

Commissioning in Public Buildings:

Market Progress Evaluation Report

prepared by

Quantum Consulting Inc.

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NORTHWEST ENERGY EFFICIENCY ALLIANCE

COMMISSIONING IN PUBLIC BUILDINGS PROJECT

FINAL MARKET PROGRESS EVALUATION REPORT

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TABLE OF CONTENTS

		PAGE
1	EXECUTIVE SUMMARY	
	1.1 Project Background	1-1
	1.2 Evaluation Overview	1-1
	1.3 Evaluation Results and Recommendations	1-2
2	PROJECT INFORMATION	
	2.1 Project Description	2-1
	2.2 Implementation History	2-2
	2.5 Program Activities	2-2
3	EVALUATION INFORMATION	
	3.1 Evaluation Goals and Questions	3-1
	3.2 Evaluation Methodology	3-3
4	EVALUATION FINDINGS	
	4.1 Evaluation Of Use Of Case Studies	4-1
	4.2 Assessment of Effects of Program Participation	4-7
	4.3 Market Assessment	4-9
	4.4 Review of Cost-effectiveness Assumptions	4-17
5	CONCLUSIONS	5-1

LIST OF EXHIBITS

EXHIBIT	TITLE	PAGE
1	Project Theory	2-3
2	Evaluation Overview	3-1
3	Sample Frame	3-4
4	Case Studies by Building Use and State	4-1
5	Participant Satisfaction with the Program	4-7
6	Participant Policies	4-9
7	Non-participant Perceptions	4-11
8	Non-participant Policies	4-13

APPENDICES

	TITLE	
A	Summer 2004 memo	A-1
B	Survey Instrument -- Nonparticipant	A-4
C	Survey Instrument - Participant Follow-up	A-8

1. EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND

The Commissioning in Public Buildings Project seeks to make commissioning standard practice in public buildings in the Northwest (Oregon, Washington, Idaho and Montana). It is a multi-year effort, launched in 1998 and running through calendar year 2004. Until 2004, the project was coordinated across the four-state region by the Oregon Department of Energy (ODOE – formerly the Oregon Office of Energy, OOE), the Alliance’s prime contractor. ODOE’s subcontractors included the Washington Department of General Administration (GA), the Idaho Department of Water Resources (IDWR), and the Montana Department of Environmental Quality (DEQ). In 2004, individual contracts were executed with each of the four organizations. Specific objectives of the project include:

- Educating facility and project managers, administrators, and business managers on the benefits of commissioning
- Demonstrating commissioning and analyzing results
- Adoption of state requirements and model policies for commissioning for local government facilities and schools
- Disseminating commissioning results and model policies, including case studies describing the costs and benefits associated with the demonstration projects.

The Commissioning in Public Buildings Project was originally scheduled to end at the end of 2003. However, developing the case studies took much longer than expected – not only because of the need to take projects through a long-term construction or retro-commission process before a case study could be developed, but also because of issues in estimating the costs, energy savings, and other benefits from commissioning. Because the case studies were not available as marketing tools until late 2003/early 2004, the Alliance extended the contract for one year and provided additional funding averaging about \$20,000 per state to support the state staffs’ marketing of the case studies and to provide technical assistance when requested by clients.

1.2 EVALUATION OVERVIEW

This document is the last of four market progress evaluation reports (MPER) for the Commissioning in Public Buildings Project. The overall goal of the evaluation is to determine the extent to which the project has been successful in achieving its stated goal of making commissioning standard practice in public buildings. The current, final MPER focuses on the education and marketing activities that have taken place since the case studies documenting the demonstration projects have become available. The overall evaluation conclusions about the program have not changed significantly since the third MPER. These are described in Section 5.

Specific activities undertaken for this MPER to support the evaluation's goals include:

- 1) an evaluation of the state efforts to use case studies and related information to promote policies and guidelines supporting commissioning.
- 2) an assessment of the effects of program participation on agencies that participated in the demonstration projects, including changes in agency policy or standard practice, additional buildings commissioned, and satisfaction with both the commissioned building and the commissioning process.
- 3) documentation of developments in the commissioning market since the project was launched, with a focus on the extent to which policies have been developed and adopted or are being considered by public agencies
- 4) a review and analysis of the assumptions driving the Alliance's cost-effectiveness calculations for this project.

Data collection methods for this project were generally similar across analysis tasks, and relied heavily on document review and qualitative interviews, with input to the market evaluation also coming from surveys. In all, surveys or interviews were conducted with more than 50 respondents for this evaluation, distributed as shown below.

Sample Frame

State	Program Staff	Public Agencies		Total
		Parts.	Non-parts	
Oregon	2	5	13	20
Washington	1	6	12	19
Idaho	2	3	4	9
Montan	1	3	4	8
Totals	6	17	33	56

1.3 EVALUATION RESULTS AND RECOMMENDATIONS

Overall, the Commissioning in Public Buildings Project has made significant progress toward its goal of making commissioning standard practice in public buildings in the PNW. Despite active and persistent efforts by program implementation staff in all four states, that progress has been uneven, however, which is not surprising in light of the differences in infrastructure, customer receptivity, and overall market conditions. The following are the conclusions of this evaluation:

- In Washington, the goal of market transformation appears to be well on its way to being achieved with respect to new building commissioning in public buildings. While commissioning is not yet truly standard practice, there are a number of indicators of momentum in that direction:
 - a large population of commissioning providers
 - a high level of awareness of commissioning and relatively low perceived barriers among non-participants
 - sector- and agency-specific policies and guidelines
 - state codes that, while not requiring the level of commissioning promoted by the Alliance, nonetheless familiarize the owner, designer, and contractor communities with the concepts of functional performance testing, documentation, and other aspects of commissioning
 - effective use of case studies and other media to expose a wide audience to commissioning benefits
 - development of a self-sustaining commissioning program serving the public sector.
- Oregon, too, has made significant progress toward making commissioning widely accepted, but it does not appear to be as close to achieving the critical mass needed for self-sustaining change in the market.
 - The availability of SB 1149 funds for schools that carry with them a requirement for the commissioning of energy efficiency projects valued at greater than \$50,000 (for controls) and \$100,000 (for HVAC systems) has raised the visibility of commissioning in the public sector, created business opportunities for providers, and generated a great deal of interest among school districts.
 - The cost of commissioning new buildings in Oregon is eligible for a tax credit equal to 35 percent of the cost, including the commissioning agent's fee, engineering fees to develop commissioning specifications, and the test and balance agent's fee.
 - One-on-one meetings with local officials who have new construction plans offer an effective means of delivering the case studies where they will have the greatest effect. In addition, the Oregon Department of Energy offers commissioning policy templates, the Building Commissioning Association-approved "Building Commissioning Handbook," and information on other available resources.
 - The strong interest in green building in Oregon offers opportunities to tie commissioning in with LEED certification as more public agencies establish policies that require or encourage meeting specific LEED standards. The higher levels of LEED (silver and, especially gold and platinum) require rigorous commissioning.
 - As is the case in Washington with the building code, Oregon's State Energy Efficient Design (SEED) program may make more owners and others aware of functional performance testing, but (also like the Washington Code) it lacks the critical element of third party testing and verification that would more effectively promote commissioning.

- Oregon barely missed passing a revision to the state energy code that would have required commissioning; proponents will try again at the next code revision cycle with improved code language that accommodates most of the concerns expressed previously by the building industry and code enforcement officials.
- In Idaho and Montana, the market for new building commissioning clearly lags several years behind those of Washington and Oregon.
 - In Montana, a weak economy limits overall new construction activity and opportunities for new building commissioning. On the plus side, there have been gains in incorporating commissioning into planning budgets for some major new construction projects, and the state enjoys a local pool of commissioning providers who gained extensive experience on the Alliance demonstration projects as well as through the Rebuild Montana program (part of Rebuild America), and who offer very cost-effective commissioning services. In addition, commissioning was included as a line item for all new construction projects included in the state’s Long Range Building Plan. The Architecture/Engineering Division, which is responsible for all new construction on state facilities, commissions almost all retrofits of existing state buildings with complex controls systems, energy retrofit projects, and new buildings with integrated controls and HVAC systems to assure systems operated to meet standards and codes. Although funding influences the size of scope and number of buildings, the state’s new head mechanical engineer is a proponent of commissioning for both new and existing buildings, which may provide opportunities to develop future commissioning guidelines and policies.
 - In Idaho, the virtual absence of local commissioning providers limits the opportunity for market transformation. While the demonstration projects have created a small group of enthusiastic commissioning advocates, the lack of infrastructure suggests that any progress in making commissioning business as usual will be at least several years in coming. A positive achievement was the Division of Public Works (DPW) recommending commissioning on all state building projects over \$1 million.
- Throughout the region (including Washington), retro-commissioning is far less established than new building commissioning.
 - Knowledge levels are lower and perceived barriers higher among participants and non-participants alike, especially since there are two financial hurdles that need to be cleared: funding the initial study and funding the implementation of the findings.
 - Even where the benefits of retro-commissioning are recognized, projects proceed on an *ad hoc* basis as funding becomes available
 - Based on a survey of non-participating public agencies in all four states, market penetration of retro-commissioning appears to be less than 5 percent per annum (13 of 33 agencies interviewed planned to retro-commission a total of 51 buildings over the next two years, out of a total building stock of more than 900 buildings) – far less than the critical point needed to transform the market.

- For both Idaho and Montana, retro-commissioning may still offer a relatively effective way to overcome the extreme price sensitivity and cost concerns of school districts, towns and counties, and other agencies in those states. To the extent that small-scale energy efficiency initiatives can open the door to more ambitious commissioning efforts, this approach may yield results over the longer term. In the near term, however, these markets remain far from transformed.
- Five of nine participants interviewed who had commissioning policies or guidelines in place said their policies and guidelines had changed since their program participation.
- Finally, given the relatively modest changes in the number of public sector agencies that have implemented permanent changes in policies and guidelines over the past two years of the Commissioning in Public Buildings Project, it does not appear that additional funding of a dedicated commissioning project would significantly move the market in the near term.
 - In Washington, where the infrastructure exists to properly use additional funds, evolution of the market is likely to continue on its own precisely because of the infrastructure that has been built.
 - Conversely, the states where the most additional progress is needed (i.e., Idaho and Montana) would need a much larger infusion of resources because they do not currently have a permanent, non-Alliance funded mechanism to systematically support commissioning, appear to have a lower level of awareness and interest among public agencies, and have fewer commissioning providers than Washington and Oregon.
 - Oregon appears to be somewhere between these two extremes. On the one hand, existing programs (SEED and SB 1149) and an adequate supply of qualified providers help ensure continued commissioning activity, while potential changes in code could lead to wider-reaching adoption. On the other hand, while agencies have access to substantial resources to support their commissioning efforts, there is no formal program in place that provides the kind of turn-key solution less experienced agencies might require, and the agency with primary responsibility for state construction projects has been unenthusiastic about commissioning.

2. PROJECT INFORMATION

2.1 PROJECT DESCRIPTION

This document is the final formal market progress evaluation report (MPER) of the Northwest Energy Efficiency Alliance's (the Alliance's) Commissioning in Public Buildings project¹. The Commissioning in Public Building project seeks to make commissioning standard practice in public buildings in the Northwest (Oregon, Washington, Idaho and Montana). It is a multi-year effort, launched in 1998 and running through calendar year 2004.

The project is being coordinated across the four-state region by the Oregon Department of Energy (ODOE - formerly the Oregon Office of Energy, OOE), the Alliance's prime contractor. ODOE's subcontractors include the Washington Department of General Administration (GA), the Idaho Department of Water Resources (IDWR), and the Montana Department of Environmental Quality (DEQ). Initially, the project also included a subcontract with the Building Commissioning Association - Northwest (BCA-NW) to promote the establishment of an association of commissioning providers. As BCA-NW grew in size and scope (it has since become a national organization and dropped the NW suffix), the subcontract with BCA was rewritten as a direct contract between BCA and the Alliance.

Specific objectives of the project include:

- Educating facility and project managers, administrators, and business managers on the benefits of commissioning
- Demonstrating commissioning and analyzing results
- Adoption of state requirements and model policies for commissioning for local government facilities and schools
- Disseminating commissioning results and model policies

¹ Previous evaluation reports for this project:

Building Commissioning Practices in New Construction and Existing Building Markets in the Pacific Northwest, SBW Consulting, Inc., October 1998, Alliance Report #E98-017

Enhanced Baseline Assessment of Public Building Commissioning in the Pacific Northwest, Quantum Consulting, Inc., June 1999, Alliance Report #E99-032

Market Progress Evaluation Report, Commissioning in Public Buildings, No. 2, Quantum Consulting, Inc., December 1999, Alliance Report #E99-042

Market Progress Evaluation Report, Commissioning in Public Buildings, No. 3, Quantum Consulting, Inc., February 2003, Alliance Report #E03-107

2.2 IMPLEMENTATION HISTORY

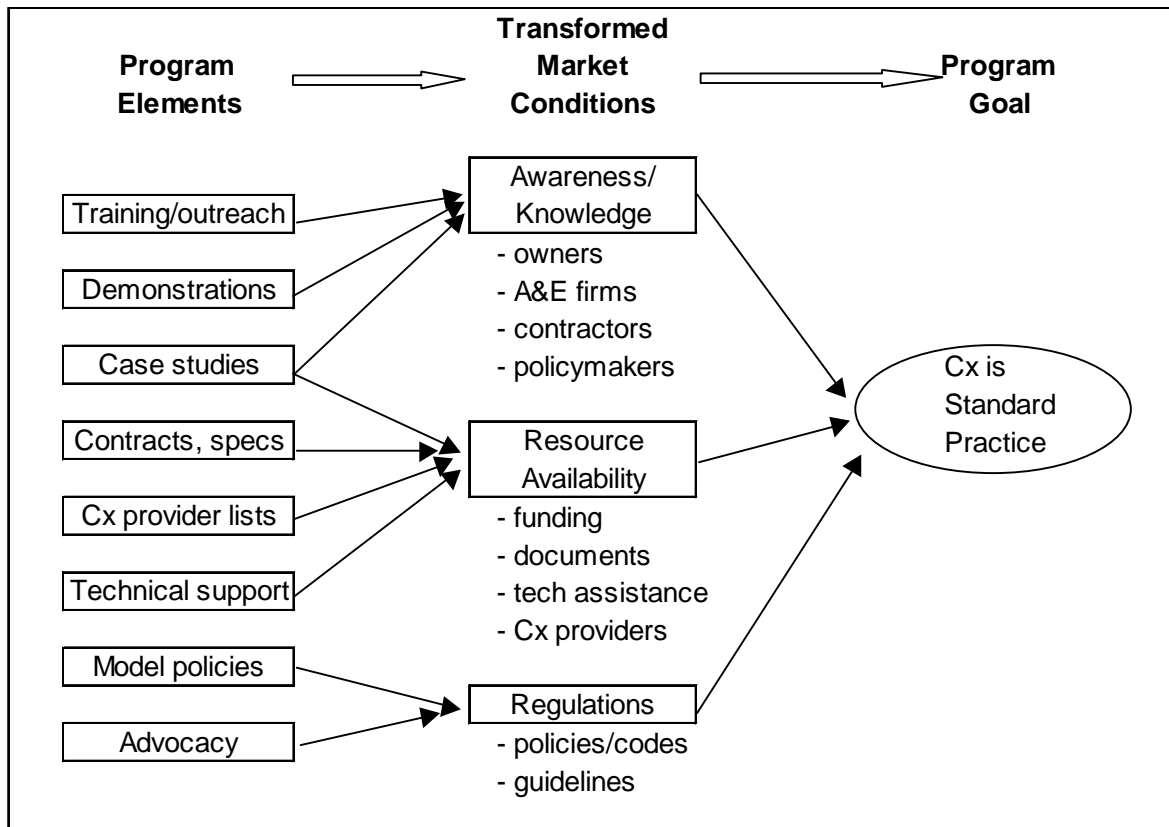
This project was first proposed to the Alliance in 1997 by OOE to address public building commissioning in Oregon only. Given the relatively large scope and resource requirements (\$1.5 million) of the proposed project, the Alliance Board decided that the project would be more appropriately implemented as a multi-state venture that would cover all of the geographic area served by Alliance member utilities. OOE solicited participation from appropriate agencies in Washington, Idaho, and Montana, and a revised proposal was approved by the Alliance Board in early 1998. While OOE originally proposed a five year project and the Alliance recognized the need for a longer term approach to the inherently lengthy public building process, uncertainty regarding the Alliance's own future funding led the Commissioning in Public Buildings project to be approved with a December 2000 end date.

In July 2000, the Alliance Board approved an additional \$615,000 to extend the project through 2003, with funding designated for developing case studies, documenting the benefits of commissioning practices and disseminating the results. Unfortunately, a number of issues regarding the calculation of both energy and non-energy benefit delayed the development of the case studies, with the result that they were not available for dissemination until the end of 2003. The Alliance therefore provided limited additional funding to cover only the dissemination of case studies and other marketing activities through 2004. Funding was not intended to support continuation of the demonstration projects and other commissioning activities that were the focus of most of the program.

2.3 PROGRAM ACTIVITIES

The overall approach to market transformation taken by the Commissioning in Public Buildings project is illustrated in Exhibit 1.

*Exhibit 1
Commissioning in Public Buildings Project Theory*



Program elements and activities were designed to bring about changes in market conditions – notably increased awareness and knowledge of commissioning, increased availability of resources to implement commissioning, and a policy/regulatory framework that supports commissioning – that ultimately lead to commissioning being standard practice in the public sector. To bring about these changes in the market, the Commissioning in Public Buildings project employed elements that were among those identified as potentially effective by public sector representatives contacted for the baseline study. Key elements include:

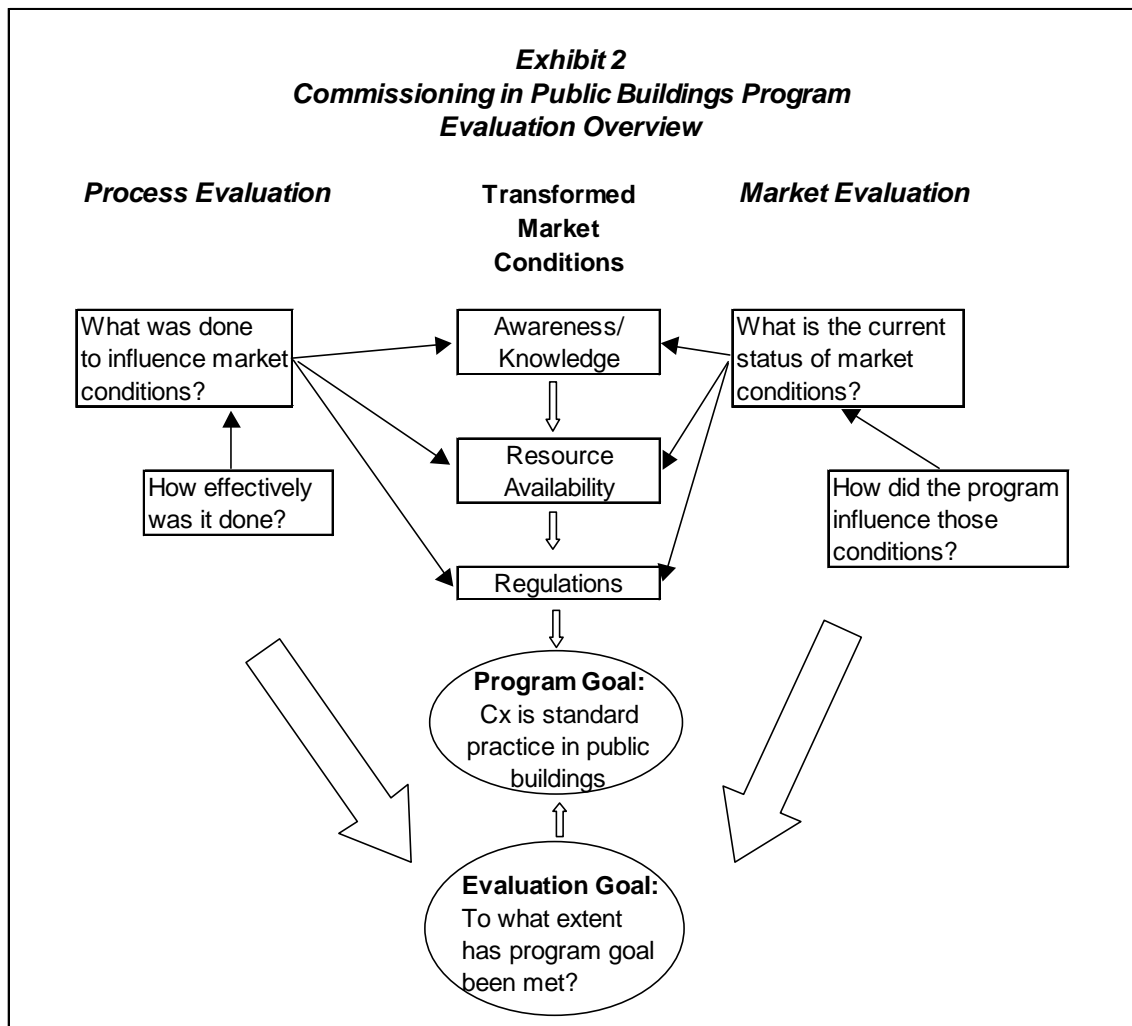
- Demonstration projects/case studies – OOE and its subcontractors selected a number of state and local government buildings to demonstrate and refine the commissioning process for new facilities and, as appropriate, for existing buildings. The process and its results were documented, analyzed, and incorporated into case studies to be published and distributed across the region.

- Technical Assistance – As public agencies went through the commissioning process for the first time, the project provided technical assistance, either through on-staff specialists or an advisory contractor.
- Model policies – All four state agencies have developed model policies requiring new and retrofit buildings to be commissioned. These policies can either be used as-is by an agency or adapted to the organization’s specific needs. Idaho and Montana have also compiled and published “best practices” documents and Oregon and Washington have published guidelines to capture lessons learned in past commissioning efforts.
- Education and training – While OOE’s Statement of Work for the project cited as an objective “educate facility and project managers, administrators, and business managers on the benefits of commissioning,” this was not called out explicitly as a task or activity of the project. Nevertheless, a number of the states either provide education and training as part of the project or incorporated training from other sources to promote the aims of this project.
- Financial assistance to help cover the cost of commissioning – To help encourage agencies to commission their buildings, the states covered a portion of the cost of commissioning for the demonstration projects. The remaining costs were covered by the participating agency or by funds from another source.

3. EVALUATION INFORMATION

3.1 EVALUATION GOALS AND OBJECTIVES

The purpose of the evaluation of the Commissioning in Public Buildings Project is to determine the extent to which the project has been successful in achieving its stated goal of making commissioning standard practice in public buildings. As shown in Exhibit 2, the evaluation is designed to assess both what was done to influence the market conditions targeted by the project (process evaluation) and to what extent those market conditions have changed (market evaluation.) In other words, the evaluation objectives are to document project activities, analyze the effectiveness of these activities, and make recommendations to improve both the effectiveness and the efficiency of the project in achieving its goals and objectives.



The current, final MPER focuses on the marketing activities that have taken place since the case studies documenting the demonstration projects have become available. The case studies have always been considered a core element of the information dissemination effort that would help transform the market. Unfortunately, developing the case studies took much longer than expected – not only because of the need to take projects through a long-term construction or retro-commissioning process before a case study could be developed, but also because of issues in estimating the costs, energy savings, and other benefits from commissioning. The net effect is that the case studies were not available as marketing tools until between late 2003 and early 2004.

Ending the contract on schedule at the end of 2003 would have meant that there was no systematic effort to disseminate the case studies that had taken so long to develop. Recognizing the importance of at least some level of marketing to ensure that the case studies reached their intended audience and served their intended purpose, the Alliance provided funding that would allow the states to keep the marketing of case studies “on their radar” through 2004. Specific indicators of progress cited by the statements of work for the individual states included the development of policies or guidelines requiring commissioning, either statewide or by individual state agencies, and the use of outreach and education efforts to demonstrate benefits and reduce the uncertainty for public agencies to adopt commissioning as standard practice.

It should be noted, however, that the 2004 contract extensions were just that – extensions that would allow the states to follow up the development of case studies with some kind of marketing effort – rather than full-scale contracts that would support the development of new initiatives. The level of funding provided by the Alliance for marketing activities in 2004 was relatively low, averaging less than \$20,000 per state. As a result, the program of marketing support appears to have been most successful where it served as an added resource to other commissioning activities, notably in Washington, where GA has launched a stand-alone commissioning program. All the other states have other energy-efficiency related efforts that the Commissioning in Public Buildings Project can link to (e.g., Rebuild American in Idaho and Montana, SB 1149 and SEED in Oregon), but none of those deal directly with commissioning the way GA’s program does in Olympia.

Specific activities undertaken for this MPER to support the evaluation’s goals include:

- 1) an evaluation of the state efforts to use case studies and related information to promote policies and guidelines supporting commissioning.
- 2) an assessment of the effects of program participation on agencies that participated in the demonstration projects, including changes in agency policy or standard practice, additional buildings commissioned, and satisfaction with both the commissioned building and the commissioning process.
- 3) documentation of developments in the commissioning market since the project was launched, with a focus on the extent to which policies have been developed and adopted or are being considered by public agencies
- 4) a review and analysis of the assumptions driving the Alliance’s cost-effectiveness calculations for this project.

3.2 EVALUATION METHODOLOGY

Data collection methods for this project were generally similar across analysis tasks, and relied heavily on document review and qualitative interviews, with input to the market evaluation also coming from surveys.

Document Review

Review and analysis of the “paper trail” for each aspect of the project helps provide a thorough understanding of how the project is being implemented and can contribute valuable insights into the effectiveness of program delivery. For this evaluation, document review comprised not only monthly progress reports, but also commissioning reports for individual projects, draft case studies, marketing plans, web sites and other materials.

Qualitative Interviews

Qualitative interviews formed the heart of the data collection process. The relatively small number of market actors makes traditional sampling and quantitative analysis difficult, at best. We believe we have made the best possible use of interviewer time by developing an informal “panel” of a core group of market actors with whom we have established an ongoing relationship, including staff members of ODOE and its subcontractors, commissioning authorities, and various state agencies. These market actors have been contacted over the life of the project, are familiar with the evaluation and its objectives, and have been willing to provide objective input regarding what happened as well as their own perceptions regarding why things happened. In addition to questions relating directly to the project, interviews with these key players covered developments in the broader market, including the level of commissioning activity, the supply of commissioning providers, and the status of regulations or other requirements for various levels or commissioning.

Surveys

Telephone surveys were conducted with representatives of public sector agencies not participating in the Commissioning in Public Buildings Project, with the goal of determining to what extent the non-participant agencies have adopted commissioning practices. A total of 33 telephone surveys across all four states were completed with representatives of non-participating agencies. The surveys included questions regarding the number of buildings commissioned in the recent past, the respondents’ own knowledge of new building commissioning and retro-commissioning, and their perceptions regarding specific barriers to its use.

Sample

In all, interviews or surveys were conducted with more than 50 respondents for this evaluation, distributed as shown in Exhibit 3.

Exhibit 3
Sample Frame

State	Program Staff	Agencies		Total
		Parts.	Non-parts	
Oregon	2	5	13	20
Washington	1	6	12	19
Idaho	2	3	4	9
Montana	1	3	4	8
Totals	6	17	33	56

4. EVALUATION FINDINGS

The findings of this process evaluation are organized according to the key analysis tasks set forth in the evaluation work plan and described in Section 3.1.

4.1 EVALUATION OF USE OF CASE STUDIES

Case studies are a focus of this MPER because they are the focus of the final phase of the Commissioning in Public Buildings Project and the main reason the project was extended for a year. It was the goal of the project, and of individual marketing plans developed by the states, to inform public sector decision makers and thereby help transform the market. By early 2004 the project had developed a total of 24 case studies from the 33 demonstration projects, distributed across states, building types, and new and retro-commissioning as shown below.

*Exhibit 4
Case Studies by Building Use, Cx Type and State*

Building Use/Type	New Cx				Total New	Retro Cx				Total Retro	Grand Total
	OR	WA	MT	ID		OR	WA	MT	ID		
K-12 School	1				1	1	4	1		6	7
Office	1		1	1	3	1			1	2	5
Community/Tech College		3			3		1			1	4
University Facility	1			1	2			1		1	3
Corrections Facility		2			2					0	2
Library/ Museum		1			1					0	1
Hospital/Health Lab		1			1					0	1
Military					0			1		1	1
Totals	3	7	1	2	13	2	5	3	1	11	24

The case studies comprise a variety of building types, but are dominated by schools, offices, and colleges and universities. The large proportion of higher education facilities of all kinds in the case studies reflects their position at the forefront in the adoption of commissioning in the Northwest. Since new construction for state universities and community colleges usually goes through the same process as new construction for other agencies (e.g., through GA in Washington and DPW in Idaho), one would expect substantial spillover to other state construction projects.

In addition to the case studies shown here, both Washington and Oregon offer case studies on their web sites that were not the result of the demonstration projects – providing at least some indication of changes in the market outside the program. The extent to which non-participants have seen or remember the case studies was investigated in the non-participant survey, discussed in Section 4-3.

Case Study Marketing Overview

As described in the previous MPER, each of the states developed a plan for disseminating the case studies, a process that required several iterations and consultation between the state program managers and the Alliance. The resulting marketing plans had several elements in common, with all setting forth specific steps to be taken to disseminate the case studies, such as direct mailings, attendance/participation at regional conferences, and use of the internet. All of them also identified key positions in organizations that would be targeted by the case studies. The plans were less specific on how follow-up contacts would be made, who would make them, and how these contacts might lead to the changes in policy that are the ultimate goal for the Commissioning in Public Buildings Project.

Since the initiation of the marketing phase of the project, the states have used different approaches to publicize the case studies. All have made them available over the internet, both directly on their own websites and through links to the Alliance's BetterBricks website. At least initially, however, the web-based marketing of the case studies was less than effective, primarily because of expired links and inaccurate contact information on some of the individual websites. A memo prepared by Quantum Consulting in July 2004 (see Appendix A) detailed the difficulty of finding some of the case studies on the state web sites and identified a number of links/contacts that had not been updated. The websites have since been updated, and the case studies for each state are now accessible from their home page with a modest number of clicks.

The broad outline of the previously developed marketing plans formed the basis of the statements of work for the final 2004 program year contracts with the states. As noted previously, however, there was no intent to hold the states strictly to the letter of previously developed plans; instead, the final year was seen as an opportunity for the states to use the newly developed case studies in the most effective way possible to transition out from Alliance funding. As described below, the states used a variety of methods to disseminate the case studies, from one-on-one meetings and seminars to mass mailings and article placements.

Project Status by State

Discussions were held with each of the state program coordinators to review the approach to marketing the case studies. Overall, there appears to be a clear ranking of the states with regard to the extent of progress made: Washington leads, followed by Oregon, with Idaho and Montana significantly farther behind. One rough indication of the current status of Cx in each of the states is provided by the number of BCA member practitioners in each state listed on the BCA website (excluding associate and owner members).

- Washington has 53 members in 34 companies
- Oregon has 14 members in 8 companies
- Montana has 4 members in 3 companies
- Idaho has only a single member

In the remainder of this section, the marketing experience of individual states is discussed.

Washington

In Washington, the Commissioning in Public Buildings Project Program Manager (PM) says GA is using the Alliance contract to support marketing activities that it would otherwise be unable to conduct. Specifically, GA has used the money to develop several additional case studies and to market the case studies it has already developed. The marketing involves participation at regional conferences and trade shows (for example, the Northwest Plant Engineering and Facilities Maintenance Shows in Olympia and in Portland, as well as GA's own trade show in Seattle in November) and at Building Operator Certification classes, as well as placement of ads and case-study-based stories in "Shop Talk", a regional newsletter read by public sector facilities managers in the Northwest, Utah, and British Columbia. An article on commissioning by the Yelm School District was included in the fall issue of Shop Talk, and another one being developed for State Office Building 2 will be included in the winter issue.

Most of GA's marketing of the case studies has directed readers to the GA commissioning website, where all the studies can be downloaded. The PM believes this is more convenient for the target audience than a direct mail effort, and also exposes them to the other Commissioning-related services offered by GA. Several Commissioning providers are also using the links to the case studies in their marketing.

The case studies are part of a broader ongoing Commissioning effort that GA continues to pursue. At the end of October 2004, GA's for-fee Commissioning service had nine projects ongoing, in addition to five that had already been completed. There are also 30 projects being managed by GA that are undergoing Commissioning at the end of November 2004, up from 15 at the end of 2003. More are expected in 2005 as the number of construction projects grows. Despite these gains, however, the GA PM estimates that the percentage of GA projects being commissioned is still slightly less than half.

GA is also planning a Governor's Energy Conference in May of 2005 for GA clients and other state entities, with 3-400 attendees expected. (The WA Energy Office used to do these in the early 90s, but stopped when the Energy Office was dissolved.) Commissioning will be prominently featured at the conference, with one or more commissioning providers likely to speak.

Oregon

In Oregon, a direct mailing consisting of case studies and a cover letter was sent to a number of agencies, school districts, and colleges in early September 2004. While the cover letter did not require a specific action, it did ask recipients to contact ODOE for further information. A review of the mailing list shows that approximately 140 of the case studies went to school districts, 8 went to community colleges, and about 30 went to local government officials. As of December 2004, the mailings had not generated a significant response.

The Oregon Department of Energy Project Manager for the Commissioning in Public Buildings Project is also working to promote commissioning through other channels. In light of the relative lack of interest from direct mail, one-on-one meetings are being held with decision makers from a number of the second-tier cities. The ODOE PM contacted the Oregon League of Cities to identify those cities and towns with significant construction projects planned in the coming years, and has subsequently contacted a number of those cities to hold face-to-face

meetings. Examples include Bend, Medford, the Dalles, and several smaller towns. In all, nine meetings have been conducted or planned. To date, Medford has shown the greatest interest; the city has several new construction projects planned and has indicated a desire to commission those. City representatives also say they plan to retro-commission at least one building, and have asked ODOE to consider offering a "Commissioning 101" course that would introduce project managers, designers, and others to the commissioning process.

Another opportunity in Oregon comes from SB 1149 Public Purpose Funds. These public benefit funds are made available to school districts to make energy efficiency improvements in schools, and the SB 1149 program requires commissioning or retro-commissioning for the following energy related capital projects:

- All HVAC and/or Direct Digital Control capital projects exceeding \$50,000
- All boiler and chiller capital projects exceeding \$100,000
- Any other energy related (e.g., lighting and lighting controls, building envelope) capital projects exceeding \$150,000.

Eight commissioning firms have been qualified by the ODOE to perform commissioning services for schools. In addition, ODOE held a series of seminars for school districts in September where the commissioning process and the procedures required for the 1149 program were explained.

Idaho

In Idaho, where a new Idaho Department of Water Resources (IDWR) manager recently took over the management of the Commissioning in Public Buildings Project, it appears that the marketing effort currently has little momentum. The IDWR program manager laments the lack of resources in light of the very major marketing effort that he believes is needed. IDWR stated that, because of its budget process, marketing of commissioning could not begin in earnest until the first of July (the start of a new fiscal year), and the limited budget supports only modest outreach activities. The Idaho case studies have been on the web for some time, and all the organizations who participated in those projects are strong advocates of commissioning, but there does not seem to be much momentum to the commissioning marketing effort. The IDWR PM sees minimal value in mass marketing the case studies, noting that in Idaho, "a handshake and a smile plus a cup of coffee will go a lot farther than a mass marketing; and eyeball to eyeball is much better than a phone call." While he is excited about the long-term prospects for commissioning, he does not see the 2004 marketing effort as the finishing touch to the project.

The best prospects for making headway in the Idaho market, according to the PM, will be found by focusing on retro-commissioning. He points out that retro-commissioning can be done with operating (rather than capital) funds, which are controlled by the same people who have to live with the building, rather than those who are responsible only for construction. Moreover, many buildings can benefit from retro-commissioning, which also offers a relatively quicker payback in terms of energy savings than does new building commissioning.

Idaho invited the Building Commissioning Association (BCA) to make a presentation in Meridian, near Boise, to educate owners and others about the commissioning process. According to a promotional flier, the seminar offered "A look at the process, basics and benefits

of building commissioning for those who are responsible for buildings that work the day you open the doors and continue to perform throughout the life of the building. Also, the seminar will look at the process, basics and benefits of commissioning existing buildings to improve and sustain their total performance. "It drew approximately 20 attendees to a 5-hour session hosted by BCA Technical Director John Heinz, with presentations by representatives of two of the three case study buildings in Idaho. According to the IDWR PM, the presentations were very well received by an audience comprising school districts as well as representatives of state, county, and municipal government. The PM sees the next logical steps as seminars targeted to design engineers and architects. A partnership with Idaho Power is also being pursued.

Despite these successful, but limited, marketing and training efforts, the Idaho market clearly has a long way to go to in making commissioning standard practice. On the one hand, there is significant interest in commissioning from architects and others who are looking for LEED certification for their buildings or participation in the Efficient Schools program. In addition, the state government has a guideline recommending that all buildings over \$5 million should be commissioned – although this is a guideline, not a requirement. On the other hand, there are very few local commissioning providers, and there is ongoing reluctance from school districts, local governments, and others to "pay extra" for commissioning.

Montana

In Montana, the Department of Environmental Quality Project Manager (PM) for the Commissioning in Public Buildings Project is facing problems similar to Idaho's in his efforts to leverage the case studies. While availability of providers has not been a problem, the ongoing concerns about first cost and the generally poor Montana economy continue to act as barriers to the acceptance of commissioning. The DEQ PM feels that the case studies are valuable in demonstrating that commissioning has a track record, but they are not enough to overcome the inherent resistance at the typical MT public entity. He has been working with the Montana League of Cities and Towns, The Montana Association of Counties, and the Office of Public Instruction to get articles and case studies into their newsletter. He has also taken the case studies and promoted commissioning at several conferences (Montana Association of Counties, Montana League of Cities & Towns, and Montana Society of Healthcare Engineers Spring 2004 Conference), but received little in the way of positive response (the attendees that were most interested, he noted, were from Idaho and Wyoming). The BCA seminar by John Heinz (Technical Director of BCA) hosted by Montana in Helena was well-received and was attended by 17 people, including engineers, architects, building owners, accountants and a representative of the Department of Housing and Urban Development (HUD).

One possible reason response has been less than expected may be that the legislature is scheduled to convene in January, and there are some major issues on the docket regarding how schools are funded, which creates uncertainty regarding the availability of funding for commissioning activities. Another reason for the modest response may be that the cost associated with commissioning at the level described in the case studies is prohibitive for most state and local government agencies – including schools -- in Montana.

Because of this, Montana (like Idaho) appears to be favoring a gradual approach that emphasizes the quicker, relatively lower cost savings available from retro-commissioning. The PM believes it makes more sense to start small; he wants to build ongoing relationships with

building owners and managers that let him start with a no-cost basic energy usage analysis, then introduce gradually higher levels of sophistication to energy management tailored to the operational needs and budget constraints of the building owner. Building owners are made aware that retro-commissioning could be more encompassing if desired; for example, commissioning through the Montana Rebuild program for buildings undergoing major renovations was successfully promoted to start with the design intent and continue through completion of the retrofit. Building owners who are unable to commit the necessary funds to commissioning are offered alternative approaches, including energy use analysis and help with tailoring O&M contracts for energy-related energy operational issues that the facility staff was not able to address.

One area that may hold promise in Montana is to incorporate commissioning into the use of performance contracting by schools and public agencies. Enabling legislation is slated to make performance contracting an option for agencies and school districts for 2005. Commissioning can then be incorporated into the mix of services provided through a performance contract. An opportunity may also exist in multi-family housing operated through HUD, since there is a push from DOE to promote EnergyStar for multi-family housing. Again, however, the Montana PM emphasizes the need for a low-cost, gradual approach - particularly a focus on operational systems and controls rather than the whole building.

Despite some areas where the market may be receptive to commissioning, this is clearly a long-term effort rather than a final marketing push to make the best use of the case studies, and given the limited budget and time frame, it is not surprising that more extensive progress has not been made.

4.1.5 Conclusions from Case Study Marketing

First, it should be clear from these summaries that every state had a different approach to marketing, and that they had various degrees of success. Overall, it appears that Washington has had the greatest success in using the marketing funds in the way they were envisioned -- as resources to ensure that the case studies are made available to a broad audience of potential users who can use them to make decisions to proceed with commissioning or to seek additional information. It clearly helps that GA has its own commissioning program in place, and that the program manager has time available to spend on commissioning from internal funding sources. In addition, there are numerous commissioning providers in Washington who appear to be using the case studies in their own marketing efforts.

The other states do not have that same infrastructure. There are guidelines requiring commissioning for certain sizes and type of projects on the books in Oregon, Idaho, and Montana, but there does not appear to be the same critical mass of owner interest, regulatory pressure, and ongoing public funding that makes the case studies "leveragable" as a marketing tool. As a result, it appears that using only limited resources to support marketing of commissioning can be effective only when there is a robust infrastructure already in place to support the marketing effort.

Second, a common goal for all the activities laid out in the marketing plans earlier in the project and implemented in 2004 was to encourage the adoption of policies and regulations by state agencies that would irreversibly make commissioning standard practice, yet it is was in

this goal that the states were most likely to fall short. All the states actively disseminated information about commissioning, and, as noted below, a relatively high level of awareness of the case studies was attained among non-participants across all four states. Yet the number of concrete policies in place requiring commissioning remains limited.

We believe that a fundamental reason for the failure to encourage more policy changes is that the people responsible for implementing the Commissioning in Public Buildings Project are not – and cannot be expected to be – lobbyists or public finance specialists. Yet such specialists are precisely what would be needed to bring about policy changes, since changing policies requires extensive contact with higher level decision makers who are not normally concerned with building energy usage; that is, they are not the audience that state program managers would typically – and comfortably – interact with. Moreover, Washington’s GA is explicitly prohibited by its own regulations from promoting changes in policy, and the final statement of work for GA had to be modified to take out references to policy changes as an indicator of market progress.

The Alliance budgeted for a public budgeting/finance specialist to work with the states to influence policy-oriented decision makers, but this plan was abandoned when no one with the correct qualifications could be found to take the position. In future efforts to transform markets through changes in policy – whether for new building commissioning, retro-commissioning, or other practices – the Alliance should recognize the need to address a different audience from the one targeted by the initial education/information effort, with a corresponding change in the orientation of the people who are reaching out to the higher level decision makers capable of making policy decisions.

4.2 ASSESSMENT OF THE EFFECTS OF PROGRAM PARTICIPATION

In a series of follow-up telephone calls, 17 program demonstration site participants were asked about their experience with the Commissioning in Public Buildings Project, as well as about their overall knowledge and perceptions of commissioning. We were particularly interested to see if participants had, as intended by the program, commissioned additional buildings on their own or changed their agency’s policies regarding commissioning.

On average, participants were satisfied with most aspects of program participation, as shown in Exhibit 5.

Exhibit 5
Participant Satisfaction with Cx in Public Buildings Program

How satisfied are you with:	Mean Value
The commissioning agent who performed the commissioning	3.9
The amount of support you received from the program or state staff	4.2
The cooperation of the general contractor with the commissioning process	3.5
The cooperation of specialty contractors with the commissioning process	3.2
The performance of the building after it was commissioned	3.9
The amount you learned about commissioning by participating in the program	3.8
The overall experience of commissioning a building through the program	4.2

* On a 1 to 5 scale, where 1 means not at all satisfied and 5 means very satisfied

Specifically, participants gave the highest ratings to the support they received from the state and program staff and to the overall experience of commissioning a building through the program. They were only slightly less satisfied with the commissioning agent, the performance of the building, and the amount they learned about commissioning. Several participants noted the quality of building performance compared to un-commissioned buildings, and one who gave the building a low performance rating said that commissioning had been invaluable in helping his agency identify and rectify problems that resulted from poor design.

The fact that agencies learned about commissioning through their participation is confirmed by the ratings respondents gave when asked how familiar they are with new building commissioning. Participants gave an average rating of 4.2 on a 1 to 5 scale, where 1 is not at all familiar and 5 is very familiar. As discussed in section 4.3 below, this is higher than the comparable 3.8 rating for non-participants, although the difference is not statistically significant.

Participants had undertaken 40 new construction, renovation, and major retrofit projects totaling almost 3 million square feet since their participation in the program. Of those, they commissioned 29 projects totaling 2.3 million square feet. In addition, participants have plans to start commissioning on about 25 new projects over the next two years, or about 70 percent of the new projects they plan to initiate. This additional commissioning activity on such a large proportion of new buildings is a strong indication that one of the market transformation goals of the program - i.e., that participants commission additional projects outside the program - has been met.

As perceived by participants, the most serious obstacle to new building commissioning is still the cost, which was cited by 9 of the participants. Most of the others said they really didn't see any major obstacles - which seems to be verified by their intention to do a significant amount of new building commissioning over the next several years.

Respondents were less familiar with retro-commissioning. In total, participants said they had retro-commissioned 10 buildings since their participation in the demonstration project - an

average of .67 per agency. When asked how familiar they are with retro-commissioning, participants gave an average rating of 2.9 on a 1 to 5 scale, slightly lower than the 3.3 rating for non-participants – although the difference is not statistically significant. One reason for the lower number may be that some of the participants interviewed were not at all technically oriented -- for example, a school superintendent and a library director – while most of those contacted for the non-participant survey were building and facilities managers who would have at least an awareness of retro-commissioning.

When asked an open-ended question about the greatest barrier to retro-commissioning, 11 of the 15 who offered answers said cost was the biggest hurdle. Others either cited the cost of implementing findings or lack of information as the greatest obstacle to overcome.

In an effort to determine whether participation had led to any changes in policy, participants were also asked to select the statement that best described their agency’s approach to both new and retro-commissioning. Results are summarized in Exhibit 6.

Exhibit 6
Participant New Building and Retro-commissioning Policies

Commissioning Policy	Participants (16)	
	New	RCx
We have a policy requiring Cx on new buildings	25.0%	0.0%
We have guidelines that recommend but do not require Cx/RCx	31.3%	0.0%
We have no policy or guidelines, but usually Cx new buildings/RCx as needed	12.5%	25.0%
We do whatever Cx/RCx is required by state building code	25.0%	37.5%
We sometimes Cx/RCx buildings	6.3%	18.8%
We rarely or never Cx/RCx buildings	0.0%	18.8%
Don't know	0.0%	0.0%

Over half of the participant (9 of the 17) interviewed said they either require or recommend commissioning on new construction projects, and none said that they rarely or never commission new buildings. (It should be noted that several participants had done no other building projects since their participation and were not planning any in the foreseeable future.) Participants were also asked if their policies had changed since their program participation, and five of the nine with policies and guidelines said they had changed. Comments included:

- We've adopted a sustainability policy and we have adopted internal administrative procedures to provide for commissioning
- On that building we did it at the end of the project - now our outlook is that it should be done immediately
- The city has now adopted commissioning as being a requirement
- We are requiring more commissioning now
- We didn't have any guidelines before

As shown in the exhibit, participants had no policies with regard to retro-commissioning, and were much more likely to say they only commissioned rarely, sometimes, or as required by the state building code.

In summary, participants appear both to have learned about new building commissioning through the Commissioning in Public Buildings Project and to have used what they learned to develop new policies and guidelines. Little of this appears to have carried over to retro-commissioning, however.

4.3 MARKET ASSESSMENT

One of the goals of this final MPER was to determine whether the changes in the marketplace sought by the Commissioning in Public Buildings project have occurred and, if so, to what extent the project has influenced those changes. Evidence for market transformation was collected and analyzed both through document review and through interviews and surveys with program team members, participants, and non-participating agencies. While much of this evidence is qualitative, some quantitative data were gathered using the surveys of non-participants described in Section 3 of this report. As noted in the Methodology section (Section 3.2), the surveyed non-participants included a sample of 33 decision makers at agencies in other states who were contacted by telephone.

Survey results are presented in Exhibit 7. Note that the overall results mask significant differences among the responses from individual states. While results at the state level are from far too small a sample to be statistically significant (most obviously so for Montana and Idaho), they are generally consistent with the qualitative evidence collected through document review and interviews. The survey instruments for non-participants are included as Appendices B and C to this report. The results presented here for 2004 can be compared to the results of a survey with the same questions conducted in the fall of 2001, allowing us to assess the extent to which these key indicators have changed over the past three years. It should be noted, however, that because of the relatively small sample sizes, only large differences in values between 2004 and 2001 (or between states) will be statistically significant.

Exhibit 7
2004 Non-participant Perceptions -- Mean Values

	2004					2001
	OR (n = 13)	WA (n = 12)	ID (n = 4)	MT (n = 4)	AI (n = 33)	AI (n = 30)
New Building Commissioning						
How familiar with new building Cx*	3.9	4.1	3.8	3.0	3.8	3.3
Importance of obstacles to new Cx**						
Obtaining funding	3.1	2.4	4.3	2.8	2.9	3.2
Finding providers	2.0	2.0	3.0	1.5	2.0	2.2
Managing the process	2.5	1.5	3.3	2.5	2.2	2.3
Getting all parties to accept	2.8	1.8	3.5	2.8	2.6	2.9
Concerns about delays	2.3	2.0	3.3	2.5	2.3	2.0
Percentage rating obstacles 4 or 5						
Obtaining funding	38%	18%	75%	50%	38%	50%
Finding providers	15%	10%	50%	25%	17%	10%
Managing the process	18%	0%	33%	50%	18%	13%
Getting all parties to accept	36%	0%	25%	0%	17%	23%
Concerns about delays	17%	0%	50%	0%	13%	10%
Retro-Commissioning						
How familiar with retro-Cx*	3.8	2.8	3.8	2.8	3.3	2.9
Importance of obstacles to retro Cx**						
Obtaining funding	3.6	3.6	3.5	4.3	3.7	3.5
Finding providers	2.2	2.3	3.3	2.8	2.5	2.1
Managing the process	2.5	2.0	3.0	2.3	2.5	2.3
Obtaining implementation funding	3.4	4.0	4.3	4.3	3.8	3.7
Percentage rating obstacles 4 or 5						
Obtaining funding	55%	50%	50%	100%	57%	60%
Finding providers	18%	17%	25%	25%	19%	10%
Managing the process	20%	0%	0%	25%	16%	10%
Obtaining implementation funding	40%	63%	100%	100%	62%	53%

* On a 1 to 5 scale, where 1 means not at all familiar and 5 means very familiar

** On a 1 to 5 scale, where 1 means not at all significant and 5 means very significant

4.3.1 Survey Results -- New Building Commissioning

Of the 33 agencies surveyed, 14 reported having commissioned a new building, addition, or major renovation in the past two years. Out of a total of 85 new projects, the number of projects commissioned totaled 55, comprising 1.95 million square feet. However, this total includes 21 projects (350,000 square feet) for which the agency did what the respondent described as “modified” commissioning, which he defined as “putting the systems to reasonable operational posture, based on how they were designed.” Excluding these 21 projects would make the percentage of projects commissioned by non-participants 40 percent, which is statistically significantly less (at the 90 percent confidence level) than the 73 percent of projects commissioned by 18 program participants.

Overall, representatives of public agencies not participating in the project gave a mean response of 3.8 when asked to rate their familiarity with new building commissioning on a 1-to-5 point scale – up from 3.3 in 2001. Respondents in Oregon and Washington both reported greater familiarity with new building commissioning than did those in Idaho and Montana. None of these differences is statistically significant at the 90 percent confidence level, however.

Mean values for the perceived importance of various barriers to new building commissioning declined from 2001 to 2004 for all barriers except concerns about delays. While these results, along with anecdotal evidence, suggest that barriers to new building commissioning have generally declined, none of the differences is statistically significant at the 90 percent level. The one statistically significant finding is that the percentage of respondents assigning a 4 or 5 rating to the barrier posed by obtaining funding is significantly higher than the percentage assigning such a rating to any of the other four barriers.

Washington, in addition to the lowest perceived barrier for cost, also had the lowest mean barrier ratings for managing the process, getting all parties to accept commissioning, and concerns about delays. Moreover, Washington had the lowest percentage of respondents offering a 4 or 5 rating for each of the 5 barriers, with none of the Washington respondents assigning a 4 or 5 to managing the process, getting all parties to accept commissioning, or concerns about delays.

Among other states, Oregon respondents generally had somewhat higher perceived barriers across the board. In particular, there were greater percentages of respondents who provided 4 or 5 ratings for each of the barriers investigated. There were too few responses to meaningfully analyze the results for Idaho and Montana separately, but taken together they appear to have had more customers who assigned high significance to the barriers. For example, 5 of the 8 respondents in the two states gave 4 or 5 ratings to the significance of the funding barrier.

To determine whether the marketing efforts discussed in Section 4.1 had in fact created awareness of the case studies, respondents were also asked about their familiarity with any case studies describing the benefits of commissioning. Almost two-thirds of the non-participants interviewed recalled seeing the case studies, indicating that the marketing efforts were successful in this aspect of raising awareness. Of the 21 respondents who recalled seeing case studies, 17 said they knew which buildings had been discussed and 4 were actually able to name a building.

4.3.2 Survey Results -- Retro-Commissioning

Six agencies stated that they had retro-commissioned a total of 32 buildings in the past two years, for an average of 1.0 per respondent. This compares to 0.8 in 2001 – not a statistically significant difference. Over the next two years, 13 agencies said they planned to retro-commission a total of 51 buildings, for an average of 1.7 per respondent, compared to 0.7 in 2001. It is not clear whether the greater number of retro-commissioning projects planned than executed in the past two represents growing recognition of the value of the process or just wishful thinking. Note that these 51 buildings represent approximately 6 percent of the 938 buildings owned by these agencies.

Mean levels of reported familiarity with retro-commissioning were lower than for new buildings, but higher than they were in 2001; none of the differences were statistically significant, however. Similarly, while the mean values for the perceived significance of all four barriers to retro-commissioning increased from 2001 to 2004, these differences also were not statistically significant.

Compared to new commissioning, barriers to retro-commissioning for respondents overall were higher across the board -- presumably because fewer agencies had experience with the latter (14 had commissioned new buildings; 6 had retro-commissioned) . In all of the states at least half the respondents assigned a 4 or 5 rating to the difficulty of obtaining funding to conduct retro-commissioning, while all of the Idaho and Montana respondents assigned a 4 or 5 to securing funding for implementation of recommendations. Again, neither the differences between new and retro-commissioning barrier levels nor the differences among states were statistically significant because of the small sample sizes. However, the percentage of all respondents assigning high ratings to the two funding-related barriers were significantly higher than the percentage assigning such ratings to the other two barriers (finding providers and managing the retro-commissioning process), indicating that costs remain a formidable barrier to retro-commissioning.

4.3.3 Changes in Policy

Results of the survey reinforce the more qualitative findings from interviews and discussions with other market observers that new building commissioning in particular is becoming more widely known and accepted in the public sector. As in 2001, when asked to give definitions of commissioning, most owner representatives provided answers that included words like systematic, performance testing, and documentation, indicating that the basic concept is well understood. Many owners also cited policies, guidelines, and standard practices for their agency, as discussed further below.

Respondents were asked to select the statement that best described their agency’s approach to both new and retro-commissioning. Results are summarized in Exhibit 8.

**Exhibit 8
Non-Participant New Building and Retro-commissioning Policies**

Commissioning Policy	New	RCx
We have a policy requiring Cx on new buildings	21.2%	0.0%
We have guidelines that recommend but do not require Cx/RCx	15.2%	0.0%
We have no policy or guidelines, but usually Cx new buildings/RCx as needed	27.3%	27.3%
We do whatever Cx/RCx is required by state building code	6.1%	15.2%
We sometimes Cx/RCx buildings	9.1%	12.1%
We rarely or never Cx/RCx buildings	18.2%	33.3%
Don't know	3.0%	12.1%

Note that more than 36 percent of respondents said their agency had either a policy or guidelines supporting new building commissioning, while none of the agencies had a policy or guidelines for retro-commissioning. The greater acceptance of new building commissioning is

further highlighted by the fact that only 18 percent (5 respondents) said they rarely or never commissioning new buildings, while one third said they never or rarely retro-commission.

For new building commissioning, lower percentages of non-participants than participants reported having policies or guidelines (56 percent for participants, as shown in Exhibit 6, versus 36 percent for non-participants – a difference that is statistically significant at the 80 percent confidence level, but not at the widely accepted 90 percent level). However, neither participants nor non-participants had policies and guidelines for retro-commissioning.

Of the seven non-participant agencies that reported having a policy requiring new building commissioning, four were in Washington, two were in Idaho, and one was in Oregon. Washington and Oregon were the only states with guidelines that recommend but do not require new building commissioning. It is difficult to determine the impact the Commissioning in Public Buildings Project had on the development and implementation of these policies; agencies were more likely to describe policies and guidelines as externally imposed requirements, such as the Washington state requirement that schools be commissioned, but the program may have had indirect influence on those requirements as well.

As discussed below, Washington has incorporated a “commissioning-like” requirement into its building code. To assess non-participant awareness of this requirement, respondents were asked if they were aware of any code language that requires commissioning or similar activities for new buildings, and if so, what does it require? Of the 11 Washington respondents, only 4 said they were aware of any code language. Their descriptions of what was required included:

- I know that the legislature has considered that. Now the law requires us to do constructability reviews and value engineering and life cycle costs analysis.
- Any new building that has State funding is required to be commissioned by a third party.
- If a school district is utilizing State funding the requirement is to use commissioning of projects 50,000 square feet or more for new buildings and retrofits.
- The Washington Administrative Code requires it for State matching funds.

These responses confirm what the GA Project Manager observed: that the Washington building code has not done much to promote commissioning. More significant influences have been:

- LEED certification, with LEED Silver now recommended for state buildings in Washington.
- Required commissioning by an independent authority for a school board to receive matching funds from the Office of the Superintendent of Public Instruction (OSPI) on any project over 50,000 square feet.

Several changes in policy and standard practice reported in the previous MPER are still valid as the project comes to a conclusion, particularly those that relate to commissioning of new or remodeled buildings. Taken together, these changes represent significant progress toward

making commissioning standard practice. Changes in individual states are discussed briefly below.

In **Washington**, non-binding guidelines call for commissioning of all new construction projects managed by the Department of General Administration (which is responsible for projects for most state agencies and community colleges in the state) that have a value of more than \$5 million². While this is a guideline rather than a policy, several of the agency representatives we spoke to appear to perceive this as a requirement, and expect that commissioning will be standard practice for all their new construction projects.

The State of Washington has also amended the non-residential building code to require commissioning reports be provided to owners for both public and private sector buildings. While the merits of this change in the code have been debated and it clearly does not constitute a requirement for true building commissioning, it can be argued that the new code will lead to greater awareness of design review, functional performance testing, and other aspects of commissioning. The new code does not appear to have had a significant affect on the market thus far, however.

In addition, a 2002 Washington executive order on sustainability announced a generic effort to reduce use of resources and promote sustainable design and construction for state buildings. While the order did not directly address commissioning, it has increased interest in energy efficiency and LEED buildings – which should lead to greater emphasis on commissioning. Legislation passed in 2000 made LEED silver the recommended target for new state buildings, which has also contributed to making commissioning standard practice.

The Washington Administrative Code also calls for commissioning of all K-12 school buildings. Specifically, commissioning by an independent authority is required for a school board to receive matching funds from the Office of the Superintendent of Public Instruction (OSPI) on any project over 50,000 square feet; from 15-50,000 square feet, commissioning is optional.

Finally, GA has established a program to support state agencies who want to commission projects. The program, which grew out of GA's experience on one of the demonstration projects where the owner asked for additional GA assistance, provides a one-stop commissioning solution. To date, there have been more than a dozen projects that either already through or involved in commissioning through the program, and several others have expressed an interest. To the extent that it provides a relatively easy mechanism for public agencies to incorporate commissioning into their new construction projects, this program is consistent with the exit strategies set forth for the Commissioning in Public Buildings project by providing a self-sustaining framework for commissioning to become standard practice.

In **Oregon**, there is no single agency that plays a pivotal role in new construction comparable to GA in Washington, DPW in Idaho, and the A/E Division in Montana. In Oregon, most state construction projects are controlled by the Department of Administrative Services, whose management has not been receptive to commissioning. As a result, even though ODOE has

² An important distinction among the state contractors is that only in Washington is the Alliance contractor a part of the agency that is responsible for new state construction projects. This puts them in a more favorable position to communicate with state construction managers and, potentially, influence state projects.

developed and made available model commissioning policies that individual agencies may use, changes in policy and practice must be achieved one agency at a time. The state does, have the State Energy Efficient Design (SEED) program requiring all state new construction projects to go through a review by DOE recommending cost-effective energy efficiency measures, including functional performance testing. While the recommendations are not binding and do not mention commissioning by name, they raise the visibility of functional performance testing and refer owners to BCA members as providers of those services. In addition, the cost of commissioning new buildings in Oregon is eligible for a tax credit equal to 35 percent of the cost, including the commissioning agent's fee, engineering fees to develop commissioning specifications, and the test and balance agent's fee

There are a number of agencies that have adopted commissioning as standard practice. Multnomah County, for example, has made commissioning standard on all its new buildings, and several community colleges and universities say that commissioning is now standard practice for their new construction projects. In addition, schools in Oregon served by two of the largest utilities, PGE and PacifiCorp, are also eligible for funding under the provisions of the state's Senate Bill 1149, which sets aside money for school energy retrofits. After an initial audit, schools can receive funding for cost-effective energy efficiency upgrades, and projects with a value greater than \$50,000 are required to be commissioned.

A proposed revision to the Oregon energy code introduced in 2002 that would have mandated commissioning of HVAC systems in new buildings as a code requirement – with specifics depending on the scope and sophistication of the HVAC system – was narrowly voted down, in part because of the poor new construction market at that time. The code language is likely to be re-introduced during the next code change cycle, with proponents confident that their improved version will address most of the concerns previously raised by the building industry and code enforcement officials.

Idaho's Division of Public Works (DPW) recommends commissioning on all state building projects over \$1 million. (Commissioning had been required on buildings greater than \$5 million and encouraged on projects from \$1-5 million, but this requirement was changed to a recommendation.) DPW also has what it calls a retro-commissioning policy, which consists of the guidelines for commissioning of existing buildings. Both sets of guidelines were developed by IDWR's technical support contractor for the Commissioning in Public Buildings project.

Several of the Idaho agencies participating in demonstration projects have become advocates of commissioning and adopted policies for its use.

- At Boise State University, commissioning is now routinely included in new building plans.
- Ada County passed a resolution on commissioning and sustainable building practices similar to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program.

In **Montana**, the relatively low level of new building commissioning activity largely reflects the low level of overall construction activity. As new construction increased, commissioning was included as a line item for all new construction projects included in the state's Long Range

Building Plan (LRBP). The A/E Division, which is responsible for all new construction on state facilities (universities, prisons, state offices, Fish & Wildlife, etc.), made commissioning a part of every project over \$4 million, and of some projects from \$1-4 million. Commissioning was slated for six projects with a total construction budget of \$34 million, with the commissioning authority included in the design review. Although this was in part due to the advocacy and influence of A/E's former mechanical engineer, the state's new lead mechanical engineer is also an advocate of commissioning for both new and existing buildings.

Given the recent departure of A/E's mechanical engineer, the question arises as to how much of that will continue in his absence. The Montana DEQ PM notes that commissioning for new construction projects is now promoted, but not required. However, the state's lead mechanical engineer at A/E continues to advocate commissioning for existing buildings with complex controls systems, those involved with funding for energy retrofit projects, and new buildings with integrated controls and HVAC systems.

4.3.4 Market Assessment -- Conclusion

Anecdotal evidence of increased commissioning activity in the Northwest is supported by survey results regarding past and planned commissioning projects: agencies that participated in the Commissioning in Public Buildings Project had commissioned a significantly higher percentage of non-program new projects over the past two years than non-participants. While survey results also suggest that familiarity with commissioning among non-participants appears to have increased and barriers to have decreased since 2001, none of these changes are significant at the 90 percent confidence level. Similarly, while agencies that participated in the project case studies were more likely than non-participants to have policies and guidelines in place calling for commissioning, the difference does not meet the criteria for statistical significance at the 90 percent level.

The Commissioning in Public Buildings Project does appear to have been successful in creating awareness of the commissioning case studies, which was one of the goals of the 2004 contract extension. Furthermore, since the start of the project more than five years ago, there have been a number of changes in policy and standard practice at agencies in all four PNW states, particularly with regard to commissioning of new or remodeled buildings. Most of these changes were described in the previous MPER, and there have been no major changes in policies and practices since then, although it is evident that the GA commissioning program in Washington continues to grow and assist more agencies in implementing commissioning projects. Taken together, these changes represent significant progress toward making commissioning standard practice. However, while the concept of commissioning is increasingly accepted, there are still barriers – particularly with regard to cost -- to implementation of the kind of thorough, independent third-party commissioning that is necessary for the full benefits of commissioning to be realized.

Across the Northwest, movement in the market toward making commissioning standard practice in the public sector has obviously been influenced by many factors, of which the Commissioning in Public Buildings project is just one. Others range from national initiatives such as the LEED program and Rebuild America to local utility programs; from state code changes like the one in Washington to the requirements of the Oregon SEED and SB 1149 programs. Although there have not been any large-scale efforts other than the Commissioning

in Public Buildings Project to systematically influence the practices of state and local agencies across the four-state area, a definitive causal link between the project and the observed changes in the market cannot be proven. It seems reasonable, however, to conclude that the project has had an influence on the changes observed.

4.4 REVIEW OF ALLIANCE COST-EFFECTIVENESS ASSUMPTIONS

Cost-effectiveness assumptions for the Commissioning in Public Buildings project are based on a review of 21 of the 33 demonstration sites by SBW, Inc., which developed some uniform rules for how to estimate costs and savings for commissioning measures³. The resulting “Commissioning in Public Buildings Cost-Effectiveness Analysis Key Assumptions” provide a basis for estimating program costs and benefit, including savings from increased market acceptance of new building commissioning and retro-commissioning.

The site-specific estimates of costs and savings appear to have been carefully calculated from the best available data, and the scope of this evaluation offers no additional insight that could be used to refine those estimates. However, some of the data collected for this MPER do provide information to address the assumptions regarding market acceptance. Specifically, market acceptance by 2010 is assumed to be 20 percent of the existing market and 11.6 percent of the new market. Our findings suggest that the new market acceptance is likely to be higher and the existing market acceptance lower.

- From the non-participant survey, respondents indicate that some 40 percent of new construction, renovation, and major retrofit projects undertaken in the past two years in the public sector by non-participants were commissioned – well above the 11.6 percent assumed for new buildings.
- On the other hand, non-participants also indicated that they planned to retro-commission only 51 buildings over the next two years, representing approximately 6 percent of the 938 buildings owned by these agencies and indicating an annual market penetration of 3 percent.

All the results of research conducted for the current MPER indicate greater acceptance of new building commissioning than retro-commissioning in the public sector. Moreover, levels of familiarity and perceived barriers regarding retro-commissioning do not suggest that a rapid increase in market acceptance is likely over the next several years.

³ Full report available at <http://www.nwalliance.org/resources/documents/CPBReport.pdf>.

5. CONCLUSIONS

Overall, the Commissioning in Public Buildings Project has made significant progress toward its goal of making commissioning standard practice in public buildings in the PNW. That progress has been uneven across the four states, however, which is not surprising in light of the differences in infrastructure, customer receptivity, and overall market conditions. The following are the conclusions of this evaluation:

- In Washington, the goal of market transformation appears to be well on its way to being achieved with respect to new building commissioning in public buildings. While commissioning is not yet truly standard practice and hard-wired into codes, there are a number of indicators of momentum in that direction:
 - a large population of commissioning providers
 - a high level of awareness of commissioning and relatively low perceived barriers among non-participants
 - sector- and agency-specific policies and guidelines
 - state codes that, while not requiring the level of commissioning promoted by the Alliance, nonetheless familiarize the owner, designer, and contractor communities with the concepts of functional performance testing, documentation, and other aspects of commissioning
 - effective use of case studies and other media to expose a wide audience to commissioning benefits
 - development of a self-sustaining commissioning program serving the public sector.
- Oregon, too, has made significant progress toward making commissioning widely accepted, but it does not appear to be as close to achieving the critical mass needed for self-sustaining change in the market.
 - The availability of SB 1149 funds for schools that carry with them a requirement for the commissioning of energy efficiency projects valued at greater than \$50,000 (for controls) and \$100,000 (for HVAC systems) has raised the visibility of commissioning in the public sector, created business opportunities for providers, and generated a great deal of interest among school districts.
 - The cost of commissioning new buildings in Oregon is eligible for a tax credit equal to 35 percent of the cost, including the commissioning agent's fee, engineering fees to develop commissioning specifications, and the test and balance agent's fee.
 - One-on-one meetings with local officials who have new construction plans offer an effective means of delivering the case studies where they will have the greatest effect. In addition, the Oregon Department of Energy offers commissioning policy templates, "The Building Commissioning Handbook," and information on other available resources.

- The strong interest in green building in Oregon offers opportunities to tie commissioning in with LEED certification as more public agencies establish policies that require or encourage meeting specific LEED standards. The higher levels of LEED (silver and, especially gold and platinum) require rigorous commissioning.
- As is the case in Washington with the building code, Oregon’s State Energy Efficient Design (SEED) program may make more owners and others aware of functional performance testing, but (also like the Washington Code) it lacks the critical element of third party testing and verification that would more effectively promote commissioning.
- Oregon barely missed passing a revision to the state energy code that would have required commissioning; proponents will try again at the next code revision cycle with improved code language that accommodates most of the concerns expressed previously by the building industry and code enforcement officials.
- In Idaho and Montana, the market for new building commissioning has not progressed as far as it has in Washington and Oregon.
 - In Montana, a weak economy limits overall new construction activity and opportunities for new building commissioning. On the plus side, there have been gains in incorporating commissioning into planning budgets for some major new construction projects, and the state enjoys a local pool of commissioning providers who gained extensive experience on the Alliance demonstration projects and who offer very cost-effective commissioning services. In addition, commissioning was included as a line item for all new construction projects included in the state’s Long Range Building Plan. The A/E Division, which is responsible for all new construction on state facilities, commissions almost all retrofits of existing state buildings with complex controls systems, energy retrofit projects, and new buildings with integrated controls and HVAC systems to assure systems operated to meet standards and codes. Although funding influences the size of scope and number of buildings, the state’s new head mechanical engineer is a proponent of commissioning for both new and existing buildings, which may provide opportunities to develop future commissioning guidelines and policies.
 - In Idaho, the virtual absence of local commissioning providers limits the opportunity for market transformation. While the demonstration projects have created a small group of enthusiastic commissioning advocates, the lack of infrastructure suggests that any progress in making commissioning business as usual will be at least several years in coming. A positive achievement was the Division of Public Works (DPW) recommending commissioning on all state building projects over \$1 million.
- Throughout the region (including Washington), retro-commissioning is far less established than new building commissioning.
 - Knowledge levels are lower and perceived barriers higher among participants and non-participants alike, especially since there are two financial hurdles that need to be cleared: funding the initial study and funding the implementation of the findings.

- Even where the benefits of retro-commissioning are recognized, projects proceed on an *ad hoc* basis as funding becomes available
- Based on a survey of non-participating public agencies in all four states, market penetration of retro-commissioning appears to be less than 5 percent per annum (13 of 33 agencies interviewed planned to retro-commission a total of 51 buildings over the next two years, out of a total building stock of more than 900 buildings) – far less than the critical point needed to transform the market.
- For both Idaho and Montana, retro-commissioning may still offer a relatively effective way to overcome the extreme price sensitivity and cost concerns of school districts, towns and counties, and other agencies in those states. To the extent that small-scale energy efficiency initiatives can open the door to more ambitious commissioning efforts, this approach may yield results over the longer term. In the near term, however, these markets remain far from transformed.
- Five of nine participants interviewed who had commissioning policies or guidelines in place said their policies and guidelines had changed since their program participation.
- Finally, given the relatively modest changes in the number of public sector agencies that have implemented permanent changes in policies and guidelines over the past two years of the Commissioning in Public Buildings Project, it does not appear that additional funding of a dedicated commissioning project would significantly move the market in the near term.
 - In Washington, where the infrastructure exists to properly use additional funds, evolution of the market is likely to continue on its own precisely because of the infrastructure that has been built.
 - Conversely, the states where the most additional progress is needed (i.e., Idaho and Montana) would need a much larger infusion of resources because they do not currently have a permanent, non-Alliance funded mechanism to systematically support commissioning, appear to have a lower level of awareness and interest among public agencies, and have fewer commissioning providers than Washington and Oregon.
 - Oregon appears to be somewhere between these two extremes. On the one hand, existing programs (SEED and SB 1149) and an adequate supply of qualified providers help ensure continued commissioning activity, while potential changes in code could lead to wider-reaching adoption. On the other hand, while agencies have access to substantial resources to support their commissioning efforts, there is no formal program in place that provides the kind of turn-key solution less experienced agencies might require, and the agency with primary responsibility for state construction projects has been unenthusiastic about commissioning.

6. LONG-TERM TRACKING

The contract for the Commissioning in Public Buildings project is scheduled to end December 31, 2004. Evaluation findings indicate that the project has had an effect on the market that will continue past the end of the current contract. To determine the extent of the effect and validate post-contract savings estimates included in the Alliance cost-effectiveness model, a long-term market tracking strategy is being considered. This section offers a brief discussion of what such a strategy could look like with comments on its strengths and limitations.

The two key requirements for establishing a strategy are to establish a per unit savings estimate and to identify buildings that receive commissioning services.

Establishing a Per Unit Savings Estimate

One of the most important lessons learned during the Commissioning in Public Buildings project is that building-level savings are extremely difficult to quantify for commissioning. Factors such as the phase of design or construction when commissioning began, the scope negotiated by the owner and commissioning agent, and the level of cooperation on the part of the design and construction teams all have a tremendous influence on how much savings will be achieved. The recommendation is to use the per square foot savings estimates in the previously cited SBW Cost-Effectiveness study directly or a combination of the SBW study and results from the recently published national cost-effectiveness study authored by Lawrence Berkeley National Laboratory, Portland Energy Conservation Inc., and Energy Systems Laboratory, Texas A&M University⁴. One estimate should be established for new construction and one for existing buildings. To the extent that there are data to support it, separate estimates should be determined for major building types. Given the difficulty and expense of gathering building-specific information, no adjustments would be made to account for differences individual buildings - the estimate(s) should, as much as possible, represent an average building receiving an average level of commissioning. (As defined in the next section.) To calculate total savings, the per square foot estimate(s) would simply be multiplied by the estimated commissioned square footage for each building.

Identifying Commissioned Buildings

No one information source tracks which buildings in the Northwest receive commissioning services but by far the best source for this information would be commissioning agents themselves. Alliance staff estimates that there are currently approximately 100 agents, 70 of whom are BCA members. They should be surveyed each year with the goal of creating a list of all buildings that the respondents have commissioned for the past year. For each building, the square footage, type and sector (public or private) would also be collected.

⁴ The Cost-Effectiveness of Commercial-Buildings Commissioning available at <http://eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html>

To implement this approach it is necessary to identify the universe of commissioning agents and then determine which of those agents provide commissioning services at a level consistent with what was promoted in the Commissioning in Public Buildings project⁵. (Basically the BCA's Essential Attributes.) At the moment this would be a difficult distinction to make. The only existing list of agents is BCA members but there may be others who apply the essential attributes but have not joined the BCA. If the BCA certification becomes widely accepted it can serve as a proxy for high quality commissioning. It would then be simple to get the list of certified providers from BCA and interview them but there will not be a large list for at least a few years. In the meantime, the Alliance should start with the BCA members and supplement this list with names gathered from the network of contacts developed over the course of the project.

Cost and Accuracy

The above approach could be implemented relatively inexpensively, perhaps \$10,000/year for phone surveys plus \$5-10,000 initially to set up forms and a database and establish the per unit savings estimate. The results will not be particularly robust. In part this is because the SBW study included so few buildings and in part because of the inherent variability described above.

As a final note, an additional source of information for long-term tracking could be the commercial building baseline study when this is done again in 2006. Questions should be included in the study to determine the prevalence and level of commissioning. Potentially this information could then be compared to the SBW commissioning baseline that was done in 1999.

⁵ Note that the current level of Cx required by code in WA (and probably coming soon in OR) is not Cx as we defined it in the program so would not need to be tracked. If the code becomes significantly more stringent over time this topic may need to be revisited.

APPENDIX A
SUMMER 2004 MEMO

July 28, 2004

To: David Cohan, John Jennings
From: Phil Willems
Re: Cx in Public Buildings Marketing Status

To assess the current status of efforts by the various states to use the Public Buildings project case studies in their marketing efforts, I spoke with the project directors in each state and asked them about what had been done and what was being planned. This memo summarizes the results of those discussions and offers suggestions on how to proceed with the wrap up of the evaluation so that the add-on marketing contract is also addressed.

Overall, there appears to be a clear ranking of the states with regard to the extent of progress made. As noted below, Washington leads, followed by Oregon, with Idaho and Montana significantly farther behind. A rough indication of the current status of Cx in each of the states is provided by the number of BCA member practitioners in each state listed on the BCA website (excluding associate and owner members).

- Washington has 53 members in 34 companies
- Oregon has 14 members in 8 companies
- Montana has 4 members in 3 companies
- Idaho has only a single member

Marketing progress for each of the states is discussed below.

- In Washington, Roger Wigfield says GA is using the Alliance contract to support marketing activities that it would otherwise be unable to conduct. Specifically, GA has used the money to develop several additional case studies and to market the case studies it has already developed. The marketing involves participation at regional conferences and trade shows (for example, the NW Plant Engineering and Facilities Maintenance Shows in Olympia and in Portland) and at Building Operator Certification classes, as well as placement of ads and case-study-based stories in "Shop Talk", a regional newsletter read by public sector facilities managers in the PNW, Utah, and British Columbia. Once the Shop Talk stories are developed and run, GA plans to take them to the Association of Washington Cities for placement in their newsletter. Most of GA's marketing of the case studies has directed readers to the website, where all the studies can be downloaded. Roger believes this is more convenient for the target audience and also exposes them to the other Cx-related services offered by GA. Several Cx providers (Roger cited Keithly-Welsh and TestComm) are also using the links to the case studies in their marketing.

The case studies are part of a broader ongoing Cx effort that GA continues to pursue. GA's for-fee Cx service has 9 projects ongoing, in addition to those that have already been completed. There are also 22 projects being managed by GA that are undergoing Cx, up from 15 at the end of the year. More are expected next year as the number of construction projects grows. (Despite these gains, the percentage of GA projects being commissioned is still slightly less than half.) GA is also planning a Governor's Energy Conference in May of 2005 for GA clients and other state entities, with 3-400 attendees expected. (The WA Energy Office used to do these in the early 90s, but stopped when the Energy Office was dissolved.) Commissioning will be prominently featured at the conference, with one or more Cx providers likely to speak.

- In Oregon, Justin Klure says that packages consisting of case studies and a cover letter have been mailed out to a number of agencies, school districts, and colleges. (He is checking on the numbers mailed and the targeted organizations and will get back to me.) Apparently Justin is no longer actively involved in marketing the case studies, with responsibility for that having been turned back over to Andrzej Pekalski. I will follow up with Andrzej to get more details. Based on the lack of current information on the Oregon Department of Energy website, however, it does not appear that much progress has been made on the marketing effort.
- In Idaho, I get the impression that the marketing effort is starting pretty much from scratch. Tim O'Leary, who is now responsible for the commissioning effort within the Department of Water Resources, laments the lack of resources in light of the very major marketing effort that he believes still needs to be done. Because of the IDWR's budget process, marketing of Cx could not begin in earnest until the first of July, and the limited budget supports only modest outreach activities. The Idaho case studies have been on the web for some time, and all the organizations who participated in those projects are strong advocates of Cx, but there does not seem to be much momentum to the Cx marketing effort. Tim sees minimal value in mass marketing the case studies, noting that in Idaho, "a handshake and a smile plus a cup of coffee will go a lot farther than a mass marketing; and eyeball to eyeball is much better than a phone call." While he is excited about the long-term prospects for Cx, Tim does not see the current project marketing "add-on" as the finishing touch to the project.

Clearly, the Idaho market is far from transformed. On the one hand, there is a lot of interest in Cx from architects and others who are looking for LEEDs certification for their building or participation in the Efficient Schools program. On the other hand, there are very few local Cx providers, and there is ongoing reluctance from school districts, local governments, and others to "pay extra" for commissioning.

- In Montana, Toby Benson is facing similar problems in his efforts to leverage the case studies. While availability of providers has not been a problem, the ongoing concerns about first cost and the generally poor Montana economy continue to act as barriers to the acceptance of Cx -- particularly R-Cx. Toby feels that the case studies are valuable in demonstrating that Cx has a track record, but they are not enough to overcome the inherent resistance at the typical MT public entity. He has taken the case studies and the Cx story to several conferences (MT School Business Officials, a regional health care group), but received little in the way of positive response (the ones that were most interested were from Idaho and Wyoming). Because the cost associated with Cx at the level described in the case

studies is prohibitive for most MT agencies, Toby wants to start smaller; he wants to build an ongoing relationship that lets him start with a no-cost basic energy usage analysis, then introduce gradually higher levels of sophistication to energy management, culminating in full blown retro-Cx. This is clearly a long-term effort rather than a final marketing push to make the best use of the case studies, and given a less than \$20K budget and a limited time frame, it will be hard to make much progress before the end of the year.

To sum up, it appears that only Washington is using the marketing funds in the way they were envisioned -- as resources to ensure that the case studies are made available to a broad audience of potential users who can use them to make decisions to proceed with Cx or to seek additional information. It clearly helps that GA has its own Cx program in place, and that Roger Wigfield has time available to spend on Cx from internal funding sources. In addition, there are numerous Cx providers in Washington who may be using the case studies in their own marketing efforts.

The other states do not have that same infrastructure. There are guidelines requiring Cx for certain sizes and type of projects on the books in Oregon, Idaho, and Montana, but there does not appear to be the same critical mass of owner interest, regulatory pressure, and ongoing public funding that makes the case studies "leveragable" as a marketing tool.

From the perspective of the evaluation, I think it is worth letting the marketing efforts run their course for another two or three months -- particularly since several have really just gotten under way. At that point, I believe it would be valuable to interview a number of players to assess both the use and the effectiveness of the case studies in the marketing effort. Specifically, it would be worthwhile to survey recipients of case-study-related marketing efforts in each of the states to assess their response to the case studies, level of interest in Cx, current or intended Cx actions or requests for more information (and the disposition of those requests), and perceptions of the quality and relevance of the case studies and the information they contain. I would tentatively recommend surveying about 40 owners (school districts, state and local governments, colleges and universities; a total of 10 per state) as well as a half dozen Cx authorities to see how they have used the case studies. It would be nice to be able to also interview a control group of owner's representatives in the same categories who did not receive the case study-related materials, especially if those who received the materials did not actively seek them out.

The owner and Cx authority interviews would allow us to assess the effectiveness of the case studies as a marketing tool and would also help establish the current state of the public sector Cx market in each of the states. As such, they would provide valuable input to the final MPER.

I look forward to discussing next steps with you.

APPENDIX B
NON-PARTICIPANT SURVEY

Name: _____ Phone: _____

Agency/Organization: _____ Job Title: _____

Hello, I'm calling on behalf of the Northwest Energy Efficiency Alliance regarding building commissioning practices in the public sector. To help assess the market for commissioning, we are speaking to representatives of public sector agencies to gauge your experience with new building commissioning and existing building commissioning (also known as retro-commissioning). Do you have just a few minutes to talk? Your assistance in this is very much appreciated.

I'd like to begin talking about new buildings developed by your agency.

1. How familiar are you with the concept of new building commissioning, using a 1 to 5 scale, where 1 means not at all familiar and 5 means very familiar? _____
2. IF 3 OR HIGHER: How would you define new building commissioning? (Probe: How do you differentiate commissioning from other processes such as the contractor punch list, test and balance, or equipment testing?)
3. How many new buildings, additions, renovations, or major retrofits has your organization undertaken in the past two years (including any projects currently under way)?
4. _____ Approximately how many square feet do those projects represent?
5. And how many of those projects has your organization commissioned? _____
6. _____ Approximately how many square feet did you commission?
7. Who makes the final decision regarding whether commissioning is incorporated into the design and construction process of a new building?
8. When your new buildings are commissioned who performs the commissioning? (i.e., an independent commissioning agent or authority, the design engineer, the architect, the general contractor, the Test and Balance Contractor, owner's staff?)

9. For new construction projects that were commissioned, how satisfied have you been with the performance of the buildings, using a 1 to 5 scale, where 1 means extremely dissatisfied and 5 means extremely satisfied?

10. How many new projects do you expect to start commissioning on in the next two years? _____

11. Are you aware of any code language that requires commissioning or similar activities for new buildings? _____ If yes, what does it require?

12. Please rate the importance of the following obstacles to your agency's ability to commission new buildings, where 1 indicates no obstacle and 5 indicates a serious obstacle.

_____ Obtaining funding for commissioning

_____ Finding and screening commissioning providers

_____ Managing the commissioning process (e.g., developing specifications)

_____ Getting all parties on the construction team to accept commissioning

_____ Concerns that commissioning might delay project completion

_____ Other (ask respondent if there is anything else and specify here: _____)

13. Which of the following statements best describes your agency's overall approach to new building commissioning:

_____ We have a policy requiring Cx on new buildings of a certain size

_____ We have guidelines that recommend but do not require Cx

_____ We have no policy or guidelines, but usually commission new buildings

_____ We sometimes commission new buildings

_____ We rarely or never commission new buildings

_____ We do whatever commissioning is required by state building codes

Next, I'd like to ask you about the commissioning of existing buildings that have not been commissioned previously.

14. How familiar are you with retro-commissioning of existing buildings, using a 1 to 5 scale, where 1 means not at all familiar and 5 means very familiar? _____

15. IF 3 OR HIGHER: How would you define retro-commissioning? (Probe: How do you differentiate commissioning from other processes such as building audits or tune-ups?)

16. How many buildings has your organization retro-commissioned in the past two years? _____

17. How many buildings do you think you will retro-commission over the next two years? _____

18. Which of the following statements best describes your agency's overall approach to retro-commissioning:

- _____ We have a policy requiring retro-Cx on buildings of a certain age or size
- _____ We have guidelines that recommend but do not require retro-Cx
- _____ We have no policy or guidelines, but retro-Cx buildings when needed
- _____ We sometimes retro-commission existing buildings
- _____ We rarely or never retro-commission existing buildings
- _____ We do whatever retro-commissioning is required by state building codes

19. Please rate the importance of the following obstacles to your agency's ability to retro-commission existing buildings, where 1 indicates no obstacle and 5 indicates a serious obstacle.

- _____ Obtaining funding for retro-commissioning
- _____ Finding and screening commissioning providers
- _____ Managing the retro-Cx process (e.g., developing specifications)
- _____ Obtaining funds to implement retro-commissioning findings
- _____ Other (ask respondent if there is anything else and specify here:

20. Next I would like to ask you about the sources of information you have used to learn more about commissioning. Please tell me what sources of information, if any, you have used to learn more about commissioning.

(DO NOT READ, CHECK ALL THAT APPLY)

- _____ State agency (GA, IDWR, ODE, MT DEQ)
- _____ Individual commissioning provider
- _____ Colleagues at other public agencies
- _____ Better Bricks or Alliance
- _____ Cx in PB Program
- _____ Case studies
- _____ BCA

- _____ PECI
- _____ Internet
- _____ Professional Journals/Trade Press
- _____ Conferences
- _____ Other (specify) _____

21. And which of those sources was most useful to you? (Circle most useful)

22. Why do you say that? _____

If case studies not mentioned in response to 20, ask:

23. Have you ever seen any case studies describing commissioning projects?

(IF NO, SKIP TO 26)

24. Where did you see/get them? Do you remember what buildings were discussed?

25. Did you find case studies were helpful to you? Why or why not?

26. Finally, approximately how many buildings does your organization own or manage _____

27. And about how many square feet of space does that represent _____

28. Do you have any final comments regarding building commissioning?

Those are all the questions I have for you today. Thank you for your help.

APPENDIX C

FINAL MPER

PARTICIPANT FOLLOW-UP SURVEY

Name: _____ Phone: _____

Agency/Organization: _____ Job Title: _____

Hello, I'm calling on behalf of the Northwest Energy Efficiency Alliance regarding your participation in the commissioning in public buildings program. We're following up to assess your experience with the program and with the building that you commissioned through the program. Do you have just a few minutes to talk? Your assistance in this is very much appreciated.

I'd like to begin talking about your experience with the specific building your agency had commissioned through the Commissioning in Public Buildings Program.

I'm going to ask you to rate your satisfaction with several aspects of the commissioning process and with the building that you had commissioned. For each of the following, please tell me how satisfied you were on a 1 to 5 scale, where 1 means extremely dissatisfied and 5 means extremely satisfied (For all that are 3 or lower, probe for reasons why.)

(ROTATE ITEMS)

1. the commissioning agent who performed the commissioning
 2. the amount of support you received from the program or state staff
 3. the cooperation of the general contractor with the commissioning process
 4. the cooperation of specialty contractors with the commissioning process
 5. the performance of the building after it was commissioned
 6. the amount you learned about commissioning by participating in the program
 7. the overall experience of commissioning a building through the program
-
8. How would you compare the performance of the building you had commissioned through the program with other buildings that have not been commissioned?
 9. How familiar are you with the concept of new building commissioning, using a 1 to 5 scale, where 1 means not at all familiar and 5 means very familiar? _____
 10. How many new buildings, additions, renovations, or major retrofits has your organization undertaken since you participated in the demonstration project (including any projects currently under way)?
 11. Approximately how many square feet do those project represent? _____
 12. And how many of those projects has your organization commissioned? _____

13. How many square feet did you commission? _____
14. How many new projects do you expect to start commissioning on in the next two years? _____
15. When or if you undertake additional commissioning projects, where do you think you will most likely go for information?
16. Please tell me what you currently see as the most important obstacles, if any, to your agency's ability to commission new buildings. (DO NOT READ, CHECK ALL THAT APPLY - NO RANKING REQUIRED)
- _____ Obtaining funding for commissioning
 - _____ Finding and screening commissioning providers
 - _____ Managing the commissioning process (e.g., developing specifications)
 - _____ Getting all parties on the construction team to accept commissioning
 - _____ Concerns that commissioning might delay project completion
 - _____ Other (specify: _____)
17. Which of the following statements best describes your agency's overall approach to new building commissioning:
- _____ We have a policy requiring Cx on new buildings of a certain size
 - _____ We have guidelines that recommend but do not require Cx
 - _____ We have no policy or guidelines, but usually commission new buildings
 - _____ We sometimes commission new buildings
 - _____ We rarely or never commission new buildings
 - _____ We do whatever commissioning is required by state building codes
18. Has this approach changed since you participated in the demonstration project? If not, why not; if so, how has it changed?
19. Next, I'd like to ask you about the commissioning of existing buildings that have not been commissioned previously.
20. How familiar are you with retro-commissioning of existing buildings, using a 1 to 5 scale, where 1 means not at all familiar and 5 means very familiar? _____
21. How many buildings has your organization retro-commissioned since you participated in the demonstration project? _____
22. How many buildings do you think you will retro-commission over the next two years? _____

23. Which of the following statements best describes your agency's overall approach to retro-commissioning:

- We have a policy requiring retro-Cx on buildings of a certain age or size
- We have guidelines that recommend but do not require retro-Cx
- We have no policy or guidelines, but retro-Cx buildings when needed
- We sometimes retro-commission existing buildings
- We rarely or never retro-commission existing buildings
- We do whatever retro-commissioning is required by state building codes

Has this approach changed since you participated in the demonstration project?
If not, why not; if so, how has it changed?

24. Please tell me what you currently see as the most important obstacles, if any, to your agency's ability to retro-commission existing buildings? (DO NOT READ, CHECK ALL THAT APPLY)

- Obtaining funding for retro-commissioning
- Finding and screening commissioning providers
- Managing the retro-Cx process (e.g., developing specifications)
- Obtaining funds to implement retro-commissioning findings
- Other (ask if there is anything else and specify here): _____

25. Finally, approximately how many buildings does your organization own or manage _____

26. And about how many square feet of space does that represent _____

27. Do you have any final comments regarding building commissioning?

Those are all the questions I have for you today. Thank you for your help.