# Building Performance Services: Engaging the Market to Encourage Better Commercial Building Operating Performance

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**ABSTRACT**

The concept for the Building Performance Services (BPS) initiative originated from market research conducted by the Northwest Energy Efficiency Alliance to assess current business practices, market barriers and opportunities to improve commercial building operating performance. The long-term goal for the BPS initiative is to develop a market structure that successfully promotes and supports the enhanced operating performance of building HVAC systems. In the near and intermediate terms, key activities that support this long-term goal include infrastructure development, a BPS test and a larger scale pilot with identified regional sponsors. For the Alliance's BPS test, sponsors are the Energy Trust of Oregon, Inc. and three Puget Sound area utilities – Puget Sound Energy, Seattle City Light and Snohomish County PUD. All BPS activities are conducted as a partnership between these sponsors and service providers, building on current relationships and what has been accomplished in the market.

BPS is positioned to work within the existing market structure to improve building HVAC performance as a viable business opportunity for service providers. This paper describes BPS in greater detail, emphasizing the features that set BPS apart from other efforts to encourage better building operating performance. BPS focuses on working with service providers who building managers and operators rely upon for support. The BPS approach identifies viable market-based services, including Enhanced O&M Practices, Energy Tune-Up and Commissioning. This paper describes results of the BPS test to-date, including customer and service provider reactions to the services delivered, and adjustments made to the BPS approach.

## Introduction

Several prominent studies have shown that the operating performance of large commercial buildings is less than optimal (Piette, Kinney & Haves 2001). Monitoring projects across the US indicate that existing commercial building operating performance can be improved 20% or more through improved operation and maintenance (O&M) practices alone (Piette et al. 1998). Throughout the Pacific Northwest, the commercial building sector consumes about 25% of the region's electricity and is the fastest growing sector for electrical consumption.

Early in 2002, the Northwest Energy Efficiency Alliance (Alliance) conducted market research to assess current business practices, market barriers and opportunities to improve commercial building operating performance (Schick 2002). The current market can best be described from three perspectives: the building owner or manager's, the utility's and the service provider's. Results from this research indicate the following:

- *Building Owners/Managers:* Although concerned about energy costs, building owners and managers are generally unaware of the potential to improve operating performance.

- *Utilities:* Utilities generally recognize the potential energy savings from improvements in building operations. However, these savings opportunities are viewed as more risky than capital improvement projects, where they have traditionally focused their efforts.
- *Service Providers:* While service providers see an opportunity to sell additional or enhanced services, they face a number of significant barriers. The largest is a lack of credibility with building owners and managers who are skeptical of new services offered by the same providers they know make their primary income off equipment sales.

These three perspectives indicate that, while there is acknowledgement of a significant opportunity to improve building operating efficiency, there is currently no clear path to take advantage of this opportunity for either suppliers or purchasers. Further, because the current market is fragmented and lacks common definitions for similar services, there is a need to simplify existing choices and to present these choices in a logical sequence.

In addition, the Alliance's market research identified the following key market barriers:

- lack of tools to sort through the current building stock and prioritize which buildings are most likely to benefit and which are not;
- lack of a clear process for identifying specific opportunities within a building and linking those to specified products or services;
- inability of service providers to capture the opportunities through current products and services, apart from a small niche market for retro-commissioning; and
- lack of a connection between improved efficiency and the business objectives of the building decision-makers.

The Alliance's research concluded that a market structure supporting better building operating performance could 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.

## Building Performance Services Overview

In August 2002, the Alliance's Board of Directors approved funding for the Building Performance Services (BPS) initiative. This initiative targets medium- and large-sized commercial buildings with complex heating, ventilation and air conditioning (HVAC) systems, as well as energy management and control systems (EMCS).

The long-term goal for the BPS initiative is to develop a market structure that successfully promotes and supports enhanced building operating performance through attention to these systems. The Alliance and the BPS sponsors recognize that it will take a sustained market transformation effort to achieve this goal. In the near and intermediate terms, key activities that support this long-term goal include infrastructure development, a building performance services test, and a larger scale pilot with identified regional sponsors. All activities will be conducted as a partnership between the sponsors and service providers (i.e., mechanical service contractors, control system companies, equipment manufacturers and commissioning

agents), building on current relationships and what has been accomplished in the market. Long-term indicators of success include:

- Building owners and managers who value, demand and expect better building operating performance
- Service providers and in-house facility staff who are capable of delivering better building operating performance

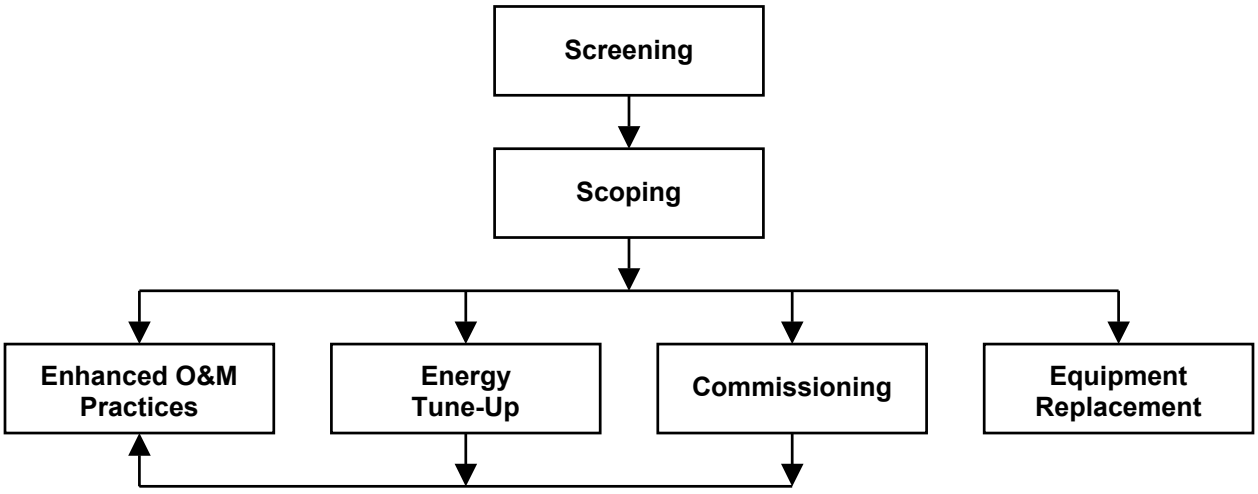
The BPS infrastructure development phase has been completed with the publication of the *Building Performance Services Implementation Toolkit* (Alliance 2004), which provides service definitions, delivery process descriptions and support tools for sponsors and service providers to use when implementing BPS. Currently, the Toolkit is only available to sponsors and service providers who are participating in the test phase.

The second phase, a test of the BPS approach as defined in the Toolkit, is now underway with sponsorship from the Energy Trust of Oregon, Inc. and three Puget Sound area utilities – Puget Sound Energy, Seattle City Light and Snohomish County PUD. A select group of service providers is also participating.

The third phase, the BPS pilot, will take what is learned in the test phase, update the Toolkit and then offer BPS to utilities, public benefits administrators and service providers throughout the Northwest region. During this pilot phase, the Alliance expects to gain valuable experience that will aid in the development of a full-scale market transformation effort.

The BPS approach is comprised of five service activities: Screening, Scoping, Enhanced O&M Practices, Energy Tune-Up and Commissioning. Figure 1 illustrates these activities and their relationships to one another. [Note: Equipment replacement, while not a part of BPS, is necessary when building equipment and systems are obsolete and no longer function adequately, or when physical modifications can result in significant financial benefit. Under the BPS test phase, candidates for equipment replacement will be referred for analysis to existing technical assistance and financial incentive programs, if available.]

**Figure 1. BPS Activities Flow Diagram**




The five BPS activities can be divided into the following two categories: *Building Selection and Technical Sales* (Screening and Scoping) and *Follow-on Service Activities* (Enhanced O&M Practices, Energy Tune-Up and Commissioning).

## Building Selection and Technical Sales

### Screening Process

Screening identifies buildings that are likely to benefit from improvements to operating performance. The two most important aspects of Screening are determining if there are practical opportunities to improve building operating performance and assessing the interest and capability of the property owner and their staff in taking action. If a utility or public benefits administrator does not want to do its own screening, then the Toolkit provides BPS guidelines for service providers as well. Screening does not result in a recommended service path, but it does provide good leads with a basic data set for follow-up during the scoping process.

Initial data collection and analysis to identify buildings with technical potential includes examining energy-use intensities, fuel type, meter type, major energy-consuming system and equipment types, and building size and use. This information can be gathered from a variety of sources and staged to avoid unnecessary data collection and analysis.

Development of key metrics and benchmarks can provide a means for comparing buildings to identify the best candidates for BPS. In particular, benchmarking is an important screening method that can be used to identify commercial buildings that have comparatively high energy use. The Toolkit provides a summary of eleven benchmarking tools that are applicable to the Pacific Northwest region.

Assessment of the interest of the property owner, manager and facility staff can be handled through a phone conversation or a meeting. Interviews are used to evaluate ownership commitment, internal decision-making practices, the interest level and skills of facility staff, and investment criteria. The interviews can be accomplished through use of structured questions designed to assess a customer's interest and their ability to take action.

The outcome of Screening is a recommendation on whether or not to proceed with Scoping. Screening provides the person doing the scoping with data for specific buildings, along with an idea of how the energy use of the building compares to regional norms for the building type. The Toolkit provides recommendations on how to present the data in a useable format, including scales, ratings and threshold criteria. Initial positive screening criteria for a candidate building include:

- size greater than 100,000 square feet;
- electric use greater than 1,000,000 kWh/year;
- relatively high EUI;
- in a targeted business sector;
- facility with known operational problems or high energy usage;
- management highly receptive to BPS; and
- owner with a history of efficiency investments.

Other factors may indicate that a particular building should be referred for analysis to existing technical assistance and financial incentive programs rather than to BPS. Examples include inefficient lighting, full pneumatic control systems or major HVAC system components near end-of-life.

The last step of Screening is to pass on the accumulated information to the Scoping Agent. This package can include an annotated copy of an owner or operator screening interview guide, utility records, a screening summary form, and other relevant data and information.

**Scoping Process**

For high priority buildings, Scoping identifies technical opportunities through an on-site review and combines these findings with the owner or operator's business objectives to recommend an appropriate course of action to improve the building's operating performance. The Scoping Agent must develop a basic understanding of the building systems, the customer's expectations, the desired operating performance, any on-going problems already identified, existing operations and maintenance (O&M) practices and obvious training needs. Scoping determines the cost and identifies the appropriate level of follow-on BPS activity – Enhanced O&M Practices, Energy Tune-Up or Commissioning.

Scoping is a four-step process which includes: development of a site-visit action plan, an on-site review of the facility, a post-visit analysis of the data, and a customer presentation of the scoping results and recommendations.

The first step is to develop a site-visit action plan focusing on areas of major energy consumption within the building. The action plan provides direction to the Scoping Agent on areas of interest within the building. Development of an action plan consists of evaluating billing and other data provided by the screening process. Unusual usage, demand and other pertinent facts are noted and follow-up activities are included in the action plan for evaluation during the on-site review.

The on-site review of the facility focuses on examining the areas and data needs as outlined in the action plan. It includes examining the building's as-built drawings and sequences of operations, reviewing general operations and maintenance practices, completing a cursory review of the systems and equipment, interviewing facility operations and maintenance staff, and identifying and flagging potential problem areas within the facility.

The third step is the post-visit analysis of the data. This step roughly quantifies overall potential savings of the flagged problem areas and identifies the appropriate follow-on service activities. The intent is not to complete a detailed analysis for each of the problem areas identified, it is to identify and flag the areas within a facility that appear to be operating poorly, based on a comparison of end-use energy consumption with benchmark data for the Pacific Northwest as provided in the Toolkit. The identified problem areas may be very specific, such as "*poor economizer operation,"* or broadly characterized as "*the mechanical system operates 24 hours per day due to morning warm-up temperature issues*."

The last step consists of the development of a site-specific plan to present to the building owner or manager for approval. This plan must consider not only the technical potential, but also the owner's objectives when recommending specific BPS offerings. The final products for presentation to the building decision-makers consist of a brief technical Scoping Report (including recommended follow-on services and a scope of work) and a Service Activity Agreement (including a business proposition) summarizing this technical information. The Service Activity Agreement is a contract between the owner and the service provider, and outlines the requirements of both parties, including the owner's O&M staff.

## Follow-On Service Activities

There are three follow-on BPS activities: Enhanced O&M Practices, Energy Tune-Up, and Commissioning. Internal Alliance studies currently estimate that Enhanced O&M practices can provide 5% energy savings and the Energy Tune-Up (which includes Enhanced O&M Practices) will provide about 10%. Commissioning (or retro-commissioning) includes both

Energy Tune-Up and Enhanced O&M Practices and together these three BPS offerings can save up to 15% of the building's total energy use.

While the savings potential of each BPS offering is dependent on many factors, including building size and complexity, the Alliance has completed early estimates of cost, savings and market penetration for a cost-effectiveness analysis. As the BPS initiative continues to evolve, an independent evaluation contractor will track the BPS progress and help to re-evaluate the assumptions used for this cost-effectiveness analysis.

**Enhanced Operations and Maintenance (O&M) Practices**

Enhanced O&M Practices ensure that operating systems and equipment function in the most energy-efficient manner and includes actions to ensure the persistence of fixes made through the Energy Tune-Up and Commissioning service activities. With a focus on improving and sustaining operating performance, the Enhanced O&M Practices service provides a systematic look at certain aspects of current O&M activities, and identifies specific energy saving opportunities and enhanced management practices.

Building Performance Services O&M practices are referred to as "enhanced" because it is assumed that basic O&M service routines are already being performed. However, it does not assume that these basic routines are being completed properly; therefore, the first step is to review existing O&M practices to identify opportunities for improvement.

Through such a review, the O&M Service Provider can develop an Enhanced O&M Practices action plan directed at changing existing O&M routines to incorporate new practices. O&M activities that can be routinely performed by in-house facility staff will be discussed with them to obtain feedback and concurrence. For those O&M activities performed by outside service providers, the Toolkit offers detailed guidance for obtaining a *best practices* O&M service contract.

Recommended management practices to be included in an Enhanced O&M Practices action plan are as follows:

- revise or add preventive maintenance activities or new service contract provisions for affected equipment;
- revise or add equipment-specific documentation of service and technical requirements, including diagrams and drawings;
- institute whole-building energy tracking/benchmarking strategies;
- create a training plan and schedule for the in-house staff needed to successfully implement the revised O&M practices; and
- develop a time frame for moving forward, with six-month and one-year-after check-in points to review key actions.

The Toolkit currently has detailed guidelines for the following Enhanced O&M Practices:

- optimizing economizer operation;
- using extended surface area filters;
- trimming pump impellers;
- cleaning cooling coils;
- tracking equipment performance and optimizing time-of-day schedules (HVAC and lighting); and

- using utility bills and average daily energy consumption to track building performance.

As the BPS initiative evolves, additional enhanced practices will be added to the Toolkit.

**Energy Tune-Up**

The Energy Tune-Up service identifies and implements cost-effective operational changes that reduce building energy costs. The goal is to produce as much energy savings as possible through operational changes that require relatively small investments and can be accomplished quickly.

This service includes an examination of equipment and controls, discussions with building operators and diagnostic testing, which may include spot measurements and analysis of trend logs. Once these steps are complete, the Tune-Up Engineer should have all of the information and analyses needed to develop a compelling action plan for the decision-maker.

The Energy Tune-Up action plan recommends improvements that may be implemented by the building owner, by service providers already under contract to the owner, or by members of the Energy Tune-Up team. The preventative maintenance (PM) practices that are needed for the long-term maintenance of these improvements are also identified.

The Energy Tune-Up service addresses high priority problems in three categories: system and central plant equipment, air side HVAC equipment, and non-HVAC equipment. The Toolkit currently lists 26 problems with recommended improvements that can be addressed by the Energy Tune-Up service. Examples include:

1. Simultaneous heating/cooling
2. Equipment not shutting off as expected
3. Variable Air Volume (VAV) box damper not operating correctly
4. Supply air temperature reset control not operating efficiently
5. Automated lighting controls not operating as expected
6. Refrigeration head pressure controller malfunction

These problems are identified in case studies that describe the issue, explain how it is detected, propose a fix, and suggest a method for verifying that the problem has been corrected. The Toolkit also provides a guide for tune-up service providers, including advice on what types of measurements are needed and the diagnostic instruments to use.

**Commissioning**

Commissioning of existing buildings, or retro-commissioning, 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. Commissioning includes a structured testing and calibration of a building's energy-using equipment.

Given the time, effort and expense involved, 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. Examples include buildings that may have unusually high energy costs, an uncomfortable and/or unhealthy work environment, high maintenance bills or equipment that continually fails to reach life expectancy.

The BPS Commissioning service incorporates the critical commissioning attributes and elements identified by the Building Commissioning Association (BCA). The BCA considers specific attributes to be fundamental to effective building commissioning and requires that all members agree in writing to adhere to these attributes whenever they serve as a project's Commissioning Authority (BCA 1999). Specifically the Commissioning Authority (CA):

1. Must be an objective, independent advocate of the owner.
2. Must have current engineering knowledge, and extensive and recent hands-on field experience regarding:
    - building systems commissioning;
    - the physical principles of building systems performance and interaction;
    - building systems start-up, balancing, testing and troubleshooting;
    - operation and maintenance procedures; and
    - the building design and construction process.

Once the necessary support and funding for a Commissioning project has been obtained, the CA is ready to begin the process, consisting of the following phases: planning, investigation, implementation, and a hand-off that includes an Enhanced O&M Practices action plan.

The product of Commissioning is a building that has improved systems performance with all equipment operating optimally. The owner will receive a Commissioning Report documenting the steps taken to optimize the building's performance, coupled with findings and recommendations for ongoing O&M and future tune-ups or recommissioning.

## Building Performance Services Test Phase

The purpose of the BPS test is to determine the usefulness of the defined service activities, and to improve aspects of service delivery and the associated technical support tools contained in the *BPS Implementation Toolkit* prior to initiating a larger-scale pilot effort.

In September 2003, the Alliance began a BPS test phase with three utilities in Washington 's Puget Sound area. These utilities – Puget Sound Energy, Seattle City Light and Snohomish County PUD – represent about 21% of the electrical sales in the Pacific Northwest (Washington, Idaho, Montana and Oregon). In March of 2004, the test phase was expanded to include the Energy Trust of Oregon, Inc., with a focus on the Portland metropolitan area. In total, up to 25 commercial buildings will participate in this test. The BPS test is targeted for completion by the end of 2004. Some of the challenges experienced during the first six months of the BPS test phase include:

### Sales Challenge

Selling BPS to prospective customers is the responsibility of the sponsors and participating service providers. BPS Screening and Scoping activities are technical support functions to the sales process. Throughout the sales process there are opportunities for the service provider and customer to interact and exchange information. With regard to the sales process, the following market perceptions have been observed**:**

- A robust sales effort begins with service providers that view BPS as an opportunity to expand service offerings to their customer base and increase revenues. Expanding

business models to incorporate these new business opportunities requires a significant commitment on their part. Some do not see the business opportunity as that important, while others may see the opportunity as very important, but lack the resources needed to move forward.

- Customers are often unaware of the opportunity to improve building operating performance, and are suspicious of service providers selling BPS. They view the service providers as equipment vendors who are primarily interested in selling capital projects.
- Customers may think that they are already paying for operating performance through their existing service contracts. However, these contracts are usually for maintaining equipment operation, not for optimization. It is a challenge to explain the distinction to customers. In some instances, the services associated with their existing contract may have been oversold.

Responses to the Sales Challenge include:

- Encouraging and assisting service providers to embrace the BPS business proposition. The business proposition centers on creating long term business relationships with customers and expanding business offerings to meet a wider range of customer needs associated with operating and maintaining their buildings. Activities such as an Energy Tune-Up may not create significant revenue for the service provider, but will create significant value for the customer and change their perceptions about the business relationship with service providers. It is an avenue for service providers to make further in-roads into partnering with customers on building operations, not just maintenance. More robust service contracts can become the norm, and when capital project opportunities arise, the service provider will be a natural first choice for the customer.
- Validating BPS services through sponsor support. BPS sponsors can play an important role in validating the BPS opportunity with customers. Customers view the local utility as a trusted source for information and the creditability they have with the customer has been an important part of moving BPS projects forward.
- Informing building owners and managers about different types of O&M service contracts. Highlight the distinctions between basic maintenance contracts and those that address operating performance. The Toolkit includes a guide to help building owners and managers develop best practice service contracts. This guide also outlines potential O&M contract provisions.
- Informing building owners and managers about ENERGY STAR®, which provides excellent tools and resources; e.g., *Guidelines for Energy Management* (US EPA).

**Scoping Challenge**

Scoping is intended to provide only enough technical and financial detail to obtain a commitment for the follow-on service activities from the facility decision-maker. With regard to Scoping, the following challenges have been observed:

- There can be a tendency to go too far with Scoping; incurring significant technical costs before the customer has committed to moving forward. This can put significant dollars at risk and result in fixes that are inappropriate given further scrutiny. By paying for Scoping under the BPS test, the market discipline associated with treating Scoping as a

technical sales function, and minimizing the cost involved, is not as strong as it would be if the service provider had to absorb this up-front cost and recoup it through the provision of follow-on services.

- Service providers have limited BPS-type Scoping experience and expertise, and often have a capital project mindset. Given that identifying and promoting capital projects is the business model they are most experienced and comfortable with, low cost O&M and tune-up opportunities can be overlooked or given less priority.
- A well-defined customer commitment process is needed for moving forward. Customers must be confident that when their resources are committed (in dollars, staff time, or both), return on investment expectations will be met. Since Scoping identifies areas of opportunity, but not specific fixes, the challenge is to provide a business structure for moving forward that customers are comfortable committing to, which allows follow-on service diagnostics and fixes to be made.

Responses to the Scoping Challenge include:

- Offering scoping-specific training and professional development opportunities to service providers. Under the BPS test, the Alliance is providing some direct Scoping assistance to service providers and their staff. Over the longer term, the Alliance is conducting a more deliberate assessment of the professional development needs of service providers, and will instigate further development and availability of training opportunities to fulfill these needs.
- Providing an example agreement to assist the parties in moving the BPS process forward. The Toolkit contains an example Letter of Agreement (LOA) between the customer and service provider. The LOA identifies appropriate follow-on service activities, establishes the customer's willingness to take action, and outlines the business parameters for the provision of services. BPS test experience will be used to improve this instrument as a means of establishing the initial business relationship between the customer and the service provider.

**Service Delivery Challenge**

With a focus on improving and sustaining building operating performance, service providers are responsible for delivering enhanced O&M services, energy tune-ups and comprehensive commissioning services. With regard to service delivery, the following challenges have been observed:

- Service providers say they are capable of offering more robust service options given the opportunity. However, BPS-type services are not generally included in the range of current options, and due to the lack of demand, most service provider staff have limited skills and experience to perform these services. This can result in a tendency for service providers to fall back into existing business practices, focusing on equipment sales and capital projects.
- There can be a lack of emphasis on enhanced O&M opportunities, including O&M management practices and specific O&M actions. These responsibilities are usually shared between in-house staff and service providers, with service providers often

responsible for maintenance, while in-house staff operate the building systems and equipment.

- In-house staff believe they are already routinely performing O&M actions. However, these practices do not necessarily improve or sustain operating performance, and in many facilities, O&M routines are not given the priority they deserve. In these situations, it is easy for the in-house staff to be uncooperative and feel defensive about their current practices.

Responses to the Service Delivery Challenge include:

- Helping to promote the business proposition associated with BPS throughout the service provider's organization to counter the tendency to fall back on old business practices. This includes discussing and demonstrating how a focus on enhanced O&M practices can result in more robust O&M service contracts and a corresponding shift in customer perspective about the nature of the relationship, resulting in more business opportunities over time.
- Providing professional development opportunities for service providers and customer in-house O&M staff. The Alliance is in the process of assessing BPS-related professional development needs of service provider staff. In the Education and Training section of the Toolkit, a number of excellent training programs for in-house staff are identified. In particular, the Building Operator Certification (BOC) curriculum offers in-house O&M staff a well-defined approach to improve their job skills and performance.
- Positioning BPS as an opportunity for facility managers and staff to take appropriate action towards improving operating performance. This includes acknowledgement of the fact that in-house staff are usually not given the tools, resources, training and support needed to significantly improve building operating performance.

## BPS Pilot Phase

The BPS pilot phase will build on the experience and results of the BPS test. The BPS pilot will include up to eight sponsors and approximately 175 medium- and large-sized commercial buildings throughout the Pacific Northwest. The objectives associated with the BPS pilot include:

- Increase building owner/operator interest and awareness of the potential to improve building operating performance.
- Integrate BPS into service provider business activity; increase their capability to sell and provide services.
- Increase facility in-house staff interest and capabilities to improve operating performance and enhance existing O&M routines.

The BPS pilot will inform future Alliance efforts to further encourage market-based solutions to improve commercial building operating performance. The Alliance expects to continue to play a role in stimulating demand for BPS-type services and supporting BPS-type service offerings to achieve the desired market effects.

## Acknowledgments

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