

# THE WHO, WHAT, WHERE, WHEN, WHY AND “HOW-TO”S OF DEVELOPING A RETRO-COMMISSIONING PROGRAM

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## Introduction

NSTAR is currently in the process of designing a retro-commissioning<sup>a</sup> program. Through background research on similar programs throughout the country, market research with their customers, depth interviews with commissioning providers, and an upcoming market characterization study, NSTAR is developing an actionable plan for implementing a full-scale retro-commissioning program in 2004. At the same time, NSTAR is currently offering a small-scale pilot program to “test the waters”.

Based on the trials and tribulations of retro-commissioning programs across the country, this paper provides ideas and experiences for designing and marketing a retro-commissioning program. Over the past few years, retro-commissioning has gained increasing attention in the energy efficiency program community as a tool to increase the realization and persistence of energy savings. Despite this trend, there are still many challenges in designing and implementing an effective program.

In this paper, NSTAR shares their findings on the retro-commissioning market, and presents their suggestions on “how to” develop a retro-commissioning program based on this initial research. Additional research is planned that is not included in this paper but will be used in the ultimate design of the program once it becomes available.

## Background and Methodology

NSTAR is the parent company of Boston Edison, Commonwealth Electric, Cambridge Electric and NSTAR Gas. As one of Massachusetts’ largest investor-owned electric and gas utilities, NSTAR transmits and delivers electricity and natural gas to 1.3 million customers in over 100 Eastern Massachusetts communities. NSTAR’s service territory consists of a large metropolitan area that includes an abundance of hospitals, educational institutions, and office buildings. Coupled with the high energy costs in the Northeast, this market provides an ideal market for providing retro-commissioning services in existing buildings.

Over the past 12 months, there has been increased attention on the commissioning of existing buildings within the NSTAR territory. This attention is driven by the large potential for cost-effective energy savings requiring minimum capital expenditures and an opportunity to provide service to an important class of large customers. Experience to date demonstrates the significant opportunities for cost-effective energy savings and improved building performance resulting from retro-commissioning.

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<sup>a</sup> This paper focuses on commissioning in existing buildings. For simplicity’s sake, throughout this paper, we refer to this as “retro-commissioning.” We use the term retro-commissioning to describe both buildings that have never been commissioned before as well as existing buildings that have been commissioned in the past (often referred to as re-commissioning). We do not use the term re-commissioning since new buildings commissioning is not yet commonplace, and thus it is unlikely that there is a large market for (re-)commissioning buildings that have been commissioned before.

To assist in developing its retro-commissioning program, NSTAR hired Opinion Dynamics Corp. (ODC) to investigate commissioning opportunities and do a preliminary assessment of the current market in the Boston area. The first step of this process was to conduct research to review existing programs throughout the country. ODC identified 15 energy efficiency programs throughout the country that offered some form of commissioning services. ODC explored these programs through depth interviews with various program administrators. Most of these programs focused on the commissioning of new buildings or new equipment, and the majority were components of more general C&I programs rather than stand-alone programs. Commission-related offerings ranged from purely informational (e.g., education about the commissioning process and assistance in selecting a commissioning provider), to programs that offered financial incentives for commissioning services.

In addition to this research, ODC also conducted focus groups with NSTAR's C&I customers and trade allies. These focus groups dealt with several possible C&I programs, including a brief discussion about commissioning services. In these discussions, building owners and trade allies indicated that commissioning (including retro- and re-commissioning) is still an unfamiliar term. Furthermore, market actors felt that customers perceive these services to be time-consuming and expensive, and are, therefore, unlikely to seek out retro-commissioning providers.

Finally, in order to gain a better understanding of the marketplace for these services, ODC solicited candid feedback from nine commissioning providers in the Boston area. The providers were mostly firms that were listed on the Building Commissioning Association website for the New England region. The firms that were not listed on the BCA website identified themselves as either engineering firms or facility management firms, but all had some sort of commissioning division within their company.

In addition to informal discussions with these commissioning providers, ODC also sent a follow-up email survey to ask about the number of retro-commissioning projects performed in Massachusetts, specifics about the characteristics of retro-commissioning customers, and detailed information about the services provided.

This paper draws most heavily on the interviews and survey data collected from these commissioning providers and presents "how to" ideas in each sections on what actions NSTAR can or is taking.

### **What Is Retro-Commissioning?**

Retro-commissioning is a fairly new concept. While the industry has started using the term retro-commissioning, the services provided under this nomenclature are also sometimes referred to as diagnostics and troubleshooting, or tune-ups.

There is a wide range of opinions of what retro-commissioning entails. Based on provider comments, there appear to be two distinct classes of services that are purported as retro-commissioning: one is a technical approach that really only touches on retro-commissioning services, while the other is described as an integrated approach. According to one respondent, it is "How deep you look at the information and what you do with it" that really distinguishes retro-commissioning.

In addition to retuning controls, the providers that we spoke with said that retro-commissioning includes benchmarking the building's energy use, looking at operational efficiencies, and determining end of life expectancies and the useful age of the equipment. It also includes implementing all no-cost and low-cost measures, and making recommendations about capital improvements. According to providers,

actually installing equipment is almost always viewed as an extra add-on cost and is not generally performed under a retro-commissioning project.

Interestingly, according to providers, robust commissioning plans are seldom done. Depending on the size of the facility, a robust initial study could take between one week and one month because it would require time to monitor the equipment and take measurements. According to one provider, this type of study would be approximately one-third of the overall project budget. Another provider stated, “Nine times out of ten the study will tell you that it’s worth commissioning so why bother doing [a robust initial study].” Moreover, it is difficult to delineate between performing a robust study to investigate how the building is functioning, and the actual implementation of the low and no cost measures since you need to have a detailed understanding of the building to determine which measures should be conducted. Many providers did not feel that their clients would want to spend the money upfront to create a detailed written report. Thus, they just roll this type of detailed understanding of the facility into the total cost and do not provide a detailed commissioning plan.

That said, most commissioning providers do provide their customers with a scope of work for the services that they provide. This scope of work is generally “canned” based on the typical services that the firm provides. It is only slightly customized based on the type of the equipment and some basic characteristics of the building. This basic scope of work provides the client with an overview of the project so that they know what will be done in their facility. Since the majority of the scope of work is pre-packaged, it doesn’t require a large financial investment.

Many providers also recognize the difficulties with documenting the savings from the retro-commissioning services. The effects are often difficult to quantify unless they perform some follow-up testing in the facility. Furthermore, providers noted that any documentation requirements increase the cost of the project. Given these costs, providers acknowledged that a large upfront study or a detailed report might preclude the retro-commissioning of some smaller buildings or projects. The extra work would offset the benefits from commissioning. According to providers, therefore, the scope of the project is often adjusted to meet the size and needs of the customer.

Once the job is underway, commissioning providers generally state that they work closely with facility managers and/or operations and maintenance staff. As one provider stated, “If you’re not working hand in hand with them you are wasting your time.”

Providers also acknowledge that while training happens along the way, there also has to be some formal training and some “leave behind” documentation. Most providers do leave behind some form of commissioning report. Through our follow-up survey, providers indicated that they often perform services such as:

- Developing a preventive maintenance program
- Providing O&M manuals
- Performing operator/facility staff training
- Verifying operator training
- Conducting a “lessons-learned” meeting

These services, however, are not always given as much attention as they should be given, or are overlooked. This may also depend on the building owners’ level of investment and schedule.

## ***How-To Ensure Standard Services and Sustainability In Your Retro-Commissioning Program***

*Because the definition of retro-commissioning is unclear, NSTAR has developed a pilot retro-commissioning program to look at the integrated performance of a building's electric and gas systems.*

*NSTAR has also developed a checklist of requirements for its full-scale retro-commissioning in order to ensure standard services. NSTAR will require all retro-commissioning projects to meet minimum requirements from this checklist. This approach gives the provider some flexibility to shape the project, while still requiring certain elements. For some providers, this may pose a barrier; but for most, this will ensure that the project is of a high enough caliber to save energy.*

*Furthermore, NSTAR's full-scale program will require that buildings meet minimum pre-requisites (such as having controls and adequate documentation of prior performance) before the building qualifies for participation in the program.*

*Since retro-commissioning is often met with variable levels of commissioning services, NSTAR's pilot program targets trade allies and strives to work with these trade allies to improve current practices. Moreover, ensuring that the project is sustainable is included among the checklist of minimum requirements. As part of the program, NSTAR's program will require commissioning providers to work closely with the building's O&M staff, and to provide both training and documentation.*

*Finally, NSTAR is also considering working with the Building Commissioning Association (BCA) and/or ASHRAE to bring manufacturers to the region so that they can offer training sessions on specific technical areas. NSTAR could offer trainings about how to participate, but most providers are skeptical about a training session that would teach them "how to commission" better. While these types of training might be useful for newcomers to the industry, established commissioning providers are not as likely to attend because of the opportunity costs. These trainings, therefore, would use manufacturer partnerships to train local providers on the "how to"s of commissioning specific equipment and/or systems.*

*Ultimately, through their program, NSTAR is seeking to build tools and systems to promote lasting energy savings from retro-commissioning.*

### **Where Is Retro-Commissioning Being Done?**

Providers agree that the most likely candidates for commissioning are owner-occupied buildings — people who have to live with the buildings. These customers are the ones that invest the money to make sure that their facility is operating properly, as they are also responsible for paying the utility bills.

The providers that we spoke with primarily serve the following sectors:

- Hospitals
- Higher Education
- Research
- Government and Military

According to providers, these types of facilities are starting to retro-commission their facilities without utility support. Many of these "institutional" customers also have multiple buildings and some sort of

incremental plan to retro-commission one or two buildings at a time. Thus, there is a growing market for retro-commissioning services.

Privately-owned commercial and industrial customers, however, are not as likely to retro-commission their facilities. Despite the fact that office buildings are constantly being remodeled to meet a new tenant's needs, very few office buildings are retro-commissioned. A couple of providers have done some work with privately-owned office buildings; however, most of these projects were through utility-sponsored energy efficiency programs similar to the program that NSTAR is building. According to providers, the projects done on office buildings have been very successful, but are unlikely to have been done without utility assistance.

The interesting dichotomy, therefore, is that while institutional buildings are more likely to have an interest in retro-commissioning (and thus less likely to need a utility program to raise their awareness), they are also less likely to have the money to perform this task. Conversely, privately-owned commercial and industrial customers may have the means to conduct retro-commissioning, but they are less likely to do so on their own.

According to provider comments about the best candidates for retro-commissioning, retro-commissioning projects should target buildings with the following characteristics:

- **Buildings larger than 50,000 square feet.** Larger facilities have a greater potential to garner greater energy savings; they have more problems and more opportunities for improvement. Large facilities are also more likely to have controls systems in place, which can be used both in the commissioning process and to verify savings. Alternatively, a customer could have multiple smaller stores (such as a chain store) on a distributed control system.
- **Buildings with modern HVAC systems.** The ideal building for retro-commissioning is a building that is less than 10-12 years old with a modern HVAC system. Older buildings with a need for lots of capital investments are better candidates for performance contracting than for retro-commissioning services.
- **Buildings that have an interested manager and building owner.** For the project to be successful, the building must continue to operate properly after the retro-commissioning is complete. A facility manager and/or building owner that has put some level of investment into the building will be more likely to ensure that this happens. Specifically, buildings that have had a change in tenant and a re-architecture of the interior parts of the building would be good candidates.
- **Owners of multiple buildings.** Given the stage of development, retro-commissioning is still a hard sell. The savings generated from the retro-commissioning project, however, are enough to sell additional services. By targeting owners of multiple buildings, one utility sponsored project may result in multiple retro-commissioned facilities.

### ***How To Target The Right Customers for Retro-Commissioning***

*In order to ensure that the pilot program successfully reaches out into the market, NSTAR's pilot program is targeting large property management firms. In addition, to assure that the projects will be both successful and on-going, NSTAR is targeting buildings with:*

- *Unjustified high energy use and/or comfort or IAQ issues*
- *Dedicated and interested maintenance staff*
- *Accurate billing and building information*

- *Newer equipment, 12 years old or younger*
- *Complex systems*

*NSTAR's program will require the support of the building's senior management. NSTAR is insisting that the financial manager be involved in the process. By requiring the involvement of upper management, NSTAR is seeking to achieve optimal operations, assure that the savings persist, and champion the retro-commissioning process.*

*NSTAR's programs have also taken a two-tiered approach based on size. In addition to the Retro-Commissioning Program for mid- to large- sized customers, NSTAR is offering a Small Business Continuous Commissioning Pilot that better meets the needs of these smaller customers.*

*NSTAR is also considering two-tiered approach for meeting the needs of institutional customers (who have higher levels of awareness but limited funds) versus meeting the needs of private-sector commercial and industrial facilities (which may have more funds, but given the facility characteristics are much less likely to seek out retro-commissioning services).*

### **When and Why Do Customers Retro-Commission Their Facilities?**

Most retro-commissioning projects are done because the systems aren't operating properly and the occupants are uncomfortable. Providers indicated that in a few cases, retro-commissioning services may be sought out because the customer is paying too much money; generally, however, building owners are not proactive about seeking retro-commissioning services.

As such, many providers feel that there is a huge and untapped market for retro-commissioning. Some associations are starting to keep on top of retro-commissioning information to help raise awareness. For this reason, retro-commissioning projects are increasing—particularly among the institutional facilities. Unfortunately, however, there is not a lot of awareness of retro-commissioning. Providers generally agreed that if customers understood retro-commissioning, they would see the value in it.

While some of the commissioning providers that we spoke with are attempting to promote their services using performance contracts, retro-commissioning does not always fit this model. Performance contracts are usually used for projects with large budgets for capital improvements. These projects generally have a high upfront cost and a financing and management mechanism to capture a guaranteed return. Retro-commissioning, however, tends to have a low upfront cost and a higher return. The projects, however, are usually smaller and the savings depend on the continued proper operation of the facility. Furthermore, it is often difficult to document the savings unless M&V systems are already in place, (since M&V costs are generally high compared to the overall costs of the project).

### ***How To Encourage Retro-Commissioning***

*NSTAR is working to increase customers' awareness of their buildings' energy use. NSTAR's goal is to accelerate awareness and investment in retro-commissioning, which will lead to significant energy and cost savings for both building owners and utilities.*

*In order to encourage customers to be proactive about retro-commissioning, NSTAR has developed an ENERGY STAR Benchmarking Initiative to help customers understand and improve their energy performance. This initiative also takes customers through the steps of actually implementing energy*

*efficiency measures and introduces them to the concept (and value) of retro-commissioning. NSTAR plans on making this a pre-requisite for participating in their retro-commissioning program.*

*NSTAR's retro-commissioning program will also offer financial incentives to help customers seek out retro-commissioning services. Initially, NSTAR's program will probably fund the majority of the initial costs of the study with the goal of increasing the customers' contribution over time. Again, by raising awareness through the upfront study, customers will see the value of retro-commissioning their facilities.*

### **Who Is Retro-Commissioning?**

The number of commissioning providers in Massachusetts is growing. The Building Commissioning Authority web site lists approximately 60 commissioning providers in the Northeast region, including five located in Massachusetts. This growth is further evidenced by the fact that building owners are now soliciting proposals for commissioning services. Rather than just sole sourcing projects, building owners are asking vendor to distinguish themselves from the pool of competitors.

While several of the respondents that we spoke with classify their primary business as "Building Commissioning Provider," among those that offer commissioning services are:

- Testing, Adjusting and Balancing (TAB) Contractors and Controls Contractor
- HVAC Designer and Contractors
- Firms that specialize in facility management
- Engineering Firms
- Energy or Energy Conservation Consultants
- Energy Services Company (ESCOs)

Not all of these groups, however, are performing services that would meet the requirements of a systems-benefits-charge (SBC) sponsored energy efficiency program. Based on comments made by the commissioning providers, there are two types of retro-commissioning providers: technicians such as TAB and controls contractors, and then providers that use a systems-oriented approach. This second group has a broader focus and explores how systems operate and how they interact with each other. For the most part, it is this second group that is performing services that would fall within the utilities' definition of retro-commissioning.

### ***How-To Select and Train Vendors***

*Through several means, NSTAR is working to develop a list of qualified providers. First, NSTAR is conducting a pilot program to build up local experience, and as mentioned earlier, NSTAR is using a checklist of requirements to standardize the definition of retro-commissioning services.*

*NSTAR is also considering working with local commissioning providers to create case studies of previously completed projects. Through these case studies, NSTAR can get a better sense of standard practices, which will be valuable in developing the standard list of tasks. Through these projects, NSTAR is also planning to track savings (using utility bills and data) over a six-month period. By determining savings from these projects, NSTAR will be able to build a database of documented savings. These projects will then form the basis of case studies that can be used to educate other customers.*

*Through these actions, NSTAR will meet the challenges posed by this market by helping to raise awareness of commissioning, better understanding the services being offered and the potential from the various services, and building a database of savings.*

## **Summary**

The number of retro-commissioning projects, and providers, in Massachusetts is growing. While still in its infancy, this is an emerging market with the opportunity for large savings. As such, it is an opportune market for an infusion of support from a rate-payer funded energy efficiency program.

While opportune, this market also presents several challenges including:

- Low levels of awareness of retro-commissioning among building owners
- Undefined, and thus variable levels of commissioning services
- Difficulty in determining savings

Utility programs can accelerate awareness and investment in retro-commissioning, which can lead to significant energy and cost savings for both building owners and utilities. For the owner, benefits include: lower energy bills, fewer building deficiencies at building turnover, fewer contractor call-backs, increased air quality (leading to healthier work environment and tenant retention), decreased O&M costs, and decreased equipment replacement costs. For the utility, retro-commissioning provides peak power reductions, increased public image, a channel to ESCO services, and customer retention for the utility through a better working relationship with customers.

To meet these challenges, therefore, NSTAR is

- Implementing a Pilot Retro-Commissioning Program to build local experience and improve standard practices
- Working with local retro-commissioning providers to develop case studies that will do several things such as, 1. educate building owners about the benefits of retro-commissioning, 2. demonstrate the requirements of retro-commissioning, and 3. help to document savings from retro-commissioning projects
- Developing a two-tiered Retro-Commissioning Program that sets minimum requirements so that the projects are both successful and sustainable
- Offering financial incentives to encourage participation and growth of the market to maximize energy savings

The development of NSTAR's full-scale retro-commissioning program is still underway. As a next step, NSTAR will be conducting a market characterization study that will assess customer interest in retro-commissioning. This study will also determine the number of facilities that meet the pre-requisites required by the program. This market characterization study will provide additional information so that NSTAR can adapt their program to meet the needs of the market.