

Improving Building Operating Performance through Building Performance Services

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ABSTRACT

Existing building operating performance is less than optimal. Energy savings from 5-15% are available at low cost through enhanced operations and maintenance, creating an opportunity for mechanical contractors to expand services beyond the typical basic maintenance package. Although demand is growing most building owners are either unaware of the potential or don't know how to capture it. On the supply side, service contractors may see a business opportunity, but face significant barriers, including a lack of clearly defined products and services to enhance building operating performance. The Building Performance Services (BPS) initiative, sponsored by northwest utilities, originated over five years ago from market research that assessed current service contractor business practices, as well as market barriers and opportunities to improve building operating performance. This research concluded that a market structure supporting better building operating performance can be encouraged by clearly defining and differentiating service activities that have viable market value. A key strategy is working closely with selected O&M service contractors and providing business planning and development of service options. Technical advisory resources provide building operating performance technical expertise in the field. Technical support is also provided with information resources, tools and in-house training. This paper describes the key service approaches of building tune-up and enhanced operations and maintenance, how they have been introduced into the Northwest commercial market, how the market has changed over the past five years, and lessons learned that will influence the future direction of the initiative.

Introduction

The Building Performance Services (BPS) concept originated from market research conducted by the Northwest Energy Efficiency Alliance (NEEA) that assessed current business practices, as well as market barriers and opportunities to improve building operating performance. Key market barriers identified include:

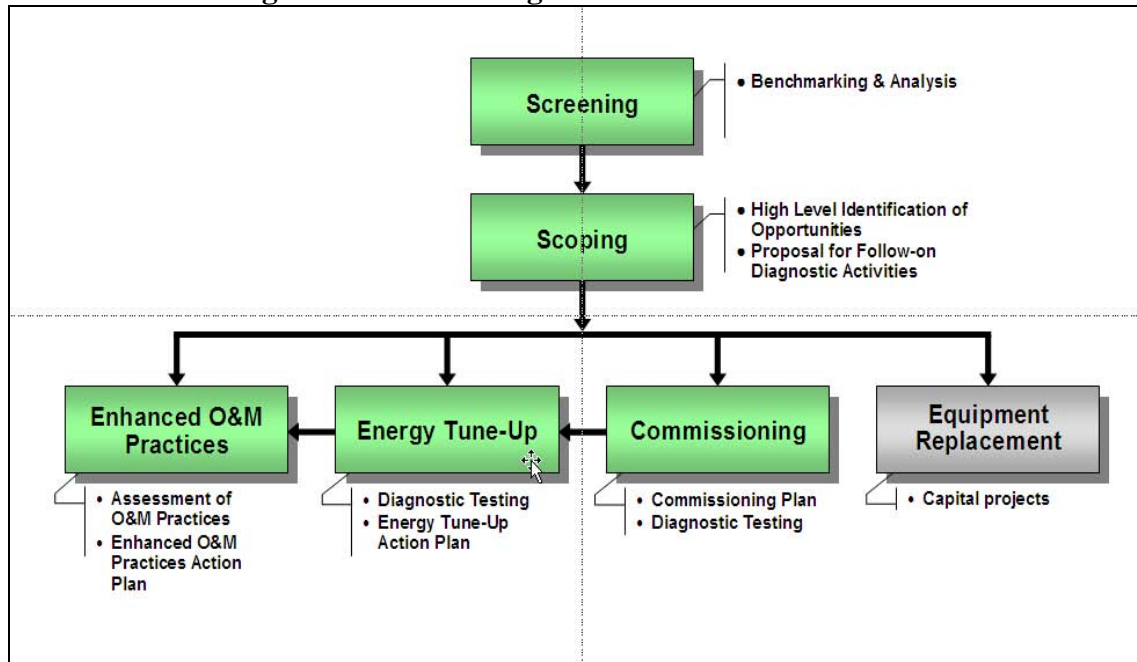
- Building owners, managers, and operators are generally unaware of the potential to improve operating performance.
- Market fragmentation, with a lack of clearly defined products and services.
- Lack of credibility of traditional service providers due to their historical focus on equipment sales.
- Lack of clear process for identifying specific opportunities within a building.
- Lack of qualified service providers with demonstrated ability to capture the opportunities and secure the value through specific products and services.

This research concluded that a market structure supporting better building operating performance can be encouraged by clearly defining and differentiating service activities that have viable market value. Capability to perform these services can be built by developing support tools and technical skills, and by working with service providers and in-house facility staff. Demand for services can be stimulated by working with building owners and managers to increase their awareness of the potential to improve building operating performance and its impact on their overall business objectives. The long-term goal for NEEA is to develop a market structure that successfully promotes and supports enhanced building operating performance. This paper focuses NEEA’s work with contractors on their service offerings.

Building Performance Services

The Building Performance Services (BPS) path, shown in Figure 1, is a framework used to illustrate broad service option concepts. Screening and scoping elements lead to a service proposal which can include one or more of the four identified service components. These follow-on services (Enhanced O&M Practices, Energy Tune-Up, Commissioning, and Equipment Replacement) consist of a detailed evaluation or diagnostic that results in specific action. Experience has shown that for most buildings there is a combination of appropriate services, e.g. an Energy Tune-Up with Enhanced O&M Services followed by Equipment Replacement (capital projects).

Figure 1. The Building Performance Services Path



Screening

Called “Lead Qualification” by many contractors, this is the process used to qualify a potential customer and building before incurring the expense of going on site. From the contractor’s viewpoint, screening needs to encompass both the practical opportunity to provide value to a customer and the interest and ability of a customer to take action.

Practical opportunity screening may include benchmarking, simple utility bill analysis and gathering of basic building information; while the customer’s interest is assessed by the sales team. A customer’s interest is usually a stronger indicator of success than the practical opportunity. Things to consider are customer commitment to the process (e.g. obtaining energy bills) past performance, internal decision making practices, and investment criteria. The outcome of screening is a rough determination of the potential opportunity and a recommendation to proceed to scoping.

Scoping

This proposal stage uses technical resources to evaluate specific practical opportunities for high priority buildings resulting in a specific cost proposal for services to improve building operating performance. Scoping consists of four-basic steps: development of a site visit plan; on-site review of the facility; a post visit analysis; and a presentation of the results and recommendations. The site visit plan provides direction on areas of interest within the building. The plan is developed through evaluation of billing information and other data obtained through the screening process or by the customer.

Because the outcome of scoping is a direct proposal for services it is crucial to develop a basic understanding of the building systems, the customer’s expectations, the desired operating performance, any problems already identified, existing operation and maintenance (O&M) practices and obvious training needs. While onsite, particular attention should be paid to examining the building’s as-built drawings and sequences of operations and interviewing facility staff.

The post visit data analysis roughly quantifies overall potential savings of problem areas, and identifies the appropriate follow-on service. The intent is not to complete a detailed analysis, it is to flag the areas that appear to be operating poorly and to roughly quantify the overall potential for the building through a comparison of category end usage estimations, and other information. The identified problem areas may be very specific, such as “poor economizer operation”, or broadly characterized, such as “excess system operation due to morning warm-up issues”.

The last step is the development of a scope of work and cost for presentation and approval. The scope of work describes the process for evaluating and analyzing the general areas of opportunity to develop an implementation plan for “fixes.” The proposed service options must address both the technical potential and the customer’s objectives.

Enhanced O&M Practices

Enhanced O&M includes day-to-day actions taken to track and maintain performance. BPS Enhanced O&M Practices emphasize operating systems and equipment in the most energy efficient manner, including actions to ensure the persistence of fixes made through energy tune-

up or commissioning. This service provides a systematic look at current O&M management practices and has been the most difficult for service contractors to market. Their initial response is that they already provide it. They are also reluctant to present these opportunities to their existing client base due to the perception that if there is opportunity for improvement, it is due to the service contractor failing to do a quality job. Most of perceived quality issue stems from the least cost mentality of the both service contractor to obtain the service contract, and the building owner/manager shopping for the service contract.

The evaluation of existing practices looks at three major areas.

- Availability of building systems documentation
 - Standards of service and comfort
 - Sequences of operation
 - Up-to-date as-built drawings
 - O&M manuals
- O&M procedures & resources
 - Are Preventive Maintenance tasks (PM's) completed
 - Are PM's comprehensive
 - Formal maintenance plans and procedures
 - Sensor calibration plan
 - Operating sequences review
 - Tracking and reporting building performance
 - Tracking key systems operating metrics
- Professional skills required for operating existing systems and equipment

The outcome is a detailed list of opportunities for change in a building's O&M Practices that includes a proposal to deliver a broader range of services. All of the O&M Practices are critical to a high performance building, but tracking and reporting building performance takes on two roles for the service contractor: maintaining building performance and communicating the value they are providing back to the customer. This is a crucial piece that is often underestimated, as service contractors tend to go back to the least cost mentality of selling operations and maintenance services.

Energy Tune-Up

This is the two phase action of identifying and implementing relatively straightforward operational improvements that impact occupant comfort, equipment reliability, and energy usage. Generally these are low cost and simple to implement. Examples include: a reset on discharge air temperatures, scheduling equipment off, calibrating critical control sensors, optimizing outside air use for economizer cooling, and modifying minimum outside air flow to more appropriately match occupancy.

The service is a detailed evaluation and analysis of areas of opportunity identified in the scoping. The process is similar to commissioning, but the level of documentation rigor and functional testing is much less. Special attention is given to how modification of existing building operating practices will support persistence of energy savings.

The outcome is a list of findings detailing the problem, the solution, the potential benefits, and the cost to fix. The customer is given the opportunity to choose those opportunities that fit their business objectives, and those fixes are implemented.

Experience shows the need for this service to be clearly linked to enhanced O&M for owners/managers to recognize the real value of the enhanced O&M practices. As such, a crucial part of the energy tune-up is to roughly quantify (within the scale of the effort) the benefits to occupant comfort, equipment reliability, and energy cost savings.

Commissioning

Commissioning of existing buildings is a systematic and documented process of ensuring that the owner's operational requirements are met, building systems and equipment perform efficiently, and building operators are properly trained. The commissioning process is more comprehensive and detailed than a building tune-up and extensive documentation is expected. Use of a formal commissioning process is appropriate most often when chronic problems exist and the building owner recognizes the need to take significant action. Potential commissioning candidates include buildings that may have unusually high energy costs, an uncomfortable and/or unhealthy work environment, high maintenance bills and equipment that continually fails to reach life expectancy.

NEEA's efforts within BPS have focused on contractors providing on-going maintenance services to leverage the existing relationships with their customers. Most service contractors have not been actively engaged in independent third party commissioning. Where those skills do reside – large firms that offer consulting services in addition to maintenance services – the focus has been to achieve the least cost solution with energy tune-ups.

Equipment Replacement

Contractors rely on this work as part of the overall value to their organization. Sales of service-led solutions to customer needs typically result in pull-through sales of both products and additional services. By providing value with tune-up and enhanced O&M, contractors are aware of the potential for equipment replacement opportunities and are usually the primary candidate for completing the work. Examples of pull through work for the contractor are compressor and heat exchanger replacements and repair, while major equipment replacement opportunities can range from new packaged rooftop equipment to new chillers..

Figure 2. The Relationship Between Building Tune-Up and Enhanced O&M

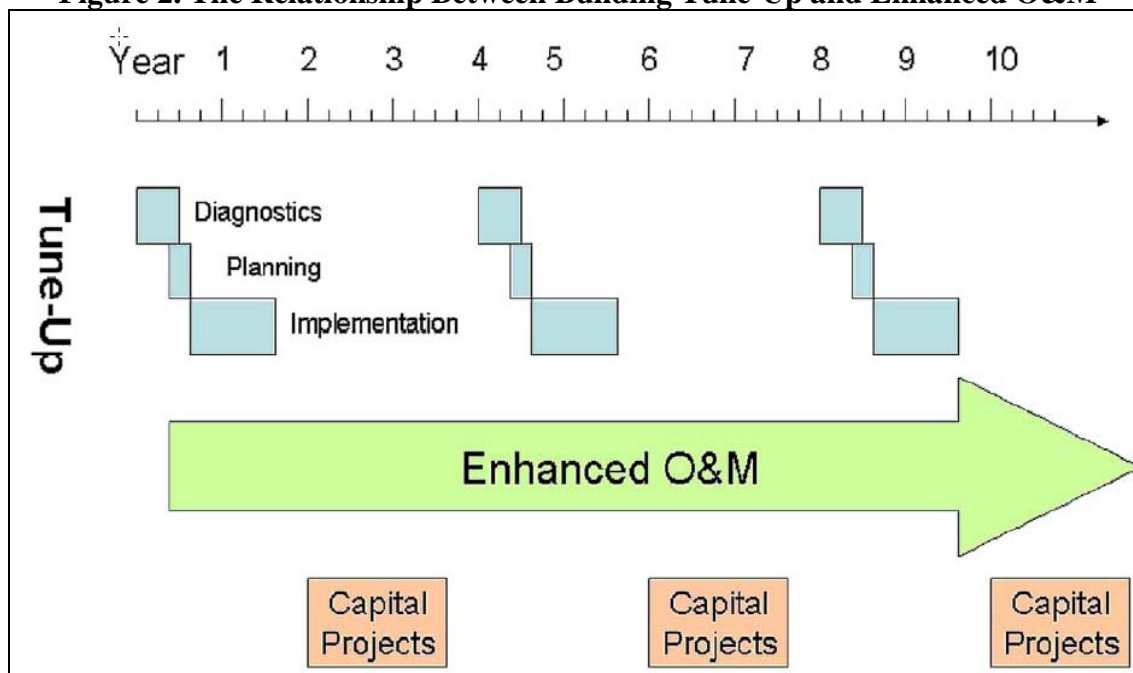


Figure 2 is a visual representation of the periodic nature of the services. An energy tune-up occurs approximately every 3-5 years with equipment upgrades and replacements occurring as required. The day-to-day enhanced O&M activities help maintain system performance. Over time performance will begin to degrade, and an energy tune-up will be necessary again to achieve peak operating efficiency.

Firm Focus

Firm Focus is a dedicated effort to work collaboratively with building service providers in the Northwest interested in offering building performance services as a means of providing greater value to customers, increasing revenues and profits, and gaining a competitive advantage in the marketplace. NEEA does not provide financial incentives or pay for the energy savings associated with the effort, so service providers that participate must see the business opportunity from offering BPS and be willing to invest their own time and resources to pursue it. What NEEA does offer is business and technical advisory resources to assist service providers in developing and delivering BPS.

NEEA and participating service providers sign a letter of agreement outlining each entity's respective responsibilities. In general, service providers agree to assign appropriate resources to the joint effort, collaborate with NEEA contractors on development of BPS and service delivery opportunities, encourage staff participation in education and training activities and promote energy efficiency and high performance buildings in their marketing. NEEA agrees to dedicate qualified contract resources and provide ongoing support in two primary areas: business planning assistance, including development of service offerings and marketing; and technical assistance, including education and training, analytical tools, and hands-on assistance with select projects.

There are currently eight firms in Washington, Oregon and Idaho participating in Firm Focus. Some are large full service mechanical and controls contractors whose customers include large high-rises with complex systems and some are smaller firms who tend to service smaller buildings with unitary equipment. Most of the firms have adopted the BPS terminology in their marketing and sales presentations. However, the actual services offered are tailored to their customer base.

Full service mechanical and controls contractor services include the whole range of BPS components. Types of projects include large office buildings as well as some healthcare facilities. Services most often center on tuning up existing systems and equipment, in some cases commissioning, or selective equipment replacement. Each customer's service package is customized to their individual needs and situation, including an assessment of current practices and an action plan.

For service companies that deal with smaller buildings and packaged unitary equipment, performance based service offerings can be standardized, "bolted-on", to current O&M services. These "bolt-on" services can be sold and delivered by service technicians using automated diagnostic tools such as Field Diagnostic's Service Assistant Tool, however, they still require a significant investment in training. A "bolt-on" packaged roof-top tune-up/O&M checklist typically covers the following:

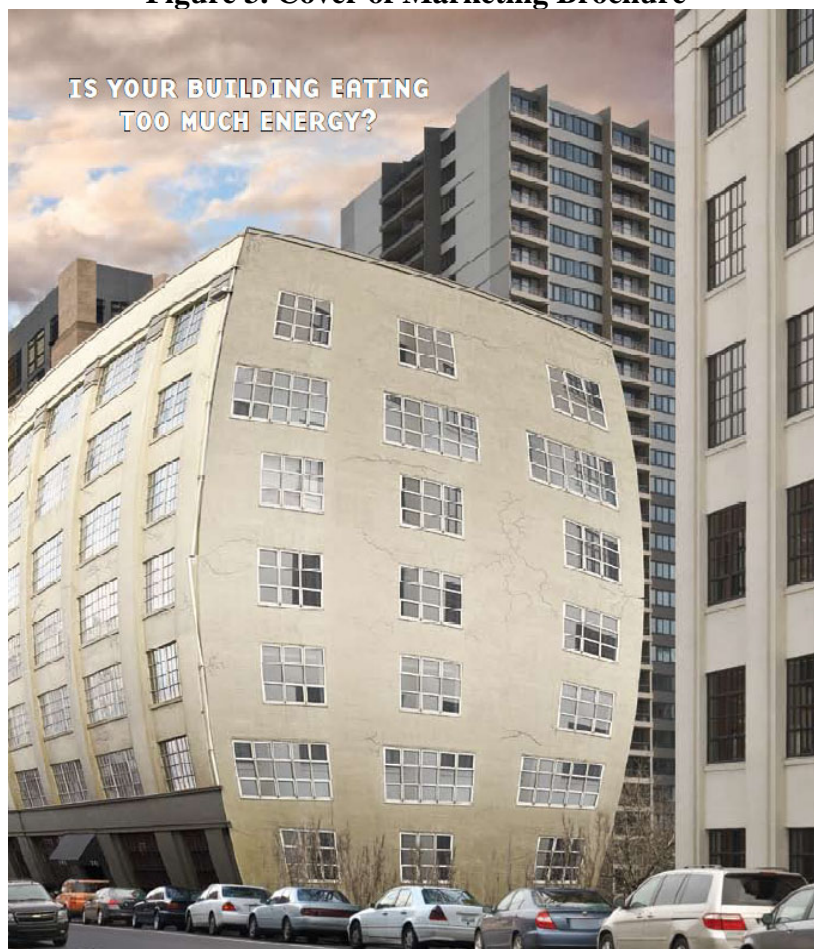
- Controls/Thermostats
- Blower Drive System
- Blower Air Delivery System
- Heat Exchanger Coil System
- Economizer
- Refrigeration System
- Compressor Operation
- Heating/Furnace System
- Filters

Lessons Learned

Marketing & Sales

Effectively marketing these services to building owners, managers and operators is challenging. Many do not see the need to "buy" additional services, and question if the value is really there. Doing upfront assessment work, such as benchmarking the building's energy use for comparison to similar buildings, can help. Market forces are also coming into play, with tenant and occupant expectations concerning energy efficiency and sustainability changing. Building owners and asset managers are recognizing that building labels such as Energy Star and LEED certification relate to a property's marketability and value. NEEA has developed a marketing brochure, Figure 3 that service providers are co-branding and using with their customer base to build greater awareness and interest in the services.

Figure 3. Cover of Marketing Brochure



Training is essential for the sales team to be comfortable and confident representing these services to existing and prospective customers. They need to be able to explain concepts like energy benchmarking and the energy savings potential of operational improvements in simple terms that are meaningful to different market segments.

Workforce Limitations

As with any other service sector, there is a range of skill level, and quality of delivery. The size and financial success of a firm are not good predictors of project quality. Larger firms tend to have more skilled staff; however they may oversee many projects and have minimal connection to fieldwork. Utilities, mechanical contractors, and consulting firms are all reporting difficulties in finding and hiring experienced energy engineers. Individuals who can correctly diagnose building problems and who understand the energy implications are in short supply.

NEEA and others are working to expand training opportunities and create new tools to address this problem. NEEA efforts include:

- A two-day training held in a large commercial building focusing on how to conduct information gathering and a walkthrough to generate a scope of work for an energy-

focused building tune-up. The first day consists of classrooms presentations and discussion of benchmarking, interval data analysis and common opportunity areas. The second day is a walkthrough led by NEEA technical advisors.

- Video training on interval data analysis available through BetterBricks.com. BetterBricks is the brand name of NEEA's commercial initiative.
- The Symptom Diagnosis Tool, also found in the building operations section of BetterBricks.com. This is guidance on how to find the root cause of operational conditions that may be indicators of energy waste.

Split between Rooftop and Complex Systems

Initially, segmentation of the commercial building market for a BPS type offering was based on building size and energy usage or cost. In working closely with contractors, it became obvious that a market based segmentation of packaged rooftop equipment versus more complicated built-up systems is the more appropriate approach. While the service concepts for the two types of systems are identical, the sale and delivery become parallel paths. It became apparent that a service contractor's most comprehensive relationships – meaning the broadest level of services they deliver – are in buildings that have no building engineering staff. (Some service contractors do provide turnkey O&M services that place staff directly in a building.) Most of these buildings are heated and cooled with packaged equipment. Buildings with more complex built-up systems generally have staff managing much of the day-to-day operation of the building.

In buildings with built-up systems and complex direct digital control systems, contractors are typically used on an as-needed basis, for example, chiller and boiler maintenance. This bifurcation of the market logically leads to working with two different types of services: a packaged service offering, and a more consultative approach working with the complex built-up systems.

We examined the current services offered by the contractors and were able to put them into three categories:

- **Good** – Basic services where equipment is inspected and air filters are changed on a scheduled basis. Any repairs are billed extra.
- **Better** – Includes the Basic service offering and adds things like belt changes, cleaning condenser coils, etceteras. Emergency calls and repairs are charged separately.
- **Best** – This is the full service offering for a client. The contractor usually covers all repairs and equipment failures.

Our approach was to develop a “bolt-on” offering to existing service packages that were very specific in nature and could be delivered easily by service technicians and mechanics. The service package elements include energy tracking, annual tune-ups of packaged equipment (both gas and electric), checking and modifying outside air usage, and modifying equipment schedules.

Evaluation Methodology

The transformation of the building services market relies to a great extent on behavior change. We are influencing the creation service products that increase building performance through better operation and attention to energy use rather than equipment upgrades. We have direct involvement in a limited number of projects to demonstrate and prove the value of the services we advocate, however market transformation needs to occur through diffusion of a set of best practices. NEEA's utility funders have put increasing emphasis on generating validated kWh savings, so we are seeking to develop a defensible methodology to make the link between practice change and energy savings.

Evaluators would like to unitize the recommended service components so that the same criteria could be used for any project. Then a per unit energy savings would be assigned based on validation of the demonstrations. This approach is difficult to apply to building tune-up and O&M where service components do not fit neatly into tightly defined units and the outcomes vary greatly from building to building. We plan to describe the services with a limited set of attributes that must be present and then assign a unit of energy savings to it based on measurements from demonstration projects and other credible sources. A somewhat analogous approach was used to evaluate and assign unitized savings to the Building Operator Certification program. A value of 0.5 kWh per square foot energy savings is claimed for each BOC graduate for their building (Peters & McRae, 2001).

Next Steps

Our initial approach of using business and technical advisors to work with service contractor personnel to develop and deliver comprehensive building tune-ups proved to be over-ambitious for the smaller firms. Technician training focuses on equipment. To effectively optimize building operation it is necessary to have a deep understanding of system interactions and energy flows that even some of the larger service companies' in-house professional engineers lack. One way to address this is to try to simplify the diagnostic scope and still capture a large proportion of available energy savings. We are moving toward simplified messaging around best practices and common opportunities. Best Practices include:

- Benchmark energy use
- Tune-up existing systems and equipment to improve performance (periodic)
- Enhance ongoing operations and maintenance practices to sustain performance
- Invest in training/skills development
- Track and report energy use (and costs) on a regular basis

Application of these best practices on a continuing basis within existing commercial buildings is the change we are looking for. For service contractors, this means offering building performance services that deliver these best practices in whole or in part, depending on customer needs.

Conclusion

The Building Performance Services path has been accepted in the market as a viable framework for the delivery of energy efficiency services to commercial customers of mechanical service contractors. NEEA will continue working in the market to increase the number of service providers who offer these types of services. Key challenges for service contractors are workforce development and effective communication of the value of these additional services to potential customers. NEEA will expand education and training efforts to emphasize best practices in service delivery and to support effective marketing.

References

Peters, Jane S. and McRae, Marjorie. 2001. **Market Progress Evaluation Report: Regional Building Operator Certification, No. 7.** Report #E01-088. Portland, OR. Northwest Energy Efficiency Alliance