburses the organization for a portion of the salary.²² One major advantage of the RCM concept is that by funding a position that is responsible for delivering a committed level of energy savings (typically structured so that the funding is cost effective over a specified period), there is increased awareness and buy-in from senior management at the facility. The RCM is solely focused on identifying and implementing energy efficiency measures. A single RCM could potentially be shared among multiple smaller facilities, if their savings investment streams are not large enough to support a full time employee.

This concept was explored with the stakeholders during interviews and, with few exceptions the interviewees were very enthusiastic about the prospect. One stakeholder noted that many hospitals already understand grant-funded positions, where outside foundations fund positions within the hospital to achieve specific goals. These positions often have specific quarterly or annual metrics that the employee has to meet. The RCM proposal would

²² NEEA typically covers around 50% of the salary, but other arrangements can be made, such as providing a guarantee that would compensate the hospital if the value of energy savings are less than the costs of the RCM position.

fit nicely into this existing system, and would have similar metrics relating to energy savings. Other stakeholders mentioned that this could achieve significant O&M savings, which most interviewees thought were being largely overlooked as efficiency opportunities, both by health care facility managers and by the structure of the utility programs.

A next step for implementing Resource Conservation Managers could be to work with a select number of large or moderately sized hospitals that are interested, in order to establish the details such as salary, cost share, job title, and performance metrics. The position could then be tested at that hospital and, if successful, expanded to more Massachusetts facilities.

Educate Facility Managers on How to Build a Good Business Case

The MA PAs have been successful working with management at the larger hospitals to develop a deeper understanding of the financial decision making criteria within the institution and assisting the facilities managers in aligning energy efficiency investments with the investment criteria and timelines of the hospital. While this strategy is currently closely linked with the deeper relationships the PAs have with the largest customers in MA, this type of education in pitching energy efficiency within the organization could assist smaller institutions in advancing projects.

Outreach through ASHE and Other Industry Organizations

This refers to marketing efforts through presentations of discrete topics to the American Society of Healthcare Engineering (ASHE), State Hospital Associations, and other industry groups. This is done by other PAs interviewed, and particular NEEA who used it to market efficiency to smaller hospitals that were not developing MOUs through the program. The outreach took the form of programming and educational activities through Societies of Healthcare Engineering and state hospital associations. Programming could range from discrete efficiency topics such as benchmarking, strategic energy management, commissioning, lighting for hospitals, etc, to general background on the utility EE offerings. Ideally, this outreach would be geared to senior leadership groups, who are often hard to access, but that do often attend these industry meetings.

Hire Market Specialists Who Focus on Healthcare

Again the MA PAs already implement this approach with their large MOU customers. NU in particular segments the market by industry and ensures the account management personnel assigned within the sector has the depth of knowledge necessary to build trust and relationships with individuals and institutions. Because of the size, age and energy loads at hospitals, it is important to look across the market to identify what resources are needed to bring all MA hospitals up to their optimum energy efficiency. This not only includes knowledgeable account managers and PA implementation staff, but also includes the TA providers, engineering design firms, commissioning providers and others that are engaged with these institutions on a regular basis and have the opportunity to increase energy efficiency with each interaction.

Work Closely with Affiliate Organizations and Hospitals

Another similar program element is to work closely with other affiliate organizations. The EEAC Consultant Team ranked this element 2nd, but the PAs did not rank it all, due to a belief that senior management would not have the bandwidth to attend such a working group and that it would not be useful if only facility engineers were involved.²³ This is avoided in Vermont and other jurisdictions by only having senior management attend one meeting and then appoint a champion to continue representing the hospital in the working group, with explicit buy-in from senior management and some authority to implement changes.

Health care advocacy groups such as Health Care Without Harm, Practice GreenHealth and their Healthy Hospitals Initiative (HHI) have objectives that are well aligned with the PA goals. All entities are engaged in reducing energy use in hospitals. The existing strong relationship between HHI and Efficiency Vermont has been expanded to Massachusetts, with Vermont Energy Investment Corporation (the contracting firm for Efficiency Vermont) currently providing energy benchmarking for the 65 Massachusetts hospitals currently enrolled in HHI's "Leaner Energy Challenge". In Vermont, this benchmark data are used to help the state legislature and hospital oversight boards understand the need for investment in health care infrastructure, to help hospitals see what can

²³ This is a realistic concern given that the Consultants attempted to interview some members of Sr. Management for MA hospitals and were unable to schedule any calls. However, as noted above, a single high level meeting, which might include Utility Sr. Management and Sr. Government officials could help to foster an increased commitment to energy efficiency across the sector.

be achieved through continuous improvement of efficiency and operations, and to plan for longer term strategies to serve all of the hospitals in the state. The data being collected in Massachusetts could be put to the same use.

Another approach used in Vermont is to develop a working group across hospitals focused on bettering energy performance that includes the Vermont PAs. This is very similar to the HHI work in MA except for the PA engagement. High level PA engagement could start with a kick-off meeting attended by senior staff and facility staff, utility representatives, and even clinicians. The management presence at the kick-off meeting provides buy-in, and allows the process to continue through pre-scheduled follow-ups without their close engagement. In Vermont, the PA is even trying to create a revolving financing fund with financing from the PA as well as local community banks specifically designed for efficiency projects at health care facilities. This will address the barrier that the smaller hospitals raised in the interviews that they have a limited capital budget, and patient care projects typically take priority over energy savings projects. Further, this collaboration will create a set of shared goals and shared technical resources that will motivate the hospitals to achieve deep savings in their facilities.²⁴

Higher Incentives

The Consultants ranked this element 3rd while the PAs ranked it 11th. The Consultants see this approach as critical for advancing energy efficiency in smaller, capital constrained institutions. The PAs do already employ negotiated incentives which may provide similar benefits. However, an articulated strategy such as this can help to minimize cream skimming and encourage whole system approaches to energy efficiency.

New Jersey's Public Service Electric and Gas Company (PSE&G) program for the health care sector addresses non-financial barriers and achieves significant participation by essentially making the incentive generous enough that the hospital feels like it has to take advantage of the opportunity. PSE&G will fund a free investment grade audit at a health care facility. Any project identified in this audit with a simple payback of 15 years or less will be eligible for an incentive designed to buy the payback down by 7 years (to a minimum of 2 years) and finance the remaining balance at a 0% interest rate. Typically, the incentive is large enough to cover ~65%-70% of the project cost, with the remainder financed by a three-year loan. It is no surprise that with such generous incentives participation is high and hospitals elect to go for deep savings, in the 25-35% range. Further, word about the deal spread quickly among hospitals in the state, and besides some initial outreach, no marketing was needed to promote the program.

Higher incentives should be cost-effective in Massachusetts, since incentive size does not impact the cost-benefit ratio from the Total Resource Cost test. However, Massachusetts utilities have to evaluate how much any increase in incentive would impact the average cost per unit of energy saved, and weigh it against the expected increase in savings (both breadth and depth). The PAs could potentially use this program element exclusively for smaller health care facilities, as a way of compensating for the fact that they are not eligible for the MOU approach and to better address this segment that is currently underserved. In fact, higher incentives are likely to be more effective at encouraging efficiency projects at small and mid-sized facilities, as these facilities tend to have more trouble accessing financing than their larger counterparts, and efficiency projects and life-safety projects tend to compete for the same pool of capital funds in this segment.

New Construction Initiative

A new construction initiative was ranked seventh overall. We did not include this in the table of elements, however, because there are not many hospitals currently being built in Massachusetts, and it is therefore a lower priority than improving efficiency offerings to existing facilities. However, since integrated design of new hospitals can achieve deeper savings at lower cost than existing facility retrofits, it is worth considering as a potential initiative within the broader New Construction program.

In conjunction with the University of Washington, NEEA has been funding research into an initiative called Targeting 100.²⁵ Targeting 100 aims to develop a set of integrated design elements and methods that combine to reduce the Energy Use Intensity (EUI) of a newly built hospital to 100 kBtu per square foot, compared to an existing average of 250 kBtu per square foot – a 60% reduction. In future years, the initiative will target even deeper savings, with a goal of eventually building “net-zero” hospitals by 2030.

In July 2009, a hospital in Seattle decided it wanted to achieve significant efficiency in a greenfield facility it was

²⁴ One possible tool to track these goals is GRITS. See the website for more information: <http://greenbillion.org/grits/>

²⁵ <http://www.integrateddesignlab.com/Seattle/t100/>

building, including 353,000 square feet of acute care, 200,000 square feet of medical offices, and a standalone central utility plant.²⁶ The acute care section contains 175 beds, putting it in the medium-to-small category. Working with NEEA, and using the roadmap being developed by Targeting 100, the owner designed its hospital with the goal of achieving an EUI of 150 kBtu per square foot. The hospital was completed in 2011, requiring about one year less for design and construction than a typical project of similar magnitude, and the facility has achieved an actual measured EUI of 110 kBtu per sf.

The experience of this hospital provides compelling evidence that for new, independent hospital buildings (which admittedly are rare in Massachusetts), the integrated design approach targeting 100 kBtu/sf creates much deeper savings than are achieved using more traditional design. In a new high acute care facility in the Northeast being served by an existing central plant, this approach is resulting in significant reduction in the load for the proposed building, with the project coming in at around 200 kBtu/sf. The PAs should be familiar with the Targeting 100 approach and work with Massachusetts hospitals developing new buildings to explore the limits of energy efficiency in hospital new construction.

HOSPITAL RETRO-COMMISSIONING

While hospital retro-commissioning was not a focus of this study, it emerged in the discussion of the Retro-commissioning Best Practice Study²⁷ with hospitals seen as having significant retro-commissioning opportunities. The in-depth system investigation associated with high quality retro-commissioning can deliver significant energy savings and improve pressure relationships and compliance with health care standards. The measures identified in these studies typically include low/no cost improvements to sequences of operation and building control repairs with 3–9 month simple paybacks and short measure lives, moderate investments such as variable speed drives and addition of new control points which have longer measure lives and paybacks of 1–3 years and capital improvement such as replacement of legacy controls and aging equipment which typically require capital investments of \$500k-\$5million and can have paybacks from 3-9 years. The MA PAs are working toward increasing the use of retro-commissioning services in MA hospitals and this is likely to be beneficial for the PAs and the participant hospitals if it is undertaken using the effective practices detailed in Retro-commissioning study.

NEXT STEPS

There steps necessary to support the enhancement and expansion of existing Massachusetts health care energy services include expansion of existing successful practices to more PAs and more customers. This may require some standardization, PA-to-PA training and additional staffing resources (contracted or hired). As with all program changes the PAs will first examine cost effectiveness. Given the highly cost effective savings the PAs are currently achieving with their largest health care clients, incremental expansion of proven MA program elements should be able to be undertaken with minimal analysis. Ongoing monitoring should be conducted by the PAs to ensure the savings for the mid-sized hospitals are adequate to support the increased investment of resources in those institutions.

While this study focuses on hospitals, but more generally refers to the health care sector. Certainly not all elements are applicable across the sector and there is more likelihood that elements described herein would be cost effective when used for large extended care facilities than for smaller medical office buildings. The PAs have the sophistication to assess the appropriate boundaries for these strategies – expanding first to all hospitals in MA and then to the largest extended care facilities and working methodically across the spectrum of facility sizes.

The next steps include:

1. PAs identify which program elements they plan to investigate for adoption/expansion and if there are elements they do not plan to undertake, indicate the rationale for not undertaking those elements.
2. The PAs should specifically articulate how they intend to maximize energy efficiency in hospitals that are not being served under MOU/SEMPs.
3. Determine the research, expansion and roll-out plan and schedule for program elements selected for expansion/adoption.

²⁶ See: <http://tc68.ashraetcs.org/pdf/2013JuneAwardHospital.pdf>

²⁷ http://ma-eeac.org/wordpress/wp-content/uploads/EEAC_CT_RetroCommissioningBestPracticesStudy.pdf

CONCLUSION

The PAs have a strong track record for success in advancing energy efficiency with the largest hospitals in MA. Even so, significant energy efficiency opportunities remain; expanding existing effective strategies and adopting new approaches to overcoming institutional and market barriers in the health care sector will help the Massachusetts PAs increase savings in the C&I sector. The top three ranked items will be particularly effective in increasing PA efficiency savings in the health care sector, namely:

- **Comprehensive support including audits, scoping, project management, and incentives.** This would ideally be geared towards medium sized facilities who are not large enough for MOUs or account management.
- **An enhanced and expanded approach to Memoranda of Understanding.**²⁸ This could involve expanding current MOUs to more comprehensively address energy usage or extending the MOUs in a tightly controlled manner to customers who are currently not eligible.
- **Cost sharing between PAs and customers for a Resource Conservation Manager (RCM).** An RCM would be an employee of the hospital whose job it would be to identify and implement energy savings measures, with a focus on low- and no- cost measures. This could be a significant aid in achieving the significant operational savings available in the health care sector.

In addition, as reported by the large customers, addressing lower cost non-capital measures such as retro-commissioning is desired by the stakeholders and provides a good opportunity to advance the approaches detailed in the Retro-commissioning Study.²⁹

In conclusion, while the current PA approach is generally successful in achieving savings for the largest health care customers, enhancing the existing offerings by implementing the recommendations outlined in this report could successfully address gaps in the current program and significantly increase savings from the health care sector.

²⁸ Currently in place for largest electric customers served by National Grid and Northeast Utilities

²⁹ MA EEAC Consultant Team. Retro-commissioning Best Practice Study. May 28, 2014.

APPENDIX A: BEST PRACTICE CRITERIA

The research group agreed to establish a list of criteria that would be used to identify best practices. The following are the final criteria used to identify best practices. A weight was applied to the scores (shown in parentheses); the PAs and Consultants developed the criteria and weights in collaboration.

The following are the criteria used for the final ranking:

- Achieves deep savings (1)
- Achieves broad participation (1)
- Works toward market transformation (0.5)
- Minimizes cost of savings over time (0.5)
- Establishes good long term relations with customer (0.9)
- Addresses non-financial barriers (1)
- Increases savings persistence (0.7)

APPENDIX B: PROGRAM ELEMENTS

This Appendix provides the combined scores and overall rank for the elements with PA non-ranked items (zero scores) included in the average.³⁰

Element Description	Averages including PA non-rank = 0	Rank - PA zeros in average	Notes
Comprehensive support including audits, scoping, project management, and incentives	19.5	1	An MOU component with broader market potential
Focus on long-term, all encompassing strategic energy plans	18.0	2	MOU/SEMP for MA Large Hospitals
Provide cost sharing for a Resource Conservation Manager	16.9	3	
Educate facility managers on how to build a good business case	16.2	4	An MOU component with broader market potential
Outreach through ASHE type organizations	16.2	5	
Hire market specialists that focus on outreach to the healthcare sector	15.5	6	An MOU component with broader market potential
New construction initiative with aggressive EUI goals (60% reduction)	13.6	7	
Reduce project paybacks by up to 7 years through higher incentives to overcome financial barriers	12.1	8	Consultants ranked 3rd overall; PAs ranked 11 of 17
Significant one on one time with each hospital to get to know internal processes	11.1	9	
Offer free comprehensive audits with EQuest energy models to develop measures, savings, and budgets	10.6	10	
Offer free direct install of lighting and occ sensors if hospital does other measures	10.5	11	
On-bill, 0% interest financing for portion of projects not covered by incentive	10.2	12	
Set up a revolving loan fund in partnership with local financial institutions, as a source of funding solely for EE improvements	9.8	13	
Work closely with affiliate organizations to get hospital executives to agree to a working group w/ shared energy goals	9.6	14	Consultants ranked 2nd overall; PAs did not score this element
Free investment grade audits	9.1	15	
Provide significant consulting and technical support for strategic energy plans	8.5	16	Roll into MOU
Identify and work with a champion from within the organization	-	17	

³⁰ The rankings were scored on a 1-5 scale. Zero indicates that the item was simply not ranked.

APPENDIX C: HEALTH CARE PROGRAMS IN OTHER JURISDICTIONS

This section describes the health care programs in the other jurisdictions examined in the report, based on the interviews performed as part of this report.

Northwest Energy Efficiency Alliance (NEEA)

The NEEA health care program has been in place since 2004, and focuses on market transformation. NEEA's market thesis was that health care facilities would take advantage of utility incentives when it aligned with a planned project, but there was no comprehensive attempt on tracking and improving overall energy performance. With this initiative, NEEA hoped to make the process for improving energy use more systematic as opposed to episodic. Note that while this is exclusively a market transformation program, the utilities in the region also run more standard incentive programs.

As part of the initiative, four market specialists in Northwest States were hired, focusing exclusively on larger health care facilities. The market specialist's role was to work their way into large health care organizations and work them to develop strategic energy plans. Getting the plan approved involved finding a champion within the organization to actively push for increased efficiency, getting buy-in from senior management, and putting in one-on-one time with each hospital in order to identify the specific organizational structure and barriers to efficiency. The plans are ambitious and all-encompassing, attempting to reach every department that impacts energy usage, including IT, O&M, procurement, nursing, etc.

In addition to significant support developing the plan, NEEA provided technical assistance and scoping work, with a particular focus on O&M based improvements. Skilled engineers would examine current O&M process and recommend changes in order to improve energy performance. In some cases, they would provide cost sharing for a Resource Conservation Manager (RCM), an employee of the hospital with a sole focus on finding and implementing EE measures, and especially O&M measures. NEEA would typically cover around 50% of the RCM's salary.

Since the Strategic Energy Management Plans are meant only for the larger hospitals, NEEA also performs a broader education and outreach program across the market. This involves a lot of work with the American Society of Health Care Engineering (ASHE) to coordinate programming and educational activities through SHE organizations. These activities were largely focused on discrete topics, such as benchmarking, commissioning, and Strategic Energy Management Plans. The marketing efforts focused as much as possible on senior leadership groups.

Finally, the NEEA program included a new construction initiative that worked with new hospitals to build according to the template set by Targeting 100, which develops prototype design options for new construction hospitals that, together, could achieve a target energy use intensity of 100 kBtu/sf. This compares to a typical hospital energy use intensity of 200-220 kBtu/sf. The program has dealt with one new construction hospital through this initiative, that is running at an energy use intensity of 110 kBtu/sf.

Public Service Electric & Gas (PSE&G)

The PSE&G health care program combines free comprehensive energy audits with very generous incentives and financing terms. First, an engineering company will perform an audit, and sit down and review the results with the customer. If the customer is interested in going forward, the engineering company will create the design and bid ready documents at no cost to the customer. If desired, program staff will also assist the customer in reviewing the bids as they come in. If the project is still good, an incentive is provided that is designed to buy the payback down by 7 years (for example, if the project has a 10 year payback before the incentive, it will have a 3 year payback after the incentive). The incentive cannot buy the payback to under two years. This incentive typically amounts to 65-70% of the installed cost of the project. PSE&G will then finance the portion of the project cost not covered by the incentive with on-bill financing at a 0% interest rate. Both electric and gas projects are eligible, even if the customer only buys electricity from PSE&G.

Any 24 hour health care facility is eligible for the program, with no size limit in place. At first mostly hospitals participated, but they are now starting to do more long-term care facility. Project costs have ranged from \$300,000 to \$12 million, and have included everything from lighting to O&M fixes to chiller and boiler plant replacements. A

typical hospital will achieve from 25-35% savings after participating in the program. Word of the program spread extremely quickly among NJ health care facilities, and very minimal marketing effort was needed. Current program funds are now fully committed, but new funding is expected to be approved by 2015.

Southern California Edison (SCE)

SCE's health care program consists of comprehensive site audits resulting in a list of potential projects, as well as an EQuest model of the facility used to estimate savings. Once the audit is performed, incentives are determined depending on measure type, with lighting on the low side with only \$0.03 per kWh, but most other projects averaging around \$0.07-\$0.09 per kWh. The audits try and focus on low- and no-cost measures with paybacks of no more than 3 years. Marketing for the program is done through account managers and contractors that are working with the program. As yet, there has been no problem in filling the pipeline with projects. Projects are varied and include lots of VFDs, chiller upgrades, CAV to VAV conversion, controls, etc.

In recognition that smaller facilities were not being served as effectively as larger customers, SCE has recently implemented a direct install plus program aimed at small and medium sized facilities, called the Healthcare Innovative Technology Program (HITP). Under this program, if a health care facility installs a non-lighting measure, it also receives free direct install of efficient lighting with occupancy sensors. This is designed to encourage smaller facilities to do comprehensive projects that go beyond lighting.

Efficiency Vermont (EVT)

EVT, in partnership with the Vermont Association of Hospitals and Health Systems and the Healthier Hospitals Initiative, is in the process of launching an efficiency program for the health care sector. While the program is not yet fully launched or designed, EVT has performed extensive market research in order to achieve a full understanding of factors such as:

- A full accounting of the barriers
- Benchmarking and a complete understanding of the building performance baseline
- Perceptions of EE in hospitals
- Financial restrictions in terms of debt service and access to capital
- Hospital priorities mission and sense of identity of hospital in relationship to the community.

As this research was performed, it identified several key barriers. One of the important ones is that hospital budgets in Vermont are evaluator through a regulator, with a limit on capital spending. In this scenario, EE projects are competing with health technology and customer service products, a competition that the EE spending typically loses. As a result, EVT is working on developing an acceptable source of capital with a wide variety of stakeholder support (local banks, foundations, local philanthropic organizations, etc) that would be used as a revolving loan fund explicitly for EE projects in Vermont hospitals. This approach has been highly successful in Vermont for the education sub-sector. EVT is not yet sure if they will also provide an incentive in addition to the low-interest loan from the revolving loan fund.

As of now, only phase one has been rolled out. This phase involved jointly engaging the hospitals in the state with the Healthier Hospital Initiative. All Vermont hospital CEOs have agreed to join the initiative. This started with a symposium on 6 points related to healthier hospitals. During this symposium, the CEOs delegated different contacts for each of the 6 points, who continued attending symposiums as well as creating baseline data and goals relating to the 6 points. At the end of the phase, each hospital had an energy action plan, including benchmarking, help with audits, saving goals, and agreements to track the plans' progress towards the goal.

Centerpoint Energy

Centerpoint's health care program is also very new – last year was the inaugural year for the program. It was originally aimed for small hospitals of 300 beds and less, and was created because the program administrators noticed that these hospitals were not participating in the standard incentive program. The size limit was chosen because it was believed that the larger hospitals had their own engineering staff that could look after the Hospitals' EE needs, but Centerpoint has decided to eliminate the size requirement for the program's second year of operations.

The program process starts by specialized marketing person aggressively reaching out to health care facilities to

schedule one on one meetings with management. So far, there has been no trouble scheduling meetings, as the Centerpoint name carries a lot of weight. From there, if the facility agrees to participate, Centerpoint provides a comprehensive assessment at no cost from an engineering firm. This firm will prepare a report and present the findings to the customer. Once the audit identifies the measures, the health care facility can get incentives equivalent to those of the standard incentive program offered to other C&I customers. However, there are no requirements to implement the recommendations from the report, and it is too early to tell how many customers end up implementing, since it's only the second program year, and most health care projects span multiple years. The feedback from clients so far is that the audit report often turns on light bulbs in facility staff heads, as it confirms things that were suspected for a while, and provides neutral third party ammunition that they can take to senior management to get projects approved. The program applies to the entire health care sub-sector, and has had participants ranging from dialysis clinics, senior care, clinics, laboratories, hospitals, and medical office buildings. They see a wide range of measures, including RTUs, LEDs, chillers, and controls.

APPENDIX D: LIST OF DISPROPORTIONATE SHARE HOSPITALS

This Appendix contains a list of Disproportionate Share Hospitals in Massachusetts. As described in the report, Disproportionate Share Hospitals (DSH) are hospitals receiving 63% or more of gross patient service charges from Medicare, Medicaid, other government payers, and the Health Safety Net. DSHs typically have a lower margin than standard hospitals, and thus may merit particular attention from the Massachusetts PAs.

	Hospital	DSH %
1	Athol Memorial Hospital	72%
2	Baystate Franklin Medical Center	68%
3	Baystate Medical Center	68%
4	Berkshire Medical Center	69%
5	Boston Medical Center	77%
6	Cambridge Health Alliance	74%
7	Cape Cod Hospital	71%
8	Clinton Hospital	67%
9	Fairview Hospital	66%
10	Falmouth Hospital	68%
11	Harrington Memorial Hospital	65%
12	HealthAlliance Hospitals, Inc.	66%
13	Heywood Hospital	64%
14	Holyoke Hospital	76%
15	Lawrence General Hospital	71%
16	Marlborough Hospital	63%
17	Martha's Vineyard Hospital	65%
18	Mercy Hospital	75%
19	Merrimack Valley Hospital	73%
20	Morton Hospital	66%
21	Noble Hospital	66%
22	North Shore Medical Center	71%
23	Quincy Hospital	69%
24	Saint Vincent Hospital	65%

25	Signature Healthcare Brockton Hospital	69%
26	Southcoast Health Systems	71%
27	Steward Carney Hospital, Inc.	73%
28	Steward Good Samaritan Medical Center	67%
29	Steward Holy Family Hospital	65%
30	Steward Saint Anne's Hospital	68%
31	Steward St. Elizabeth's Medical Center	63%
32	Sturdy Memorial Hospital	63%
33	UMMC	64%
34	Wing Memorial Hospital	71%

APPENDIX E: APPROVED WORK PLAN

Research Objectives

1. Develop a clear understanding of the health care market, including its component entities, technical areas for greatest energy savings and unique ownership, management and financing structures that may influence program design and implementation success.
2. Review energy efficiency programs across the nation, including the Massachusetts programs, effectively serving health care customers, for best practices in achieving broad health care sector participation and depth of savings.
3. Identify the specific program design and technical efficiency solutions in these programs that are demonstrated to achieve efficiency savings and benefits.
4. Assess the current deployment of best practices in Massachusetts and the applicability and practicality of best practices not already deployed for consideration in PA programs in Massachusetts.

Market

- IN STUDY
 - Acute care hospitals (primary focus of research)
 - Facilities owned by health care organizations including MOB, clinics, extended care (secondary focus of research)
 - Extended care facilities (tertiary focus)
- NOT IN STUDY
 - Leased MOBs are not directly included here as addressing issues with leasing structures and the split incentives is likely to be done under the CRE WG
 - HC laboratories are not directly included here because the technical issues for labs are unique and are more similar to the laboratory building type. HCWH is advancing laboratory best practices through direct PA education.

Study Process

1. Conduct market research –
 - a. Literature review on health care EE, impacts of Affordable Care Act on HC, etc.
 - b. Interviews with market actors including trade orgs, end users and service providers to increase understanding of the HC ops and issues specific to the MA market
 - c. Obtain data from the PAs about the quantity of HC customers, their sizes and loads
2. Conduct program research –
 - a. Develop a solid understanding of the MA PA approach(es) to the HC market
 - b. Identify 3-4 programs of interest and conduct in-depth interviews with program administrators to identify the effective practices used by those programs to address the HC market
 - c. Document effective HC market EE practices in the BP Ranking Matrix
3. Rank Effective HC Program Practices to ID Best Practices
 - a. Identify best practice criteria (BPC) – these will be program elements that address the driving market barriers and those that contribute most effectively to PA and MA goals. There will be a separate list of BPC for each of the three building types though substantial overlap is expected. Process for this:
 - i. Develop list of market barriers (draft list complete – additional PA input welcomed at any time in next week or so)

- ii. EEACC draft list of BP Criteria
 - iii. PA Team review and proposed edits to BP Criteria
 - iv. Finalize and group draft criteria
 - v. Rank draft criteria
 - b. Set up BP Ranking tool
 - c. Refine the list of practices and review with HCBP WG
 - d. WG members score practices independently
 - e. Compile and review scores
- 4. BP report
 - a. Draft Report
 - b. Review and feedback
 - c. Present findings to CIMC
 - d. Finalize report

APPENDIX F: APPROVED INTERVIEW GUIDES

Interview Guide for Healthcare Facility Staff:

Intro: Name and org.

Thank you for taking the time to speak with me. I'm calling on behalf of the Massachusetts Energy Efficiency Advisory Council and Program Administrators. We are conducting research into the most effective ways to improve energy efficiency in the health care sector and want to learn more about your organization's needs and objectives.

We estimate that this interview will take approximately 20 minutes.

1. What are the most pressing challenges to your institution? How do you measure progress towards dealing with these challenges?
 - a. What metrics most concern you in your day-to-day business?
 - b. How much does energy usage impact these metrics/challenges?
2. Hospital HVAC systems provide the ventilation and comfort levels necessary for institutional operation.
 - a. What are the most important criteria of the HVAC system (reliability, air quality, comfort, etc)?
 - b. Can you tell us about the HVAC systems in your hospitals and how well they meet those criteria?
 - c. For systems that are in need of improvement, what services or support would be most helpful to the hospital in advancing those projects?
3. There is an increasing body of research regarding the impacts of light on health. While these studies have yet to identify an evidence based solution in detail, they indicate that there are some aspects of light that directly affects circadian rhythms, sleep cycles and health. Are you familiar with this research?
 - a. If yes – have you introduced any strategies to improve lighting quality that was driven by this type of information?
 - b. If yes – can you tell me what you've done and the results?
 - c. If no – is this an area that you would be interested in learning more about? (examples include: low level night light in corridors, increased control of patient room lighting, use of amber night lights)
4. Can you tell us about your project development cycle for infrastructure upgrades?
 - a. What is the timeframe on the project cycle?
 - b. What criteria are used in selecting new and replacement equipment (first cost? Lifetime cost? Reliability?)?
 - c. What criteria are most important in determining what projects get funding?
 - d. What is the process to go from identifying a potential efficiency/infrastructure project to getting approval from management?
5. How significant are energy costs in the context of running the hospital?
 - a. What % of non-personnel costs come from energy?
 - b. Is there a large focus on reducing energy costs during day-to-day operation of the facility?
6. Does your organization have any sustainability or environmental goals?
 - a. If yes, can you tell me whether those goals impact energy related decisions?
7. Have you ever worked with the MA utility sponsored energy efficiency programs?
 - a. If no, why not? Are there specific changes or additions that could be made to the program that would make you more likely to work with it?
 - b. If yes, how was the experience?
 - i. Did the program successfully help the facility address your priorities and barriers when involved with the facility upgrade?
 - ii. Would you work with them again in the future?
 - iii. Do you have any specific areas where the energy efficiency providers can change their approach to increase adoption of energy efficiency at your site?

8. Is there anything you'd like to tell me about opportunities for increased energy efficiency at your facilities that we have not yet discussed?

Interview Guide for Healthcare Management

Intro: Name and org.

Thank you for taking the time to speak with me. I'm calling on behalf of the Massachusetts Energy Efficiency Advisory Council and Program Administrators. We are conducting research into the most effective ways to improve energy efficiency in the health care sector and want to learn more about your organization's needs and objectives.

We estimate that this interview will take approximately 20 minutes.

1. What are the most pressing challenges to your institution? How do you measure progress towards dealing with these challenges?
 - a. Do you foresee the need for changes to building infrastructure to improve institutional results relative to these metrics?
 - b. How much does energy usage impact these metrics/challenges?
2. Can you tell us about your project development cycle for infrastructure upgrades?
 - a. What is the timeframe on the project cycle?
 - b. What criteria are used in selecting new and replacement equipment (first cost? Lifetime cost? Reliability?)?
 - c. What criteria are most important in determining what capital projects get funding?
 - d. How are efficiency projects typically identified? What is the process to get from identification to implementation?
3. How significant are energy costs in the context of running the hospital?
 - a. What % of non-personnel costs come from energy?
 - b. Is there a large focus on reducing energy costs during day-to-day operation?
4. Does your organization have any sustainability or environmental goals?
 - a. If yes: can you tell me whether those goals impact energy related decisions?
5. Have you ever worked with the MA utility sponsored energy efficiency programs?
 - a. If no, why not? Are there specific changes or additions that could be made to the program that would make you more likely to work with it?
 - b. If yes, how was the experience?
 - i. Did the program successfully help the facility address your priorities and barriers when involved with the facility upgrade?
 - ii. Would you work with them again in the future?
 - iii. Do you have any specific areas where the energy efficiency providers can change their approach to increase adoption of energy efficiency at your site?
6. Is there anything you'd like to tell me about opportunities for increased energy efficiency at your facilities that we have not yet discussed?

Interview Guide for Healthcare Affiliate Organizations:

Intro: Name and business. Thank you for taking the time to speak with me. I'm calling on behalf of the Massachusetts Energy Efficiency Advisory Council and Program Administrators. We are conducting research into the most effective ways to improve energy efficiency in the health care sector and want to learn more about your program.

We estimate that this interview will take approximately 30 minutes.

1. Would you please tell me about your organization and membership?
2. What are the primary drivers in your work with your membership?
3. Tell me about your role in helping your members increase their energy efficiency?
4. What are the key drivers that increase the adoption rate for energy efficiency improvements?
5. What barriers to energy efficiency do you see as the most challenging to address?
6. Have you found effective solutions to overcoming those barriers?
7. If yes – can you tell me about the solutions, where they have been used and how successful they were at addressing the targeted barrier(s)?
8. As you look to the future of health care, what opportunities do you see to reduce the energy intensity of the industry?
9. Can you tell me about how you have interacted with the Utility energy efficiency programs in the past? What has been the outcome of those interactions?
10. Is there anything you'd like to tell me about opportunities for increasing energy efficiency at your members' facilities that we have not yet discussed?

Interview Guide for Healthcare Program Administrators:

1. Please give an overview of your health care efficiency program?
 - a. What is the process from intake to completions?
 - b. What services do you offer?
 - c. How are potential projects identified and recruited?
 - d. What are the key roles and responsibilities of the individuals and companies involved in a project?
2. What are the most common measures installed in health care facilities through your program?
3. What kind of training/education/awareness activities has the program undertaken? Have you found these to be effective?
4. In your experience, what are the key barriers to efficiency investment for facilities in the health care sector?
 - a. What does the program do to address these barriers?
 - b. Is there anything else that could be done?
5. Has your program been effective in achieving strong participation?
 - a. Can you provide data on participation rates relative to market size?
 - b. Do you often get repeat jobs from the same customers?
6. Have there been any formal or informal evaluations on the programs? Can you share them with us?
7. What program features have been most important at increasing savings depth at individual customer sites? What about increasing participation to a wide range of participants?
8. Are there any areas where you are looking to improve your program relative to participant experience and savings?
9. Are there aspects of the program that work towards market transformation in the health care sector?
 - a. Are there program aspects that aim to reduce the cost per kwh saved?
10. Is there anything we haven't discussed that you'd recommend to the MA PAs to consider as an effective method for achieving saving in the health care sector?

APPENDIX G: LIST OF COMPLETED INTERVIEWEES

PAs from Other Jurisdictions

1. David Dzierski, Program Manager at Centerpoint Energy
2. Katie Wilson, Willdan. Principle Program Manager for SCE health care energy efficiency program
3. Richard Donnelly, Strategic Planning Manager, Institutions. Efficiency Vermont.
4. Stan Price, Principal at Putnam Price Group. Primary contractor for NEEA health care initiative.
5. John Senkewicz, Manager – Energy Services. PSE&G.

Hospital Staff and Affiliate Organizations

6. Chai Srisirikul, Director of Facilities and Engineering, Partners Health Care.
7. Michael Grimmer, VP of Services and COO. Heywood and Athol.
8. Bob Biggio, VP of Facilities and Support Services. Boston Medical Center
9. John Lombardi, Director of Facilities. Cooley Dickenson Hospital.
10. Angelo Aglieco, Energy Manager. VA Medical Center.
11. Thomas Hodovanec, Facilities Manager. Mercy Hospital.
12. Paul Lipke, Senior Advisor. Health Care Without Harm.