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Commercial Real Estate (CRE) Infrastructure Market Progress Evaluation Report #1

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EXECUTIVE SUMMARY

The Northwest Energy Efficiency Alliance (NEEA) contracted with Navigant in October 2015 to complete the first Market Progress Evaluation Report (MPER) of Commercial Real Estate (CRE) Infrastructure program. NEEA sought to understand the CRE Infrastructure program's early progress toward reaching NEEA's goal of leveraging strategic partnerships to deliver an integrated set of energy efficiency best practices and tools for CRE and utility partners regionwide.

About CRE Infrastructure

NEEA's 2015-19 Business Plan calls for it to deliver an infrastructure[1] program to advance adoption of energy efficiency best practices and products by the CRE market industry through delivery of market resources. These market resources include tools, trainings, best practices and market engagement strategies delivered in partnership with market allies, utility partners, Bonneville Power Administration and Energy Trust of Oregon.

The long-term vision of the CRE Infrastructure program is for the Northwest commercial real estate industry to lead the nation in leveraging energy efficiency as a value creation investment with compelling financial returns to gain competitive advantage.

The 2015-19 CRE program seeks to build upon past NEEA market transformation successes by combining best practices from both past efforts and newly refined training and online resources into a ***common platform*** to support the CRE vision and goals. These programs include:

- ***Strategic Energy Management (SEM)*** – From 2007-2013, NEEA's CRE program was an initiative that advanced adoption of SEM as a best practice among owners, property managers and building engineers, and operators of commercial leased office buildings. In 2015-2019, CRE will enable market advancement of energy efficiency best practices including SEM through tools, training and resources, and strategic market relationships.
- ***Existing Building Renewal (EBR)*** – NEEA developed the EBR program in the 2010-14 business plan cycle. The goal of the program was to accelerate the adoption of deep energy retrofits in buildings greater than 20,000 square feet throughout the Northwest region. NEEA defines a deep energy retrofit *or* building renewal as a comprehensive, integrated set of measures that achieves at least 35% energy savings over previous conditions. The 2015-19 NEEA Business Plan transitioned the EBR Initiative assets to the CRE program for future implementation, include the buildingrenewal.org website and the Spark Tool.
- ***Market Resources and Tools Development and Delivery –*** The 2015-19 programs include launch and delivery of three additional CRE-tailored resources with utility and market partners. These include benchmarking education and training; BetterBricks.com CRE Resource Center; and Building Owners and Managers Association (BOMA) Energy Efficiency Program (BEEP) training. In addition, NEEA will create an overarching "Navigator" online port to help regional stakeholders find the information they need with ease.

[1] NEEA distinguishes between initiative and infrastructure programs. The former are characterized by NEEA's active intervention to transform a market. The latter (including this CRE effort being evaluated here) are characterized by NEEA providing the market tools and resources that allow the market to drive transformation on its own.

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- ***Smaller Buildings Market*** – The CRE Infrastructure program also includes a focus on development of tailored resources for the small buildings market (<20,000 sq. ft.,) in conjunction with rural smaller utility partners.

Evaluation Objectives and Activities

The team conducted a series of evaluation activities aimed at gathering the market intelligence necessary to assess CRE's legacy and new efforts and progress toward market transformation. Specific tasks included:

- **Logic model review:** Navigant assessed the efficacy and evaluability of the three logic models that make up the program: (1) CRE Infrastructure Logic Model and MPI; (2) BR Spark Tool Logic Model and MPIs; and (3) the CRE/BetterBricks Resource Center Logic Model and MPIs.
- **Legacy programs savings analysis:** Navigant developed savings analysis for the legacy SEM program efforts—specifically the legacy SEM Kilowatt Crackdown (KWCD) and Market Partners Program (MPP) programs.
- **Process evaluation and savings validation of the EBR[2] demonstration buildings:** Navigant conducted a process evaluation and undertook savings validation activities for three legacy EBR demonstration buildings to assess post-implementation owner and implementer perception of the process as well as its outcomes and energy savings.
- **Spark Tool pilot review:** A major new component of the CRE Infrastructure effort is the market development and promotion of the Spark Tool. Spark is an interactive, web-based assessment tool designed to illustrate the potential value of building renewal and enable decision-making to plan and implement building renewal projects. It is currently undergoing pilot user market testing. Navigant conducted market process interviews of Tool users.
- **Market characterization:** Due to concerns about legacy program market actor interview fatigue, the focus of market research for this first MPER was threefold:
    1. Conduct a thorough review of secondary research on former CRE legacy programs
    2. Conduct a survey of both participating and non-participating building operators in the Building Operator Certification program, and
    3. Develop a thorough profile of smaller businesses in Oregon and Washington

Progress Toward Market Transformation/Establishing a Baseline

The CRE Infrastructure's integrated platform, market approach and related market progress indicators (MPIs) are contained in program's three logic models (Appendix A, Appendix B, and Appendix C). Each model has a similar overarching vision and focus: that CRE tools, resources, and partnerships are *adopted as standard practice* in the CRE market. The CRE MPIs—regardless of specific logic model—all focus on stakeholder *use and adoption* of the program's tools, resources, and stakeholder partnerships and programs. Because of the focus on market adoption and the early stage of program development, the project team (in conjunction with NEEA staff) determined that the MPI review for this first MPER should focus on establishing a baseline of activities against which future market adoption of CRE resources,

[2] The EBR Demonstration Program focused on encouraging building owners to incorporate integrated measure packages of energy efficiency solutions with the goal of increasing energy savings by 35%-50% above the building's pre-EBR usage.

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tools, and strategic partnerships might be measured. In this regard, Navigant found no evidence of progress made as measured against any of the three logic model indicators as related to market *adoption* for this CRE MPER 1. This is not surprising. As noted, CRE efforts are in their early stages of program/platform design and have focused on early market developing and testing of concepts in 2016, rather than on broad market implementation. The project team did find, however, that a good deal of *awareness* exists of NEEA CRE legacy programs, tools, and resources among those directly surveyed by Navigant and among those surveyed in previous CRE research.[3] With no evidence of market adoption of the newly created CRE Infrastructure effort, Navigant determined a zero baseline of market presence for all of the MPIs for MPER 1.

Key Findings

In addition to the team's assessment of MPIs, it also identified the following key findings:

1. ***Logic Model Review.*** **All three CRE Infrastructure logic models successfully illustrate NEEA's theory of change**. Navigant found that NEEA's current and planned activities address known market barriers and that necessary logical connections exist between logic model outputs, barriers, and outcomes.While Navigant found that the CRE Infrastructure program logic model and related MPIs are evaluable over the course of the program's implementation, we express concern that a key proposed data source element, the Customer Relationship Management (CRM) database, has yet-to-be-fielded, and as such presents a potential risk for NEEA in future MPI assessments.[4]
2. ***Legacy Savings Analysis.*** **Navigant found persistence in *electricity savings* from the legacy SEM Market Partners Program (MPP) and Kilowatt Countdown (KWCD) programs in the region. Navigant found no persistence *natural gas savings*.** The MPP and KWCD programs supported NEEA's SEM initiative efforts and ended in 2013. This report reviewed the extent to which electricity and gas savings persisted in the post-program period, reviewing two 12 month timeframes – the program period (January 2013 through December 2013) and the post-program period (October 2014 through September 2015).[5] Navigant's findings showed that after the MPP and KWCD programs ended, electricity savings for the sampled buildings increased by 5.6% and 10.5%, respectively. Gas-metered buildings did not show any statistically significant savings after the MPP and KWCD programs ended.
3. ***Process Evaluation of building renewal Demonstration Sites.*** **Navigant found a high degree of building owner/property manager satisfaction with the overall process, savings outcomes and NEEA's role in the effort.** Navigant interviewed owners and property managers of two of four BR demonstration buildings.[6] Benefits stated included increased rental occupancy rates and the ability to increase square footage pricing. On issues of implementation, the Portland project owner was extremely satisfied with NEEA's support and the overall process. However, installation and monitoring problems at the Montana site caused delays in the project and, at the

[3] We note that at the request of NEEA, Navigant reviewed literature on CRE market leaders and participants rather than undertake direct interviews of these audiences – as a means of reducing interview fatigue for this important audience.
[4] Sources identified in the CRE logic models for various MPIs include the CRM system, company reports, market actor/leader evaluation survey/interviews, market research, and utility reports/logs.
[5] The post-program period between the program period (January 2013 through December 2013) and the post-program period (October 2014 through September 2015), was not analyzed as part of this report. See footnote 14 for further details.
[6] Of the four BR demonstration projects: Montana, Idaho, Portland and Seattle, only two -- Portland and Montana -- had completed installation of retrofits at the time of this study and participated in the effort.

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time of the study,[7] the inability to accurately assess savings—although the owners averred that their overall energy bills had gone down over the study period.

4. ***Savings Validation of Building Renewal Demonstration.*** **Navigant found energy savings in both the Montana and Portland buildings.** For the Portland building, Navigant found that EBR retrofits resulted in a total of 0.314 average megawatt (aMW) electricity savings, or a 37.7% reduction relative to the baseline. Natural gas savings were not monitored prior to EBR retrofit activities; thus, no savings could be estimated. For the Montana building, where fuel displacement took place from natural gas to electricity, Navigant found natural gas consumption dropped to nearly zero due to a decommissioned gas boiler, realizing 98% savings. No electricity savings were recorded in 2015 due to increased electric usage with the boiler displacement.

5. ***Spark Tool Pilot User Review.*** **Navigant interviewed two pilot test users of the Spark Tool to receive feedback on a key user issues. Reviews were mixed.** Overall, NEEA's communications provided to respondents were seen as positive and NEEA staff was seen as helpful and responsive. However, respondents also indicated that they lacked understanding of how the Tool would fit into their business models, suggesting the communications did not cover (or adequately cover) all needed topics, including Spark's intended use as first cut analysis. The Tool itself was seen as user-friendly and reported to be well-rounded and capable of being integrated into customers' business strategies. On the other hand, respondents were concerned that the Tool in its current design is not able to accommodate detail of their specific buildings and so were concerned about whether the estimates generated were reliable. Specifically, they were concerned that the savings estimates generated were too high.

Recommendations

The team identified the following opportunities during its evaluation that may aid CRE Infrastructure in its market transformation efforts.

1. ***Logic Model Review.*** **Navigant recommends two changes to the logic models**
   - Revise the impact statements to read "Establish a Standard of Practice" rather than "Standard of Practice" to provide an actionable impact focus
   - Specify CRM requirements and identify the entities that will provide input and maintain data integrity

2. ***Legacy Savings Analysis.*** **The two programs in NEEA's CRE legacy initiative are MPP and KWCD**
   - Expand the number of buildings in the study, which could have the added benefit of greater overall savings figures because the energy reduction rate would be applied to more square feet.
   - Add control customers, which would allow NEEA to more reliably determine the extent to which energy savings were due to the CRE initiative or other factors.

3. ***Process Evaluation of Building Renewal Demonstration Sites***
   - Ensure stakeholders have a clear understanding of NEEA's role and its limitations.

[7] NEEA reports that this issue has been resolved as of August 2016.

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- Develop a project viability template or checklist to reduce the time cost for building owners/operators or NEEA trade allies to replace whole-building systems, as owner/operators must carefully plan around tenant vacancies.
- NEEA should undertake a review of its process related to issues of contractor oversight during the implementation stage reducing risk of project disruption.

4. ***Spark Tool Pilot User Review***

- Provide information to demonstrate the Tool's reliability and effectiveness online and in any promotional collateral
- Communicate to customers how the Tool fits specifically into customers' business models
- Strengthen training prior to Tool usage through providing information on how to best use the Tool to strengthen their business case
- Ensure that reported energy-saving estimates are within typical bounds for the group of measures and/or end uses within the recommended packages
- Allow users to specify budgetary constraints
- Package suggested measures or recommendations into case scenarios to strengthen the business case
- Provide estimated costs/payback information and the time/level of effort required for each

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1. INTRODUCTION

The Northwest Energy Efficiency Alliance (NEEA) contracted with Navigant in October 2015 to complete the first Market Progress Evaluation Report (MPER) of Commercial Real Estate (CRE) Infrastructure program. NEEA sought to understand the CRE Infrastructure program's early progress toward reaching NEEA's goal of leveraging strategic partnerships to deliver an integrated set of energy efficiency best practices and tools for CRE and utility partners regionwide.

1.1 MPER Goals

The goal of this MPER is to assess and document CRE Infrastructure overall progress toward transforming the commercial real estate market toward standard practice adoption and use of CRE's newly combined energy efficient tools, resources, and strategic partnership offerings. At a high level, the team's MPER objectives included the following:

1. Review the three CRE logic models to ensure the logical consistency and correct linkages between activities, outputs, outcomes, and market progress indicators (MPIs)
2. Conduct a process evaluation of the two of the four Building Renewal (BR) demonstration buildings
3. Conduct savings validation of two of building renewal demonstration buildings
4. Conduct a Building Renewal (BR) Spark Tool pilot user's test[8]
5. Undertake characterization of the legacy (larger buildings) market for CRE
6. Collect market intelligence through secondary research and a limited number of interviews and/or surveys to identify market progress, as noted in the program's three CRE logic models

1.2 CRE Market Intervention Strategy

The overarching goal of the CRE Infrastructure program is to transform the commercial real estate market toward incorporation of energy efficiency measures, methods and approaches as a standard practice.

NEEA based its market intervention strategies partly on themes identified by several regional working groups, which identified the following market needs:

1. Engage and leverage owners and decision makers
2. Help customers navigate a cluttered market
3. Make/quantify the business case for energy efficiency
4. Support benchmarking best practices
5. Help customers identify opportunities and take next steps (cross-cutting)
6. Support utility programs with tools, lessons learned

[8] As noted, Spark is an online assessment tool that is an outgrowth of a pre-2015-2019 Existing Building Renewal (EBR) initiative. Spark is designed to encourage businesses to undertake deep energy retrofits by providing sophisticated assessment support to businesses in estimating the total project cost and value creation potential.

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The CRE Infrastructure market intervention strategy focuses on four broad areas of intervention: creating a strategic relationship platform in the region for efficiency market adoption; increasing market awareness of the building renewal strategy, Spark Tool, and BetterBricks resource center's; and encouraging small and rural utilities to adopt benchmarking and SEM type programs.
Table 1 below describes these areas and NEEA's market intervention focus.

Table 1. CRE Infrastructure Intervention Strategies and Goals

Market Intervention Strategy	Intervention Focus	Mid- to Long-Term Goals
CRE Relationship Platform	• Making the business case for NEEA commercial offerings (includes building renewal and Spark) • Supporting CRE decision makers to implement energy efficiency best practices at portfolio level including benchmarking, strategic energy management and green leasing (including tenant decision makers) • Beginning to engage large tenants to promote the adoption of energy efficiency through green leasing and portfolio benchmarking resources	• Majority of target market increased participation in NEEA's partner utility programs • Target audience widely adopts NEEA and partner programs, resources and tools at key building lifecycle intervention points • Early majority of the CRE office building owner target audience is adopting continuous improvement EE practices • Majority of CRE office building owner target market implements EE continuous improvement practices (SEM) as a standard practice
Spark Tool	• Increasing CRE market awareness of building renewal approach and business case; and partner with regional utilities to integrate Spark into program offerings	• Majority of target market has increased participation in NEEA's partner utility programs
Navigator	• Providing a valued resource to assist CRE stakeholders to navigate a cluttered market	• Target audience widely adopts NEEA and partner programs, resources and tools at key building lifecycle intervention points

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Market Intervention Strategy	Intervention Focus	Mid- to Long-Term Goals
Small Market Value	• Encouraging small and/or rural utilities to consider benchmarking and SEM best practices as commercial customer offering • Promoting market adoption of benchmarking and SEM best practices by small market CRE building owners and managers	• Majority of target market has increased participation in NEEA's partner utility programs • Early adopter segment of CRE warehouse and big box retail target audience is adopting continuous improvement EE practices

In its CRE logic models, provided in Appendix A, Appendix B, and Appendix C, NEEA outlines how the successful implementation of these interventions would transform the market. Below we provide a highlight of these activities:

Increase in number of market actors and target audiences, owners and market leaders that:

- Adopt energy efficiency best practices to gain competitive advantage
- Understand the benefits of Navigator to access resources and tools at key intervention points
- Engaging utilities delivering pilot Spark Tool, program and resources
- Adopt strategic Programs and resources, including incentives, ratings, certifications, and automated data services, as well as EMIS, Benchmarking/ENERGY STAR
- Have deepened relationship with NEEA, provided ideas to advance programs, and requested more solutions through access to Navigator and other tools and resources

1.3 About CRE Infrastructure

NEEA's CRE program, active from 2007-2013, aimed to increase adoption of Strategic Energy Management (SEM) best practices for commercially leased office buildings. The CRE program focused primarily on educational opportunities for owners and managers of leading commercial sector real estate firms. Educational opportunities included the Market Partner Program (MPP) that offered in-depth coaching to participating businesses on SEM best practices and office energy efficiency competitions in three states known as Kilowatt Crackdown (KWCD) that benchmarked existing building performance and challenged owners and managers in the Northwest to reduce energy use. During this period NEEA also initiated a deep energy retrofit pilot initiative for commercial buildings known as the Existing Building Renewal (EBR) pilot. Under this program, four buildings in states throughout the region implemented NEEA-supported deep energy retrofits.

In 2015, the CRE program ended and the CRE Infrastructure effort began with the adoption of NEEA 2015-19 Strategy Plan.[9] This combined "legacy" CRE Initiative programs into a common infrastructure platform aimed at developing market resources (tools, trainings and best practices) to address market

[9] NEEA Strategic Plan | 2015-2019, July 8, 2014
http://neea.org/docs/default-source/default-document-library/neea-2015-2019-strategic-plan-board-approved.pdf?sfvrsn=

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barriers with the goal of accelerating CRE market adoption of energy efficiency. As an ongoing strategy, NEEA intends to expand and develop relationships with CRE firms and utility partners to increase their awareness and understanding of energy efficiency best practices and utility program incentives.

In 2015, NEEA created and promoted: The Spark Tool and the tools and resources housed in the BetterBricks Resources Center. The Spark Tool is an online assessment tool that is an outgrowth of the EBR pilot. This Tool aims to encourage businesses to undertake deep energy retrofits by providing sophisticated assessment support to businesses in estimating the total project cost and value creation potential. The BetterBricks Resource Center is an online portal that serves as a repository for CRE tools and resources that commercial building professionals may use as a one-stop shop to easily access commercial building energy efficiency savings links and resources.

NEEA's promotion of the Spark Tool and BetterBricks Resources Center focused on regional stakeholder awareness and adopt energy efficiency best practices. This effort represented one of the three components of the CRE Infrastructure effort. The other two aspects focus on partnerships and program participation:

1. Build strategic partnerships that support NEEA and utility programs and provide market-supporting resources and tools with organizations such as local utilities, the US Department of Energy (DOE), the United States Green Building's Council (USGBC), and others.
2. Increase participation in strategic partnership programs, such as the Building Owners and Managers Association (BOMA) Energy Efficiency Program (BEEP), US DOE tools integration, Urban Land Institute (ULI) Center for Sustainable Leadership, Market Partner/Utility Council, ENERGY STAR, and the USGBC's Leadership in Energy and Environmental Design (LEED) program.
3. Provide best practice market resources and tools to support commercial sector awareness and adoption of CRE Infrastructure-focused energy efficiency efforts.

1.4 Report Structure

NEEA uses MPIs, typically developed during the initiative planning process, to gauge the effectiveness of its market intervention efforts. The MPIs serve as a set of predetermined, comprehensive evaluation metrics by which NEEA and its contractor teams should objectively assess initiative performance.

As such, the team structured this report to focus on its assessment of CRE's MPIs and to provide the NEEA with a concise evaluation of the initiative's early performance. The team also provided activity-specific findings memos as appendices for those seeking more detail about specific efforts and findings.

The body of this report consists of four sections, while the appendices contain both the aforementioned activity-specific findings memos and the team's data collection instruments. Collectively, the body of the report and its appendices offer a complete summary of the team's MPER research.
The report is structured as follows:

- **Executive Summary.** Summarizes the CRE Infrastructure program, the evaluation tasks undertaken as part of this MPER, and the team's assessment of the CRE MPIs, as well as key findings and recommendations.
- **Introduction.** Details the CRE Infrastructure market intervention theory and strategic development concepts.

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- **Methodology.** Outlines the approach the team used to complete each of the six evaluation activities. In most cases, additional methodological details are available in the activity-specific findings memos in the appendices.
- **Logic Model Review.** Outlines the three logic models used in the CRE Infrastructure effort.
- **Legacy Programs Savings Analysis.** Details the direct savings impact of two legacy CRE programs, MPP and KWCD.
- **Existing Building Renewal Demonstration Building Process Review.** Navigant conducted a process evaluation of two pilot buildings post-implementation to determine owner and implementer perspectives on the EBR process. This section presents the findings from Navigant's evaluation at each site.
- **Existing Building Renewal (EBR) Demonstration Building 2015** Savings Validation**.** This section presents the findings from Navigant's validation of savings findings for three EBR pilot buildings -- post-implementation at each site.
- **Spark Tool Pilot Process Evaluation.** Outlines feedback and lessons learned that Navigant gathered regarding user experience with the Spark Tool.
- **Market Characterization.** Details market characterization and information about leased small office buildings in the NEEA study region.
- **MPI Review.** Offers the team's assessment of the CRE Infrastructure market transformation progress relative to the three logic models and associated MPIs
- **Conclusion.** Provides team observations and conclusion on the status of the CRE Infrastructure effort for this MPER 1 first year of activity.
- **Appendices:**
    - ***Appendix A to Appendix C:*** Details the three NEEA CRE Infrastructure logic models and MPIs. Activity-specific findings memos that detail the team's specific findings for each activity. The team previously submitted each of these memos to NEEA during the MPER process.
    - ***Appendix D to Appendix I:*** Provides activity-specific findings memos that detail the team's specific findings for each activity. The team previously submitted each of these memos to NEEA during the MPER process.

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2. METHODOLOGY

To meet the multiple needs of the CRE Infrastructure evaluation, and to determine CRE progress in the market, Navigant undertook the following six research activities in the following areas:

- **Logic Model Review**
- **Legacy Savings Analysis**
- **Process Evaluation of BR Demonstration Sites**
- **Savings validation of the EBR demonstration buildings:**
- **Spark Tool Pilot User Review**
- **Market Characterization**

Below we provide discussion of each activity. Further detailed discussion of each may be found in Appendix D through Appendix I, which provides relevant reports and memoranda for each of the activities.

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3. LOGIC MODEL REVIEW

The CRE Infrastructure effort includes three logic models: CRE Infrastructure, BR Spark Tool, and BetterBricks Resource Center.[10] The logic models link activities, outputs, and outcomes to desired market impacts to assure the linkages are sufficiently clear to support evaluability and market transformation. In November 2015, Navigant reviewed all three models to:

- Verify the logical connections between outputs, barriers, and outcomes, as well as the evaluability through the data sources specified[11]
- Determine the extent NEEA's current and planned activities address all known market barriers

In 2015, Navigant provided comments for each of the three logic models in the *CRE Infrastructure Logic Model Review* memorandum contained in Appendix D. Overall, all three logic models illustrate NEEA's theory of change and have clear logical linkages between program activities, outputs, and outcomes. Each model provides a concise description of the target market, target audience, and relevant partnerships. The models also track expected outcomes to both a general timeline and a market segment.

For each outcome, the models provide a MPI as well as one or more data sources. In the review, Navigant noted that while the outcomes and indicators indicate the expected trend within a specific population, some of the data sources to track market progress are not well defined and may be too reliant upon a customer relationship management (CRM) database or an under-specified registry/report. Navigant suggested two revisions to all three logic models:

- **Revise the impact statements to read, "Establish a Standard of Practice."** The impact statement "Standard of Practice" does not indicate if NEEA intends to replace an existing standard of practice with a new version or establish a new standard of practice where none currently exists.
- **Specify CRM requirements and identify the entities that will provide input and maintain data integrity.** Of the eight outcomes and MPIs, NEEA lists CRM as a data source in six. NEEA does not list the specifications for this CRM nor is it clear which individuals or entities are responsible or accountable for providing input to the CRM. Navigant's concern is that if the CRM lacks sufficient information to inform an evaluation, it will not be possible to track market progress for these six indicators; thus, evaluation efforts may not be able to quantify the program's success or value to NEEA's funders.

Navigant suggested additional revisions unique to each logic model, as detailed in the following subsections.

3.1 CRE Infrastructure

1. **Restate the barriers.** This logic model lists five barriers that read more like desired outcomes than market conditions that prevent the greater adoption of energy efficient goods and services among the target audience. However, the barrier statements provide sufficient context that a

[10] Appendix A, B, and C, respectively, provide copies of the CRE Infrastructure, BR Spark tool, and CRE Resource Center logic models.
[11] Sources suggested by the logic model for various MPIs include a customer relationship management (CRM) system, company reports, market actor/leader evaluation survey/interviews, market research, and utility reports/logs.

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reader can infer the intended meaning. Navigant recommends that NEEA restate the barriers as follows:

a. The target audience lacks awareness of energy efficiency best practices
b. Existing tools and resources are not tailored to the business needs of the target audience
c. The target audience does not understand the business case for energy efficiency
d. Building performance data is not visible to the market (commercial building owners and tenants)
e. The target audience lacks necessary skills to implement best practices

2. **Define the term "company reports" and "utility reports" and indicate where an evaluator could find such reports.** Three of the outcomes for this program list "company reports" or "utility reports" as data sources. The logic model does not define these terms or designate a repository for such reports. NEEA should also consider specifying which individuals or organizations are responsible for developing and maintaining these reports.

3.2 Spark Tool

1. **Define the term "BetterBricks Registry" and indicate what information an evaluator would find in this registry.** Three of the outcomes for this program list this term as a data source. The logic model does not define the term and does not specify the information expected to be contained in this registry. NEEA should also consider specifying which individuals or organizations are responsible for maintaining this registry. Minimum evaluation sufficiency for such a registry would include the following elements:
    a. Location of building (address)
    b. Name of building owner (individual or corporate entity)
    c. Building owner contact information (contact name, title, mailing address, telephone number(s), email address(es)
    d. Start date of BetterBricks participation
    e. Names of serving utilities (electricity, natural gas, water, and steam)
    f. Services provided by NEEA programming at each location
    g. Start date of each NEEA-sponsored service
2. Provide small incentives to encourage **users to register to the BetterBricks website so that NEEA and or utility program staff can track use by individual user.** MPI I states that the "number of Target Audience which have utilized BetterBricks website navigator resources and tools at market intervention points" and lists "BetterBricks website hits" as a data source. The number of website hits indicates the level of traffic but not necessarily the number of unique visitors.
3. **Define the term "BetterBricks Registry" and indicate what information an evaluator would find in this registry.** In addition, one of the outcomes for this program lists "BetterBricks Registry" as a data source. The logic model does not define this term and does not specify the information expected to be contained in this registry. NEEA should also specify which individuals or organizations are responsible for maintaining this registry. Minimum evaluation sufficiency for such a registry would include the following elements:
    a. Location of building (address)
    b. Name of building owner (individual or corporate entity)

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c. Building owner contact information (contact name, title, mailing address, telephone number(s), email address(es)
d. Start date of BetterBricks participation
e. Names of serving utilities (electricity, natural gas, water, and steam)
f. Services provided by NEEA programming at each location
g. Start date of each NEEA-sponsored service

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4. LEGACY PROGRAMS SAVINGS ANALYSIS

The research team quantified the direct savings impact of two legacy CRE programs: MPP and KWCD. Both CRE programs stopped running in 2013, and NEEA wanted to determine the extent to which gas and electricity savings persisted or increased in the post-program period. Navigant undertook a billing review of participating buildings to determine the electricity and gas savings to measure the persistence of the program impacts during the post-program period.

The available data for the billing review fell into two separate categories:[12]

- Active program baseline savings period "2013" savings (between January 2013- December 2013)[13]
- Post-program "2015" savings period (between October 2014-September 2015)

NEEA provided Navigant with billing data for 33 KWCD buildings and 15 MPP buildings. Billing data was divided into the two 12 month timeframes noted above. Bills were then adjusted to calendar months to normalize billing periods across buildings. Navigant divided billing data into two 12-month timeframes—the program period in 2013 (between January 2013- December 2013) i.e., "2013" baseline data, in which the participants actually were participating in the program, and the post-program period in 2015 (October 2014-September 2015)[14] , i.e., "2015" post-program data. Navigant then normalized each building billing period across calendar months. Navigant's final project report, *Estimates of Validated Annual Energy Savings from Commercial Real Estate Program* in Appendix H, provides a detailed discussion of the methodology.

Section 4.1 provides evaluation results from the electricity energy savings analysis for MPP and KWCD, followed by summary findings for post-program electricity participants. Section 4.2 provides gas energy savings results and summary findings and recommendations.

4.1 Electricity Savings Results

KWCD participants saved approximately 0.89 kWh per square foot during the 12-month post-program period (October 2014-September 2015) relative to the 2013 program period, in which participants actually participated in the program. During the same timeframe, MPP participants saved approximately 2.36 kWh per square foot. This is equivalent to 5.6% average savings for the 30 KWCD participants and 10.5% savings for the 14 MPP participants. Both results, significant at the 90% confidence level, are detailed below—along with relevant confidence intervals (CIs)—in Figure 1. Total annual electricity savings were approximately 0.385 aMW for KWCD and 0.69 aMW for MPP.

[12] An interim post-program savings period from January 2013-September 2014 of data was also developed by NEEA, but was not the subject of the assessment completed in this "2015" Navigant savings report.
[13] Navigant used data to establish the "2013" baseline from a Cadmus 2014 study for NEEA: Northwest Energy Efficiency Alliance. March 2014. Commercial Real-Estate Participant Cohorts Market Progress Report. Prepared by Cadmus. REPORT #E15-308
[14] We note that the 2015 savings estimates are not directly comparable with the 2013 estimates because the 2015 billing data contained approximately one-third of the 2014 data.

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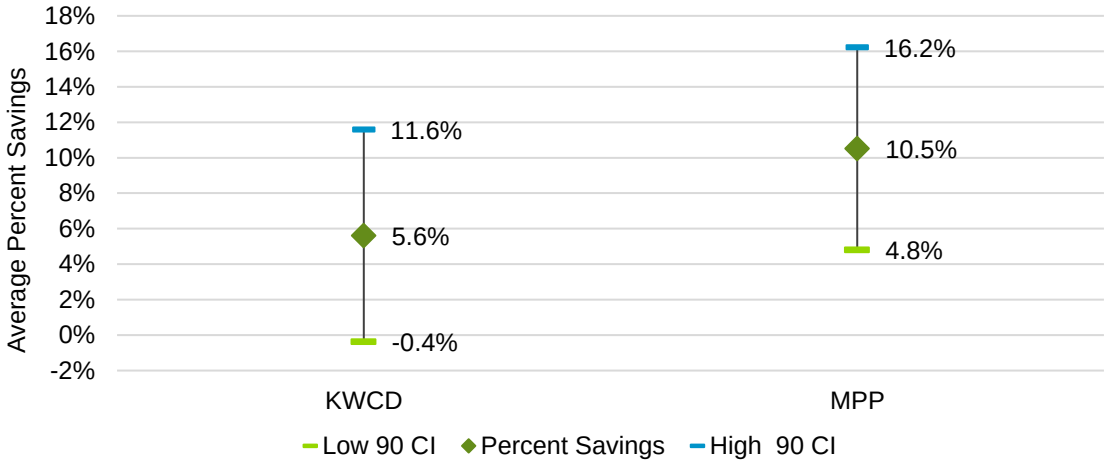
Figure 1. Results from KWCD and MPP Electricity Savings for the 2015 Post-Program Period



Source: Navigant analysis of billing data from KWCD and MPP programs, February 2016

Table 2 and Table 3 compare the results from Navigant's 2015 KWCD and MPP electricity analysis to a previous study that examined electric savings during the post-program period in 2014 (October 2013-September 2014).

Table 2. Comparison of KWCD Electricity Results from 2014 and 2015[15]

Year	Number of Buildings	Total Square Footage	Monthly Savings (kWh/sq.ft.)	90% CI Low	Annual Savings (kWh/sq.ft.)	90% CI High	Percent Savings	Total Savings (aMW)
2014	91	14,991,580	0.02	0.02	0.47	0.92	1.84%	**0.472**
2015	30	3,781,846	0.07	0.89	0.89	1.84	5.6%	**0.385**

Source: Navigant analysis of billing data from KWCD and MPP programs, February 2016

Table 3. Comparison of MPP Electricity Results from 2014 and 2015

Year	Number of Buildings	Total Square Footage	Monthly Savings (kWh/sq.ft.)	90% CI Low	Annual Savings (kWh/sq.ft.)	90% CI High	Percent Savings	Total Savings (aMW)
2014	47	6,182,073	0.05	0.02	0.42	0.82	3.79%	**0.420**
2015	14	2,568,818	0.19	2.36	2.36	3.65	10.5%	**0.690**

Source: Navigant analysis of billing data from KWCD and MPP programs, February 2016

Navigant's analysis determined that, after KWCD and MPP programs ended, electricity savings for the buildings in this study's sample increased by 5.6% and 10.5%, respectively, during the post-program period in 2015. This result suggests that electricity savings from SEM approaches persist even after programs have ended, perhaps due to a maturation of the SEM methods. An additional process analysis could be used to determine the cause of the energy savings persistence. From the program design

[15] 2014 savings values are provided by the Cadmus study, which is accessible in here: Northwest Energy Efficiency Alliance. March 2015. Commercial Real-Estate Participant Cohorts Market Progress Report. Prepared by Cadmus. REPORT #E15-308

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perspective, adoption of SEM practices may result in long-term electricity savings. Table 2 and Table 3 show an increase in KWCD and MPP percent electricity savings rates in the post-program period, relative to program period evaluation study conducted by Cadmus. The persistence of savings provides directional information on the potential that SEM electric savings efforts may persist beyond the SEM program implementation period. However, as noted previously, because the 2015 sample size was so much smaller than in 2014, it is important to exercise caution when drawing results from comparing the two analyses, as estimated savings from the 2015 and 2014 evaluations are not directly comparable unless the 2015 evaluation is re-estimated with the same sample size used in Cadmus' analysis of the 2014 data.

4.2 Gas Savings Results

Gas-metered buildings did not show any statistically significant savings after the KWCD and MPP programs ended. Table 4 and Table 5 show a decrease in KWCD and MPP gas savings rates in the post-program period relative to the 2014 savings analysis. However, caution should be applied when comparing results between the two analyses because the 2015 gas programs were not statistically significant. By not being statistically significant, the results from the KWCD and MPP gas programs are indistinguishable from zero.

Table 4. Comparison of KWCD Gas Results from 2014 and 2015

	Number of Buildings	Total Square Footage	Monthly Savings (therms/sq.ft.)	90% CI Low	Annual Savings (therms/sq.ft.)	90% CI High	Percent Savings	Total Savings (aMW)
2014	65	11,021,742	0.0010	*	0.012	*	7.53%	0.001
2015	20	3,258,411	-0.0003	-0.004	-0.004	-0.004	-2.33%	-0.001

Table 5. Comparison of MPP Gas Results from 2013 and 2015

	Number of Buildings	Total Square Footage	Monthly Savings (therms/sq.ft.)	90% CI Low	Annual Savings (therms/sq.ft.)	90% CI High	Percent Savings	Total Savings (aMW)
2014	27	3,625,579	0.0010	*	0.012	*	7.95%	0.001
2015	11	2,136,263	0.0002	0.002	0.002	0.002	3.28%	0.001

Table 4 and Table 5 show a decrease in KWCD and MPP gas savings rates in the post-program period relative to the 2014 post-program period. However, caution should be applied for any comparison of results between the two analyses because the 2015 gas programs were not statistically significant. By not being statistically significant, the results from the KWCD and MPP gas programs are indistinguishable from zero.

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5. EXISTING BUILDING RENEWAL DEMONSTRATION BUILDING PROCESS REVIEW

While many Northwest utilities offer incentives for building equipment retrofits, NEEA designed the EBR Initiative to enable significantly more energy and operating cost savings through a deep energy retrofit (building renewal). Integrating measures across multiple building systems can achieve larger load reductions per building than traditional approaches. The EBR goal was to achieve a minimum energy savings of 35%, while targeting 50% or more per building.

To inform and inspire building owners and property managers to undertake building renewal, NEEA developed a comprehensive tool for building owners called the Integrated Measures Package (IMP). The Integrated Design Labs (IDL) at the University of Idaho and the University of Washington designed the Tool and a financial analysis assessment to provide building owners and managers with potential energy efficiency opportunities and a way to quantify potential savings benefits to their buildings.

In 2013, NEEA began recruiting pilot demonstration projects in four Northwest cities: Boise, Idaho; Seattle, Washington; Missoula, Montana; and Portland, Oregon to pilot the IMP Tool. NEEA collaborated with two IDLs to offer pilot building owners the IMP Tool and the corresponding financial estimates of project costs and benefits. In return, the building owners of selected pilot projects committed to implementing the retrofits through contractors of their choice.

Navigant conducted a process evaluation of the pilot buildings post-implementation to determine owner and implementer perspectives on the EBR process. Navigant evaluated two of the four[16] demonstration projects—Portland, Oregon and Missoula, Montana—that completed their retrofits by the end of 2015. Navigant measured the following:

- Satisfaction of building owners, managers, and tenants with the retrofit
- Amount of non-energy benefits obtained from the upgrades
- Energy savings

The following two sections detail Navigant's findings.

5.1 Process Evaluation

Navigant interviewed three key stakeholders at each project (Project A and Project B): the building owner and operators, the director of the IDL who determined the measures, and the retrofit service provider who physically installed the measures.[17] These interviews took place over the phone between December 2015 and February 2016, lasting an average of 45 minutes. Navigant also conducted a survey of a fourth group of stakeholders to gather tenant perspectives on the upgrade which was completed in 2015.The EBR Demonstration Building Process Evaluation Report in Appendix G details the specific research objectives for each of these interviews. In general, they each sought to:

- Understand the owner and tenant value perceptions of the retrofits
- Identify areas of success or improvement

[16] At the time Navigant conducted the evaluation, only two projects had completed installation of retrofits.

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- Quantify satisfaction with each aspect of the project
- Identify the experience of each stakeholder throughout the implementation process[18]

The evaluation team surveyed building tenants from Project A in April 2016 (the building owner at Project B requested that Navigant not contact their tenants to avoid inconveniencing them). Navigant asked about their motivations for leasing space in the building, their satisfaction with the retrofit, and—for tenants who leased before and after the retrofit—to compare their experience before and after. Tenants received the online survey by email; out of 10 tenants contacted, six responded to the survey.

5.1.1 Overview

Overall, the building owners understood the value of building renewal and realized non-energy benefits such as improved reputation or marketability to potential tenants. After the building renewal, occupancy and rents increased at both projects, summarized in Table 6.

Table 6. Building Occupancy and Rent Increase

Project	Occupancy		Lease Rate ($/sq.ft.)	
	Before	After	Before	After
Project A	50%	94%	$15	$17
Project B	76%	98%	$26	$30

Source: Navigant December 2015 and January 2016 interviews for Existing Building Renewal Demonstration Building Process Evaluation report

Project A's occupancy (50%) is partly due to vacant space held to facilitate the replacement of the building HVAC system. The jump to 94% at a higher rental rate after the HVAC system was installed may suggest some influence on occupancy rates after of the retrofit, but further research would be required to assess the variables involved.

Building owner and manager satisfaction ratings indicate that energy savings is not the only value proposition for BR. Non-energy benefits were a major point of success among owners and managers, particularly for Project A. Table 7 lists satisfaction with the non-energy benefits. Owners and managers rated various non-energy benefits on a scale from 1 to 5, in which 1 was "very dissatisfied" and 5 was "very satisfied."

[18] A previous EBR evaluation focused on the expectations and decision-making of the involved parties.

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Table 7. Building Owner and Operator Satisfaction Ratings*

Topic Area	Project A	Project B
Ease and cost of building maintenance	5	TBD
Tenant retention	4	4
Building occupancy	5	4
Reputation in the community	4	4
Building property value	5	3
Net operating income	5	3
Competitive positioning	5	3
Ability to comply with regulations	5	4
Marketing and ability to attract tenants	4	4
EBR project overall	3[19]	4

Note: Navigant inferred these scores from a combination of numeric ratings and detailed replies.

** Interviewees were asked to rate their overall satisfaction with the EBR process for the issues noted above. Ratings were on a 1-5 scale in which 1=very dissatisfied and 5=very satisfied.*

Source: Navigant December 2015 and January 2016 interviews for Existing Building Renewal Demonstration Building Process Evaluation report

Tenant Perspective: The limited survey of tenants at Project A found that enjoyment of retrofit energy and non-energy benefits are not as pronounced for building tenants as for owner and managers. When provided options such as “better indoor air quality” and “wanted to be in a ‘green’ building,” or “lower energy costs,” respondents did not choose these reasons for leasing space in the building. Figure 3 provides a summary of key tenant findings for Project A.

[19] The owners explained that their overall score of 3 would have been higher except for several issues related to the inability, due to meter issues, to track savings and because NEEA had not assisted them in achieving an ENERGY STAR certification. NEEA has since followed up on the building’s certification and is currently in the certification process.

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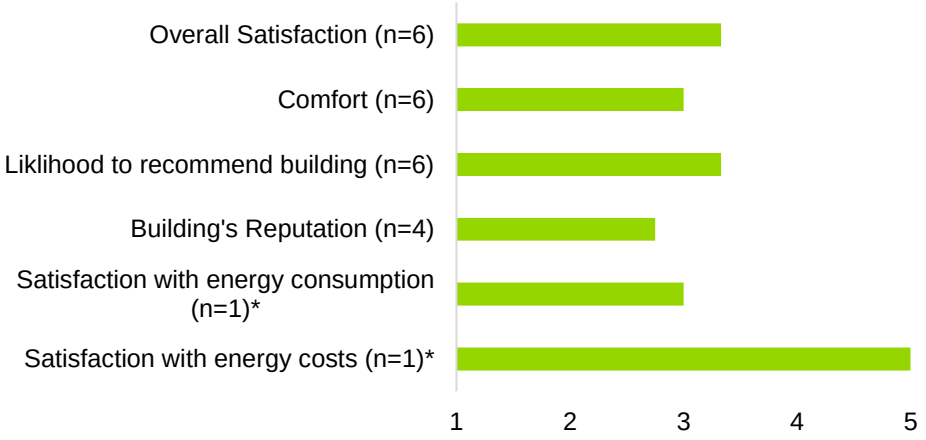
Figure 2. Project A Tenant Satisfaction Metrics



**Only one tenant received a bill and had awareness of his or her office's energy costs and usage, rating them a 5 and 3, respectively. The other tenants responded that they did not know.*

Source: Navigant April 2016 tenant survey for Existing Building Renewal Demonstration Building Process Evaluation report

5.1.2 Findings and Recommendations

Navigant's findings and recommendations from the process evaluation are below.

Satisfaction: Based on the satisfaction metrics of building owners, managers, and tenants, Project A was an overall success. However, the project ran into hurdles in the implementation phase that persisted at the time of the study. Ineffective daily project oversight, early misperceptions of roles, and problems with improper installation of equipment—which led to difficulty in monitoring post-project completion energy usage and cost—provide lessons learned for future EBR efforts. The EBR Demonstration Building Process Evaluation Report in Appendix D covers these issues in depth. At Project B, implementation ran smoothly from initiation to completion.

NEEA Facilitation Role: Owners of both demonstration buildings felt that NEEA's role in facilitating the projects was very important to the success of the project. In particular, their engagement strategy—to piggyback their deep retrofit proposal onto existing retrofit planning at potential buildings—is smart, though stakeholders of Project B stressed the need to engage the owners and managers as early as possible since every change to the plan creates ripples that require action from every member of the team.

Demonstration Implementation: The evaluation suggests that NEEA should ensure stakeholders have a clear understanding of NEEA's role and its limitations. In these pilots (and future building renewal projects) NEEA planned to provide oversight during the concept and design phases but not throughout implementation. Project A's building owner acknowledged that NEEA encouraged him to use a general contractor, but he chose not to. The plan, which was designed offsite by the IDL, required modifications during the implementation, and the lack of coordination about these changes caused problems. One retrofit service provider requested greater NEEA oversight into the physical work of the project to avoid the problems caused by a less experienced contractor.

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Stakeholders offered four possibilities to increase oversight:

1. Scout out and vet local contractors to ensure they are capable of doing the work as designed, or act as the owner's representative on the project
2. Use an IDL within driving distance that has the human resource bandwidth to monitor implementation more closely than the Boise IDL was able to in Missoula.
3. Build redundancies into the communication network to minimize the impact of weak links or the chance that installation deviates from the plan as modeled
4. Include a process protocol through the whole project—not just individual phases; include the protocol in operations and maintenance (O&M) documentation so it does not sunset at the end of a contract period.

Based on these suggestions, Navigant recommends NEEA continue encouraging building owners to contract with third-party managers to oversee the implementation process end-to-end.

Additionally, based on feedback from Project B, Navigant suggests NEEA develop a project viability template or checklist to reduce the time cost for building owners/operators or NEEA trade allies to replace whole-building systems, as owner/operators must carefully plan these around tenant vacancies. Any proposal to expand a scheduled project with comprehensive, whole-building retrofits is a risk to building owner/operators. NEEA personnel and its trade allies can offset this risk by timing building renewal proposals to coincide with an owner/operator's major system replacements or with external pressure and resources from, for example, a city trying to create a local EcoDistrict; unfortunately, these opportunities are rare and require a lot of groundwork to identify. A viability template or checklist can speed up the process of engaging owner/operators so a wider net can be cast and can reduce the perception of risk.

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6. EXISTING BUILDING RENEWAL (EBR) DEMONSTRATION BUILDING 2015 SAVINGS VALIDATION

To validate 2015 energy savings estimated as a part of the IMP of energy efficiency measures deployed in each building, Navigant reviewed the existing and proposed model inputs and compared both models at projects in Portland, Oregon and Missoula, Montana. This section presents the findings from the evaluation at each site.

6.1.1 Findings: Building 1 – Portland, Oregon

This building completed two phases of retrofit activities: Phase 1 in March 2013 implemented efficient HVAC controls, while Phase 2 in January 2015 replaced a central utility plant and installed energy efficient lighting. The IDL created the demonstration *building's existing building model* and an *initial design building model*, modeled on eQUEST, to simulate energy consumption levels for the building. The baseline and proposed energy models required calibration with actual energy consumption in the building. Given inputs from building energy models and monthly billing data, Navigant calibrated the baseline model with pre-retrofit billing data and incorporated the efficiency measures implemented in Phases 1 and 2 using post-retrofit data. By the end of Phase 2, retrofits resulted in a total of 0.314 aMW electric savings, or a 37.7% reduction relative to the baseline.[20] Savings values are summarized in Table 8.

Table 8. Portland Demonstration Building 2015 Phase 2 Project Savings

Savings Metric	Phase 2 Incremental*
Electric Savings	37.7%
Natural Gas Savings**	N/A
Electric Savings (MWh)	2748.4
Natural Gas Savings (MMBtu)	N/A
Natural Gas Savings (Therms)	N/A
Electric Savings (aMW)	0.3137

Note: Annual aMW = (MWh annual saved) / 8,760 hours
**Phase 2 Project Savings represent the savings of Phase 2 relative to baseline modeling.*
*** No gas consumption in the baseline modeling (pre-retrofit)*
Source: Navigant analysis for Existing Building Retrofit (EBR) Product Testing and Validation – Progress Report

By comparing results from the simulated building model in eQUEST to real metered data, Navigant validated the savings achieved by this project. Figure 3 and Figure 4 show electric and gas consumption, respectively, for both simulated data and monthly billed data at the site. Gas consumption in Figure 4 shows only the post-retrofit period (February 2015-October 2015), when the building started metering natural gas.

[20] Prior to the phase 1 and phase 2 replacements, the building did not meter natural gas, so the baseline model did not include data on pre-retrofit natural gas consumption with which to calculate savings.

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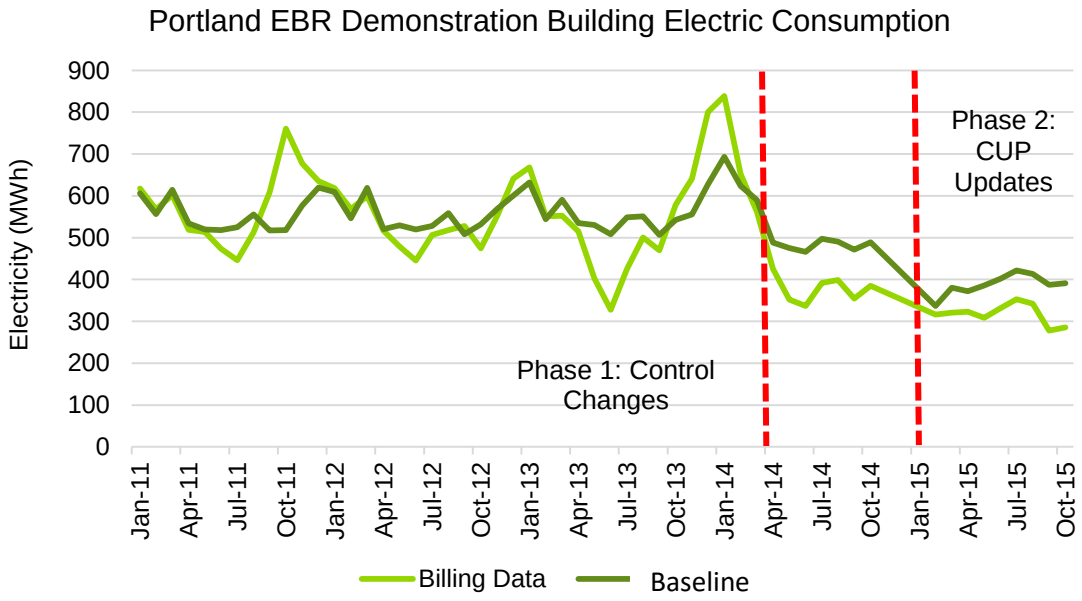
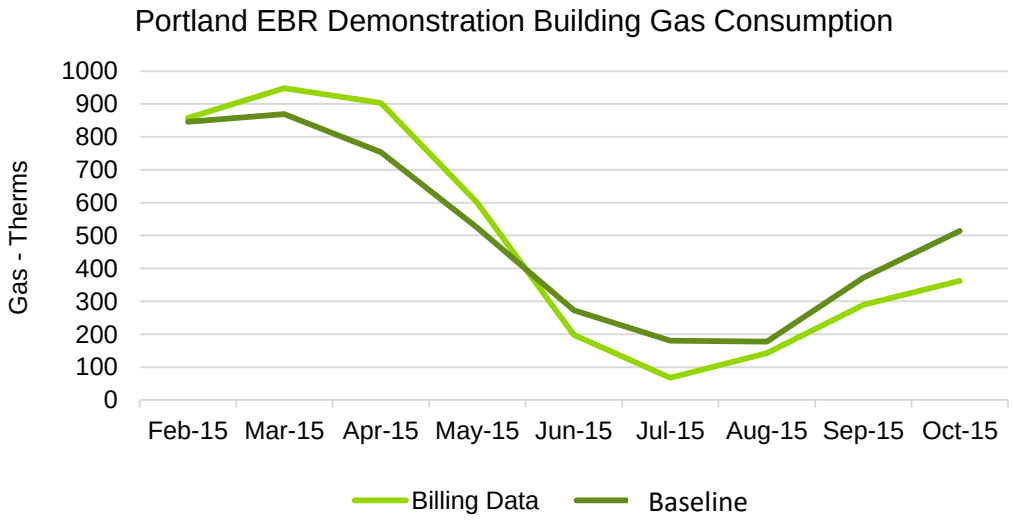
Figure 3. Comparison of Building Electric Consumption (Billing vs. Simulated)



Note: For simulation data baseline model is used for Jan-11 through Oct-14 (including Phase 1 model Apr-14 through Oct-14), and Phase 2 model is used for Feb-15 through Oct-15.
Source: Navigant analysis for Existing Building Retrofit (EBR) Product Testing and Validation – Progress Report

Figure 4. Comparison of Building Natural Gas Consumption (Billing vs. Simulated)



Note: The simulation data baseline model is used for Jan-11 through Oct-14 (including Phase 1 model Apr-14 through Oct-14), and Phase 2 model is used for Feb-15 through Oct-15. Only has gas consumption after the post-retrofit.
Source: Navigant analysis for Existing Building Retrofit (EBR) Product Testing and Validation – Progress Report

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6.1.2 Findings: Building 2 – Missoula, Montana

Navigant validated savings following 10 energy efficiency measures implemented as part of the building's Phase 2 retrofit. Both baseline and post-retrofit models required calibration to adjust for 2015 changes in building occupancy and metering patterns. The building owner provided a full year of electric meter data post-September 2013, after a lost year in 2013 due to submetering issues. The post-retrofit electric meter data had high levels of variance to set it apart from the pre-retrofit data. Despite irregularities in the data, Navigant used the new metering data for the post-retrofit case to calibrate the post-retrofit model and provide more robust validated savings values compared to the 2013 report.

After comparing results from the simulated building model to real metered data, Navigant determined that Phase 2 measures did not achieve any electric savings in 2015. In fact, validated electricity savings compared to the baseline were less than the reported electricity savings in 2013. However, on the natural gas side, consumption dropped to nearly zero due to a decommissioned gas boiler, realizing 98% savings. Gas savings in 2015 are consistent with values reported in 2013.

From this analysis, Navigant concluded that natural gas savings have been maxed out on the building, and it is unlikely that further electric savings will be achieved based on existing measures installed. Thus, no further evaluation on this demonstration project is necessary. Table 9 shows the findings.

Table 9. EBR Montana 2015 Phase 2 Savings

Savings Metric	Phase 2 Total Savings	Phase 2 Incremental Savings (2015)
Electric Savings	0%	0%
Natural Gas Savings	98%	0%
Electric Savings (MWh)	0	0
Natural Gas Savings (MMBtu)	1,997.9	N/A
Natural Gas Savings (Therms)	19,979.0	N/A
Electric Savings (AMW)	0	0

Source: Navigant analysis of data for Existing Building Retrofit (EBR) Product Testing and Validation – Progress Report

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7. SPARK TOOL PILOT PROCESS EVALUATION

During the months of May and June 2016, Navigant conducted a limited process evaluation of the Spark Tool user's pilot, focusing on the introduction and use of the Tool to a select group of users. BR's Spark Tool is an online assessment Tool developed by NEEA to help inform and inspire investigation of building renewal (i.e., BR in leased commercial office buildings). As a part of this evaluation, Navigant conducted interviews with two previous Energy Trust of Oregon-selected users from the Portland, Oregon region; both of these interviewees have since reported they have discontinued or suspended usage of the Tool. The purpose of these interviews was to gather feedback and lessons learned from these users' experience with the Tool.

7.1 Overview

Navigant conducted phone interviews with two volunteer Tool users from Portland, Oregon in May and June 2016. Each interview lasted about 45 minutes. The interview objectives were to:

- Understand the motivation for participation
- Evaluate the satisfaction of participants using the Tool
- Evaluate the effectiveness, flexibility, and usability of the Tool
- Determine the extent to which the Tool can deliver the business case for BR
- Identify the successes, barriers, and recommendations for improvement

Navigant describes the findings and provides recommendations for improving the Tool in the following section.

7.2 Findings and Recommendations

Table 10 provides a summary of the successes and barriers to the Spark Tool as found by Navigant during the process evaluation.

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Table 10. BR Spark Tool Process Evaluation: Barriers and Successes

	Process	Spark Tool
Successes	Respondents were satisfied with the **communications** received from NEEA.	The Tool was well-rounded, successfully integrating technical engineering analyses into customers' overall business strategy.
	NEEA staff were helpful, responsive, and accommodating.	The Tool was user-friendly and comprehensive, probing users with multiple questions to best capture the building's performance and identify where the opportunities lie.
	The presentation, supporting handouts, and other physical **collateral** (as used and reviewed by respondents) were excellent and informative.[21]	
Barriers	There is a potential perception issue where users may question the validity or reliability of the Tool, especially if they are unfamiliar with its technical merits.	Sometimes users deemed the estimated savings to be too high or unrealistic and/or saw costs as excessively prohibitive, which can potentially weaken the business case.[22]
	One respondent did not initially understand how the Tool would specifically fit into his/her business model and/or add value to his/her customers.	The Tool did not provide project-ready recommendations; the analysis required supplementary audits or deeper investigation.[23]
	Respondents were not aware of the critical need to incorporate rental differentials into the overall business case analysis.	The Tool did not allow users to add greater detail about their building when asked about building specifications nor did it allow users to adjust the color scheme of the report.

Source: Navigant interviews May and June 2016 as part of the Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

7.2.1 Motivation

Respondent A represents an engineering firm that does energy analysis on commercial buildings as part of the firm's standard business practice. Accordingly, Respondent A joined the Spark Tool stakeholder pilot because repositioning commercial buildings is part of their service offerings; as such, the Tool seemed a natural option to add value to their conventional audit services. Respondent B represents a

[21] One respondent initially had difficulty accessing the website, but once they received access, they found the content to be user-friendly, informative, and excellent. They also praised the quality of the presentation, handouts, and other physical collateral. The other respondent only recalled interfacing with the online resource but was generally pleased with its content.
[22] One respondent mentioned savings estimates that exceeded 60%. When Navigant inquired about specific recommendations that yielded these high savings, the respondent provided the following examples: lighting (which the respondent is presently doing), envelope/ceiling retrofits, and installation of efficient windows, plug load management, powerstrips, and new variable air volume boxes. Navigant notes that the high savings estimate may be due to erroneous user inputs when specifying the baseline.
[23] Navigant told the interviewees that the tool was designed as a first-cut review of deep energy retrofits that should be followed by a more formal engineering analysis. The respondent did remember seeing reference to this in the tool literature but was not focused on this in testing the tool.

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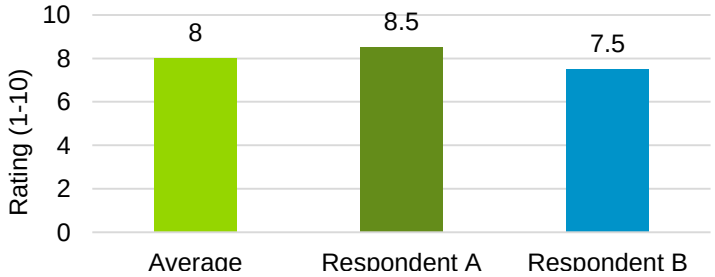
large government agency interested in perhaps using a tool like Spark to evaluate building upgrades at government owned or leased buildings. Respondent B used the Spark Tool to explore solutions to supplement their buildings analysis and evaluation work.

Navigant asked respondents whether the information they received prior to participating in the pilot described clearly how to use the Tool and was sufficient to inform their decision to use it. On a scale of 1 to 10, where 10 indicated the highest sufficiency, users rated the information they received about using the Spark Tool. Figure 5 summarizes the results.

Figure 5. Sufficiency of Information Received Prior to Participation



Source: Navigant interviews May and June 2016 as part of the Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

Respondents agreed that the information they received prior to participation described clearly how to use the Tool and was sufficient to informing their decision whether to utilize the Tool. While the information informed them, one respondent felt challenged to describe specifically how the Tool can fit into his organization's business models or service offerings.

7.2.2 Satisfaction

Navigant asked the interview respondents to rate their satisfaction using a scale of 1 to 10, where 10 indicated the highest satisfaction. Figure 6 shows their satisfaction with communication with NEEA, the supporting resources NEEA provided them, and satisfaction overall.

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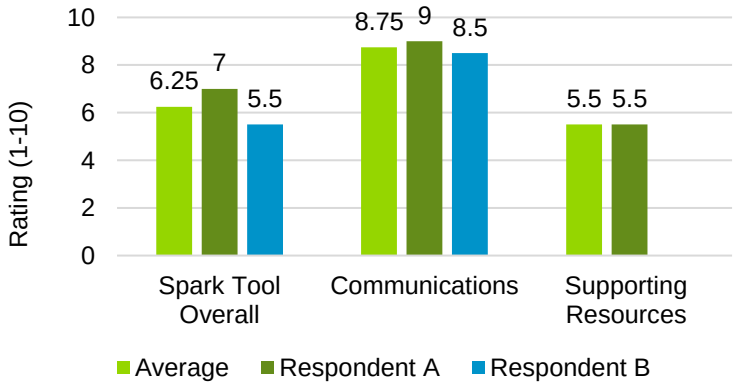
Figure 6. Satisfaction Ratings[24]



Source: Navigant interviews May and June 2016 as part of the Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

Satisfaction with communication was high (8.75) whereas satisfaction with the supporting resources was lower. Overall satisfaction was moderate (6.25). Respondent A appreciated how the Tool successfully integrates and leverages engineering analyses to develop the business case; he/she noted, however, that some of the Tool's recommendations were too costly. Respondent A also mentioned that the report results were difficult to leverage directly since the colors used did not align with his company's normal color values for making project decisions. For example, he noted that for his company, positive ratings are associated with the color green and negative ratings with the color red -- yet the Spark Tool does not consistently utilize these conventions.

Respondent B also provided positive feedback, noting that the Tool indicates, at a high level, where the financial and energy savings opportunities lie. However, there were limitations to those results. Specifically, Respondent B noted that some of the resulting savings estimates were too high for some end uses.[25] Respondent B also mentioned that the Tool was not a standalone solution that could provide project-ready recommendations, as he/she had initially presumed.

After participating in the pilot, Respondent A noted there simply was not enough interest within his organization to continue using it. This was likely due to competing projects and timelines, but also may represent the user's own experience in using the Tool related to the Tool's added value for their customers. Respondent B had not yet officially exited the pilot but ceased using it until he/she received additional internal guidance from their organization. Such guidance related to Spark's deep energy retrofit assessment and related costs, which would require higher level review of the specific government building (leased) and the added costs and savings of the deep retrofit examined in the pilot.

[24] Navigant listed the following support resources: training, promotional collateral, orientation documents, workshops, and other physical collateral or support resources. Respondent B did not provide a satisfaction rating for "Supporting Resources" since the respondent recalled interacting only with the online website. As such, the respondent declined to provide a rating in this area since he/she felt he/she was not in a position to provide a valid rating.

[25] Navigant notes that the "unrealistically high" energy savings mentioned by the respondent may be due to erroneous building inputs specified in the questionnaire. Navigant also notes the fundamental gap in the user's understanding of the savings—i.e., that the savings are with respect to the entire package and not to individual measures or end uses. See Navigant's recommendation on future pre-use training for potential pilot users.

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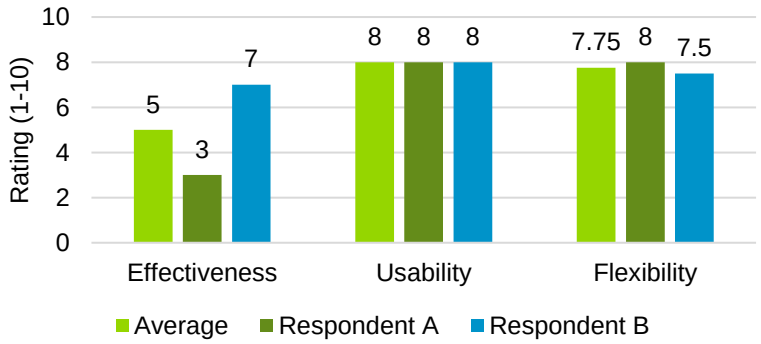
7.2.3 Effectiveness, Flexibility, and Usability

Navigant requested respondents rate the Spark Tool and its associated resources (e.g., webinars, demos, and online material). Figure 7 depicts the ratings respondents gave in terms of effectiveness, usability, and flexibility.

Figure 7. Effectiveness, Usability, and Flexibility



Source: Navigant interviews May and June 2016 as part of the Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

- **Effectiveness:** Despite mentioning that the Tool effectively indicated where the potential savings remained, respondents provided a low rating on the Tool's overall effectiveness because they felt that some of the retrofit recommendations (e.g., glass upgrades or window glazing) had too long of a payback period or were too costly to implement with respect to their budget, timelines, and goals. Presentation of costly or out-of-scope measure packages weaken the business case for building renewal when presented to decision makers.[26]
- **Usability:** Both respondents were pleased with the Tool's user interface, noting that it was user-friendly, simple, and provided various useful features. Respondents believe the extensive questions enable the Tool to best capture the building performance and provide users the ability to customize it.
- **Flexibility:** Respondents indicated that the Tool was flexible and user-friendly, garnering high ratings for both (average ratings of 7.75 and 8, respectively). Respondent A praised the Tool's flexibility, but described the presentation of recommendations as an "everything-in-the-kitchen-sink" approach instead of framing recommendations with respect to the Tool user's goals. Respondent B appreciates the significant amount of flexibility with the questionnaires.

7.2.3.1 Business Case

One of the Spark Tool's key objectives is to help trade allies and building operators articulate the costs and benefits of building renewal to the building owner decision makers. On a scale of 1 to 10, where 10 indicated the highest ability, respondents rated the Tool's ability to help them develop the business case for building renewal. Figure 8 shows each respondent's response and the average of the two.

[26] NEEA designed the Spark tool to make the business case for building renewal with both energy and non-energy benefits, such as reduced operations and maintenance costs. The two respondents seemed to be unaware of this, however. They appeared to be under the impression that energy efficiency incentives and savings alone would support the building renewal premise.

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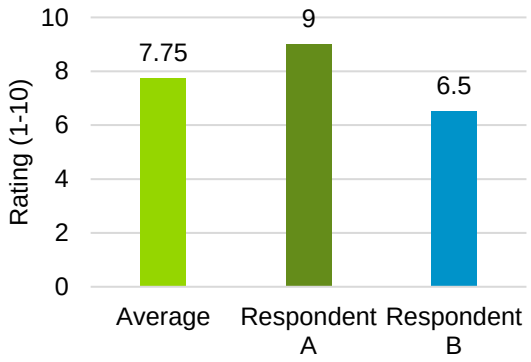
Figure 8. Tool's Ability to Develop the Business case for Building Renewal



Source: Navigant interviews May and June 2016 as part of the Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

The respondents' ratings of the Tool's ability to make the business case for building renewal also reflects their preference for measures with shorter payback.[27] They rated this area with a relatively high average of 7.75, but Respondent B noted that although the Tool helps develop a business case, it was weak due to the costly nature of some recommendations. Respondent A highlighted that this risks the tool's credibility because while its ease of use would permit even non-engineers to identify savings potential, non-technically oriented users may interpret capital- or time-intensive recommendations as a sign the tool is simply a "black box" with uncertain methodologies and assumptions. On the other hand, Respondent B commented that the tool was not as self-standing as they initially presumed it to be; specifically, his organization envisioned Spark to be a tool that would make project-ready recommendations; however, they soon realized that the tool simply provided high-level recommendations and they needed to use deeper analyses or audits in conjunction with it.

Navigant makes the following recommendations (Table 11):

[27] NEEA's description of the Spark building renewal business case relies on the premise that longer payback measures should be bundled with shorter payback measures into an IMP that will generally need economic support from rent differential. Upon further review, it does not appear that these users continued with Spark exploration long enough to consider the potential for rent differential resulting from repositioning a building as part of their business case response or were not aware of the need to do so.

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Table 11. Spark Tool Stakeholder Pilot Recommendations

Process	Spark Tool	Miscellaneous
Provide case studies online and in any promotional collateral to demonstrate the Tool's reliability and effectiveness.	Ensure that reported energy savings estimates are within typical bounds for the group of measures and/or end uses within the recommended packages. One option is to allow users the ability to enter additional, specific details about their building in the questionnaire to fine-tune results.	Ensure that the website and the associated online resources are easy to find.
Communicate to customers how the Tool fits specifically into customers' business models and/or how the Tool provides additional value to the customers' service offerings prior to the initial presentation.	Allow users to specify budgetary constraints to help identify recommendations that are within scope. Or allow users to remove recommendations they consider too costly or out of scope.	Allow users the ability to adjust the report's color scheme.
Strengthen training prior to Tool usage. Specifically ensure that knowledge of the Tool's function (e.g., "packaging" of measures and the incorporation of rent differential in the overall strategy), flexibility, and customizability be clearly conveyed and understood prior to use.	To strengthen the business case, package suggested measures or recommendations into case scenarios (provide estimated costs/payback information and the time/level of effort required for each). As an example, package lower cost, simpler, and shorter-term measures into a low-hanging fruit or simple scenario and package more complicated, costly, or longer-term projects into another scenario. Doing so will help customers with their goal planning by helping them to identify which suite of measures can satisfy short-term goals and which can satisfy long-term goals. Overall, this would provide users a potential phased approach to implementation.[28]	
Effectively train potential users and ensure sufficient understanding of the key Tool parameters users can adjust and/or customize to align the output with their goals. Ensure that customers understand the full functionality of the Tool in making the business case for building renewal.[29]		

Source: Navigant interviews May and June 2016 as part of the Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

[28] Navigant explained to one of the interviewees that the Spark Tool does not make specific individual measure recommendations but rather integrated packages of measures. Respondents stated that their experience with the tool could be improved with a better understanding of their ability to customize the packages to better align with their goals.

[29] One respondent did not receive any formal training and learned how to use the tool via an online promotional video on the building renewal site. They mentioned that the tool was pretty straightforward to use. The other respondent was introduced to the tool via an in-person presentation. The respondent appreciated the in-person meeting and left feeling like they knew how to use the tool. One recommendation this respondent had, however, was to provide more informational resources prior to the meeting to give potential clients a better understanding of how the Spark tool can specifically add value to them or fit into their larger business processes. The respondent mentioned that after the presentation they understood how to use the tool, but not how it fit into their overall business model.

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8. MARKET CHARACTERIZATION

Navigant updated NEEA's 2014 *Market Characterization and Establishing the Baseline for the Commercial Real Estate Initiative*, prepared by Cadmus Group, to include information about leased small office buildings in the region (less than 20,000 square feet).[30] The evaluation team reviewed secondary literature, surveyed certified and non-certified building operators, and analyzed real estate data provided by NEEA from CoStar. Table 12 identifies the research objectives for the market characterization and the sources of the findings.

Table 12. Market Characterization Research Objectives and Sources of Findings

	Market Characterization Research Objectives	Sources			
		CoStar Data	Secondary Research	BOC Participant Survey	BOC Nonparticipant Survey
1	Number of building owners in the region	X			
2	Number of building management companies	X			
3	Key ownership structures and business drivers		X		
4	Barriers and opportunities		X	X	X
5	Incremental costs to market actors in adopting CRE programming			X	
6	Key regional CRE actors		X		
7	Attitudes and awareness of key market actors toward energy efficiency		X	X	X
8	General market trends		X		X
9	Possible emerging or declining indicators		X		

8.1 Secondary Resource Review

Navigant reviewed three reports that NEEA recommended to identify the research areas for which sufficient data already existed and determine the additional research needed to meet NEEA's research objectives. Navigant reviewed the reports detailed in Table 14.

[30] Leased big box retail and warehouse research will commence in 2017.

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Table 13. Summary of Secondary Resources

Secondary Resource	Description
Market Characterization and Establishing the Baseline for the Commercial Real Estate Initiative, prepared by Cadmus Group, 2014. (Referred to as **2014 Market Characterization**)	This report characterizes the leased CRE market in the Northwest, measures SEM adoption, and establishes a market baseline of SEM between the years 2000 and 2033 under the assumption that NEEA, Bonneville Power Administration, Energy Trust of Oregon, and local utilities had not intervened in the market. The report's analysis includes leased commercial office buildings in the Northwest, which assumes a minimum 50,000 square foot building in Washington and Oregon and a 20,000 square foot building in Idaho and Montana.
Commercial Real Estate Participant Cohorts Market Progress Report, prepared by Cadmus Group, 2015. (Referred to as **2015 Market Progress Report**)	This study looks at NEEA's delivery methods for its CRE SEM initiative (the MPP and office energy efficiency competitions) and assesses the presence of SEM among participant firms, estimates 2013 energy savings, and determines the savings rate for planning purposes.
Commercial Real Estate (CRE) Market Test Assessment: Understanding Delivery, Partnership Strategies and Program Channels, prepared by New Buildings Institute, 2015. (Referred to as **2015 Market Test Assessment**)	This study reviews the delivery of NEEA's CRE programs and identifies key themes and potential strategies for NEEA to address in future program offerings. The study interviews CRE executives, conducts what is known as a "bright spot"[31] analysis of CRE firms whose approach to energy efficiency is substantially better than market norms, and reviews licensing, credentialing, and accreditation (LAC) trends to provide insights on how future LAC trends might reduce market barriers.

8.2 Building Operator Surveys

Navigant surveyed two groups:

1. Building Operator Certification (BOC) training participants
2. Non-certified building operators

Twenty-seven certified building operators and eight non-certified building operators responded to the surveys. Both surveys measured the level of awareness and utilization of the following CRE programs, tools, or resources:

- BetterBricks Resource Center
- Spark tool
- Green leases
- O&M toolkit[32]

[31] "Bright Spot" refers to extraordinary buildings that taken the extra mile and are thus eligible for this designation and analysis in the study

[32] This is a toolkit NEEA developed to assist building manager and operators in taking low-cost to no-cost operational energy savings steps

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- Benchmarking

8.3 Market Findings

This section documents Navigant's findings from the secondary research review and the building operator surveys as they relate to the following metrics:

- Number of leased small office buildings
- Number of building management companies
- Vintage of leased building stock
- Key ownership structures and business drivers
- Barriers and opportunities specific to this market
- Key CRE market actors
- Awareness and attitudes of key market actors toward energy efficiency
- Market trends to identify barriers and opportunities for energy efficiency best practices
- Possible emerging or declining indicators for adopting and implementing CRE Infrastructure programs

Key findings from the research include:

- Less than 300 property management companies lease roughly 8,200 offices in the region.
- Awareness of energy efficiency is present in the market, but there is evidence to suggest opportunity exists for monitoring and tracking energy use over time.
- Market actors are generally unaware of NEEA's CRE programs.

The remainder of this section is organized by the key findings.

8.3.1 Less Than 300 Property Management Companies Lease Roughly 8,200 Offices in the Region

There are 22,731 office buildings below 20,000 square feet in Oregon, Washington, Idaho, and Montana. Of these office buildings, 36% are leased office buildings (8,194), while the remainder are owner-occupied (14,537). Property managers manage leased office buildings. In the 2014 Market Characterization, Cadmus reported that in 2013 there were 281 property management companies in the region. Of these, 76 in Oregon, 164 in Washington, 32 in Idaho, and 9 in Montana. On average, property management companies lease 29 buildings.

Table 14 shows the average number of leased offices per property management company by state.

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Table 14. Average Number of Leased Offices Per Property Management Company

	OR	WA	ID	MT	Total
Leased	2,225	4,128	1,462	379	8,194
Property Managers	76	164	32	9	281
Average Number of Leased Offices per Property Management Company	**29**	**25**	**46**	**42**	**29**

Source: Navigant 2015 analysis, CoStar data

The three largest cities in each state account for 37% of the total regional leased small office buildings. Six cities in Oregon and Washington represent one-quarter of the region's leased small offices. In Oregon, the cities of Portland, Salem, and Eugene represent about 12% of the leased small office locations in the Northwest. In Washington, Seattle, Spokane, and Tacoma represent 14% of the leased small office locations in the Northwest. Leased small office buildings are concentrated in the three largest cities each in Idaho and Montana also. However, within the region, these large cities represent just a small portion of the regional total—the largest three cities from each Idaho and Montana account for 12% of the region's small offices.

Table 15 shows the concentration of leased small office buildings in the three largest cities in each state.

Table 15. Number of Leased Small Offices in Each State's Three Largest Cities

State	Number of Leased Small Offices	Percentage of Region
Oregon	972	12%
Washington	1,108	14%
Idaho	761	9%
Montana	223	3%
Region's 3 Largest Cities in each State	3,064	37%
Other Cities Total	5,130	63%
All Cities Total	**8,194**	**100%**

Source: Navigant 2015 analysis, CoStar data

Of small office buildings in the region, 41% are wood frame and 22% are masonry. Navigant analyzed the CoStar data set to determine the average age of buildings in the region. The evaluation team found that the majority of office space in the region was constructed around 1979. Oregon has the oldest building stock and Idaho the youngest. Table 16 shows the type of building construction by state and the median age of small office buildings by state.

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Table 16. Type of Small Office Building and Year of Construction by State

Construction	OR	WA	ID	MT	Total	Total %
Masonry	415	1,015	311	59	1,800	22%
Metal	5	38	4	1	48	1%
Reinforced Concrete	101	302	139	4	546	7%
Steel	8	34	7		49	1%
Wood Frame	855	1,967	475	97	3,394	41%
Unknown	841	772	526	218	2,357	29%
Vintage	**1976**	**1979**	**1993**	**1982**	**Median Age**	**1979**

Source: Navigant analysis, CoStar data

8.3.2 Awareness of Energy Efficiency Is Present in the Market, but There Is Evidence to Suggest Opportunity Exists for Monitoring and Tracking Energy Use Over Time

The surveyed non-certified building operators indicated that they have updated equipment and engaged in more efficient energy practices in the past, and will continue to do so. This is consistent with Navigant's secondary research review. The 2014 Market Characterization detects a general shift toward energy efficiency practices through energy management and more efficient technology adoption. The report found that companies are beginning to integrate energy management plans into their operations and are hiring sustainability managers. Companies are also beginning to benchmark energy use and some tie staff bonuses to this metric. Results from that study indicate that companies will be looking at energy consumption at the portfolio level and at adopting energy management strategies. These results may indicate that energy efficiency awareness is present in the market.

The 2014 Market Characterization found that the majority (75%) of market actors have identified practices to reduce energy use. The majority of firms reported implementing planned SEM practices as part of their energy management, but only 50% of firms had established energy reduction goals in the last five years. Fifty-percent reported and monitoring energy use for the entire organization. Thirty-five percent of firms reported monitoring energy use for a single building and 9% for the portfolio of buildings. Thirty-nine percent of the firms interviewed conduct their building or portfolio reviews annually.

The 2015 Market Test Assessment found that awareness of energy efficiency is present, but firms often lack fully developed energy efficiency plans. Even among market leader firms, sustainability and energy policies were common but detailed energy management plans were not. Almost all firms surveyed had done some form of energy benchmarking. However, while a number of firms claimed to have benchmarked their properties, they rarely used this information as part of a corporate- or portfolio-wide approach to energy efficiency. Firms interviewed during the 2015 Market Test Assessment varied in how they set energy reduction goals: about half of the firms said that they set energy reduction goals for the entire organization; the other half were split between setting energy reduction goals for a particular portfolio and for a specific building. Figure 9 compares the responses from the 2014 Market Characterization and the 2015 Market Test Assessment.

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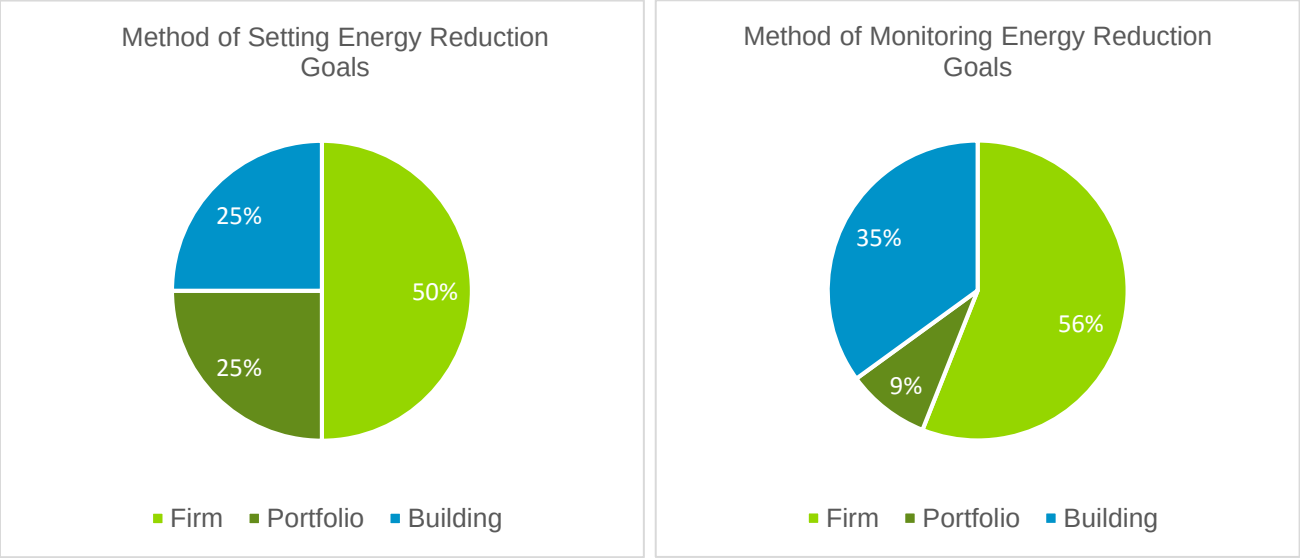
Figure 9. Methods to Set and Monitor Energy Reduction Goals



Source: Navigant Comparative Analysis of the 2014 CRE Market Characterization and the 2015 CRE Market Test Assessment

8.3.1 Market Actors Are Generally Unaware of NEEA's CRE Programs and Role in the Market

Lack of awareness is a key barrier to greater adoption of NEEA CRE programs. According to the 2014 Market Characterization, more than half of the people responsible for energy decisions in the target market were not aware of SEM or the NEEA CRE Initiative at the time of the market characterization. Additionally, firms have a poor understanding of NEEA's role in the market. The 2015 CRE Market Test Assessment found that none of the firms interviewed understood NEEA's goals or its relationships with utilities, and they had limited knowledge of NEEA's range of offerings.

Among all five CRE programs, tools, and resources specifically asked about in the survey 85% of BOC training participants had heard of at least one. Only 55% of nonparticipants had heard of at least one NEEA CRE Tool, resource, or program. The BetterBricks Resource Center and benchmarking programs were the best-known tools and resources to BOC training participants. Even among nonparticipants this was true, though their awareness was lower than BOC participants.

Utilization of the BetterBricks Resource Center and benchmarking tools appears driven by financial incentives—100% of respondents cited lower energy costs and financial considerations as the reason they used BetterBricks or benchmarking programs. Specifically, 19% of BOC participants used the BetterBricks Resource Center or a benchmarking program in order to benefit from utility incentives; however, only one-third of them have discussed these programs and tools with their utility, and when they did, the majority of them spoke about lighting rather than BetterBricks or benchmarking. This suggests the CRE program tools, resources and associated utility programs could benefit from greater awareness.

The 2015 Market Test Assessment reported a lack of understanding by market actors of NEEA's role in the market. The report indicated that the lack of awareness of NEEA's role contributes to a feeling of noise in the marketplace. According to the report, there is too much efficiency "noise" in the CRE

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market—the surplus of information, education, ideas, proposals, and businesses related to energy efficiency causes confusion for commercial real estate market actors and can delay or eliminate energy efficiency decisions. The information overload also provides market actors with conflicting or unreliable information, and firms may lack the time and expertise to resolve information gaps and conflicts.

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9. MPI REVIEW

This section summarizes the evaluation's findings for this MPER 1 relative to the three CRE logic models and related MPIs. Because the CRE Infrastructure effort is in its first year of operation, Navigant and NEEA staff determined that it was unlikely that MPIs focused on *adoption of CRE tools*, resources and strategic partnership would be evidenced in the CRE marketplace. Hence, a key focus of this initial MPI review is to: a) establish if the assumption of negligible adoption of new CRE Infrastructure for this first MPER was correct, and b) to establish baselines for each of the MPIs associated with the three CRE logic models. The CRE Infrastructure's integrated platform and market approach, and related Market Progress Indicators (MPIs) are contained in program's three logic models in Appendix A., Appendix B. and Appendix C.

In relation to market adoption of CRE, each of the logic models has a similar overarching vision and long-term goal: i.e., that CRE tools, resources and strategic partnerships are *adopted as standard practice* in the CRE market. The CRE MPIs – regardless of specific logic model – all focus on stakeholder *use and adoption* of the program offerings. Because of the common MPI focus on adoption (rather than awareness or other metrics), and because of the early stage of program development, the project team (in conjunction with NEEA staff) determined that the MPI review for this first MPER should focus on establishing a baseline of activities against which future CRE market adoption might be measured.

Navigant found no evidence of *market adoption* i.e., MPI existence, for any of the three logic model market indicators for this CRE MPER 1. This is not surprising for as noted, CRE efforts are in their early stages of program/platform design and have focused primarily on early market development and pilot testing of concepts in 2016, rather than on broad market implementation. The project team did, however, find that a good deal of *awareness* exists of NEEA CRE legacy programs.[33], [34] With no evidence of market adoption of the newly created CRE Infrastructure effort, Navigant determined a zero baseline of market presence for all of the MPIs for MPER 1.

[33] We note that at the request of NEEA, Navigant reviewed literature on CRE market leaders and participants rather than undertake direct interviews of these audiences – as a means of reducing interview fatigue for this important audience.

[34] For example, specific to NEEA benchmarking tools and resources 70 percent of BOC participants are aware of NEEA benchmarking tools and resources and 44 percent have used them. 55 percent of non-BOC market actors are aware of benchmarking tools/resources.

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10. CONCLUSION

CRE Infrastructure combines many different elements of NEEA past and current efforts to provide a platform for continuing the long-term regional effort to transform the commercial real estate market toward ever higher states of energy efficiency. Navigant finds that the theory of change embodied in each of the unique CRE Infrastructure logic models is sound and as implemented will likely move the region further along in its CRE focused goals.

CRE's inclusion of past efforts associated with EBR Initiative is focused on providing the Spark Tool to industry participants throughout the region. Navigant sees this effort as a challenge that NEEA faces in introducing Spark separate from the entire infrastructure building that would have accompanied the EBR Initiative. Still, NEEA's planning for widely introducing Spark to the industry as part of the CRE program appears sound and is logically consistent with logic model strategies and activities to overcome barriers.

In this first year of operation of the CRE Infrastructure planning, Navigant found little evidence in terms of market indicators that the market is adopting and incorporating CRE Infrastructure resources or recommended approaches into their operations. To-date, it appears from Navigant's review of NEEA targeted activities for 2016, that efforts have been focused on developing and testing market strategies and approaches in 2016 in preparation for a broader market launch in 2017. Given the challenges of integrating multiple new programmatic components into a single regional platform, Navigant has found NEEA's initial first year effort to be reasonable and consistent with the CRE Infrastructure program logic models. Further MRE efforts in 2017 and beyond will be needed to identify actual market impacts of this effort.

This first MPER for CRE Infrastructure reports savings from two pre-existing CRE-related efforts – legacy SEM and EBR demonstration buildings. The SEM savings analysis demonstrated that not only have electric savings persisted after the SEM regional initiative stopped in 2013, but also that in the case of electric savings, they increased. Future MPERs will continue to document these and related CRE Infrastructure program efforts.

Overall, Navigant finds that the CRE Infrastructure program, still in its early stages, holds real potential for establishing a CRE platform to support the three logic model's impact goal of energy efficiency considerations being "standard practice" in the region's CRE market.

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APPENDIX A. CRE INFRASTRUCTURE LOGIC MODEL AND MPIS

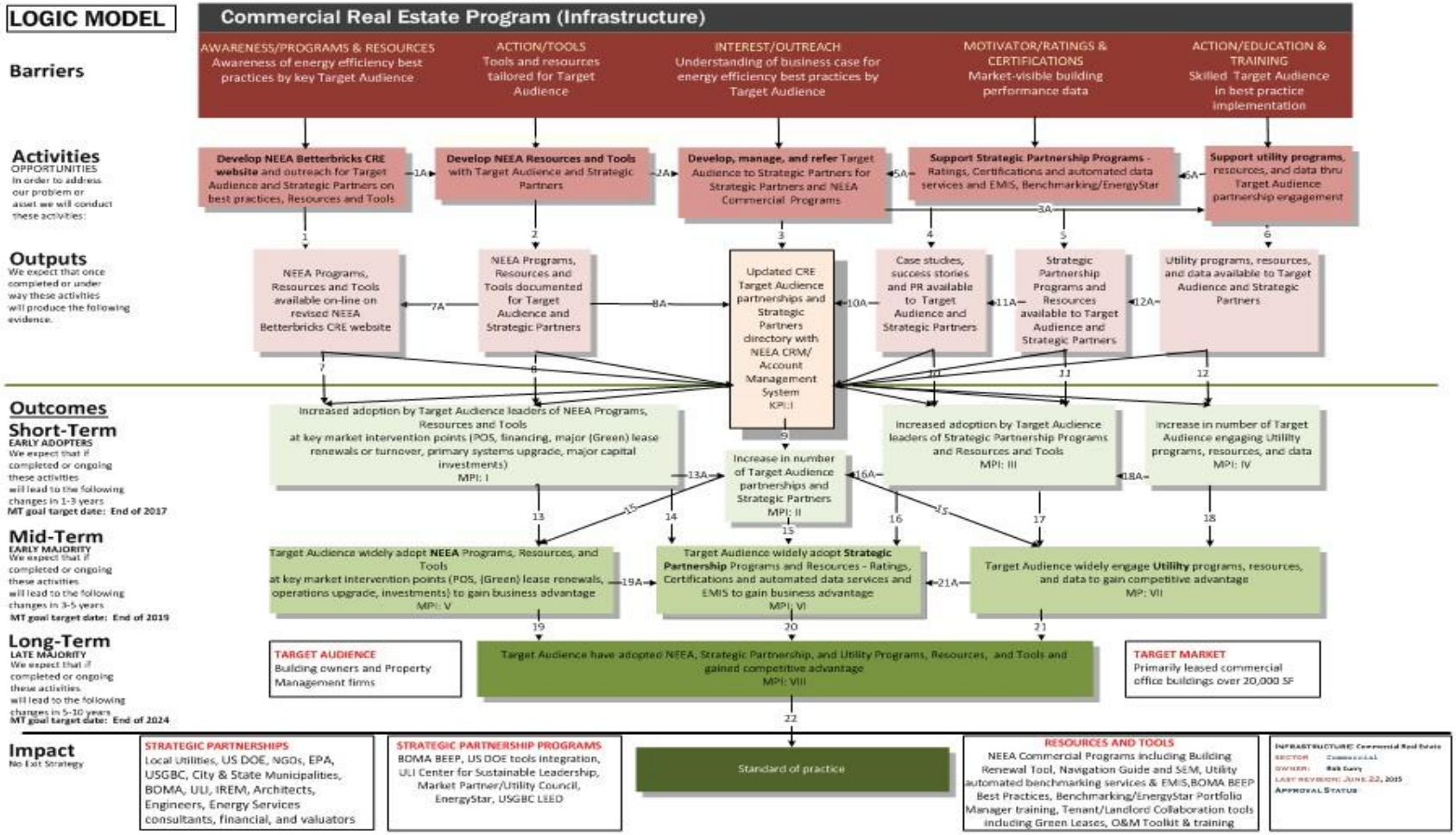

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Table A-1. CRE Infrastructure MPIs

MPI#	Outcome	Market Progress Indicator (how will you measure the success or failure of achieving this Outcome)	Data Sources
I	Increased adoption by Target Audience leaders of NEEA Programs, Resources and Tools at key market intervention points (POS, lease renewals, operations upgrade, investments)	Number of market leader companies which have started adopting NEEA Programs, Resources and Tools at key market intervention points	CRM, Company reports, market leader evaluation survey/interviews and market characterization
II	Increase in number of Target Audience partnerships	Number of Target Audience Partnerships from CRM baseline	CRM, Evaluation surveys, market research; any utility reports/log on number of customers engaged through NEEA tools
III	Increased adoption by Target Audience leaders of Strategic Partnership Programs and Resources - Ratings, Certifications and automated data services and EMIS, Benchmarking/ENERGY STAR	Number of Target Audience leaders adopting Strategic Partnership Programs and Resources	CRM, Market leader evaluation surveys, market research
IV	Increase in number of Target Audience engaging utility programs, resources, and data	Number of Target Audience engaging utility programs, resources, and data	CRM; Market research
V	Target Audience widely adopt NEEA Programs, Resources, and Tools at key market intervention points (POS, lease renewals, operations upgrade, investments) to gain business advantage	Number of Target Audience adopting NEEA Programs, Resources, and Tools at key market intervention points	CRM, Market research
VI	Target Audience widely adopt Strategic Partnership Programs and Resources - Ratings, Certifications and automated data services and EMIS to gain business advantage	Increase in percentage of Target Audience adopting Strategic Partnership Programs and Resources	CRM, Company reports, market leader evaluation survey/interviews and market research
VII	Target Audience widely engage utility programs, resources, and data to gain business advantage	Increase in number of market actors that have adopted energy efficiency best practices to gain competitive advantage	Market actor evaluation surveys, market research
VIII	Target Audience adopt NEEA, Strategic Partnership, and utility programs, Resources, and Tools to maintain business advantage	Increase in number of Target Audience adopting NEEA, Strategic Partnership, and utility programs, Resources, and Tools to maintain business advantage	Market research

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APPENDIX B. BR SPARK TOOL LOGIC MODEL AND MPIS

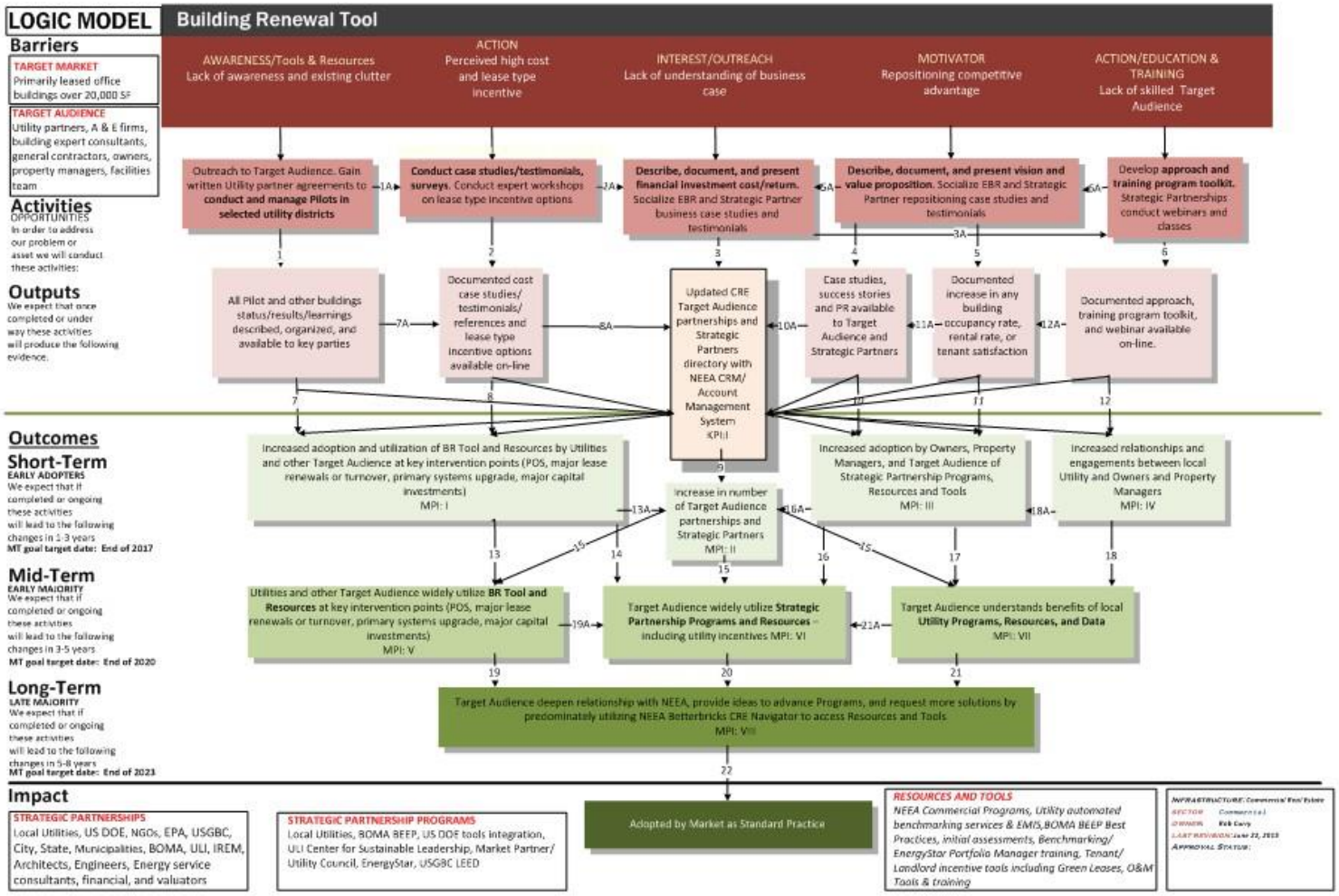

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Table B-1. BR Tool MPIs

MPI#	Outcome	Market Progress Indicator (how will you measure the success or failure of achieving this Outcome)	Data Sources
I	Utilities Pilot Spark Tool, Program and Resources at key market intervention points (POS, lease renewals, operations upgrade, investments)	Number of Utilities which have agreed to Pilot BR Tool, Program, Resources at key market intervention points	Documented written and signed pilot implementation agreements and BetterBricks registry
II	Increase in number of Target Audience partnerships	Increase in percentage of Target Audience Partnerships from CRM baseline	CRM, evaluation surveys/interviews, market research
III	Increased adoption by Target Audience of Utility and Strategic Partnership Programs and Resources - Incentives, Ratings, Certifications and automated data services and EMIS, Benchmarking/ENERGY STAR	Number of Target Audience leaders adopting Strategic Partnership Programs and Resources - Incentives, Ratings, Certifications and automated data services and EMIS, Benchmarking/ENERGY STAR	CRM, market evaluation surveys/interviews, market research
IV	Increase in number of new Utility Building Programs, Owner/Property Manager relationships and engagements	Number of new and utilization of existing Utility Building Programs, Owner/Property Manager relationships and engagements. Number of Building Owner/Property Manager meetings with and engaging utilities delivering Pilot BR Tool, program, resources, and data	CRM, Market evaluation surveys, interviews, market research, and BetterBricks registry
V	Increase in number of Utilities and Target Audience use BR Tool, Programs, and Resources at key market intervention points (POS, lease renewals, operations upgrade, investments) to gain competitive advantage	Number of Utilities and Target Audience use BR Tool, Programs, and Resources at key market intervention points (POS, lease renewals, operations upgrade, investments) to gain competitive advantage	BetterBricks registry, CRM, market research
VI	Target Audience widely use Utility and Strategic Partnership Programs and Resources - Incentives, Ratings, Certifications and automated data services and EMIS, Benchmarking/ENERGY STAR	Increase in percentage of Target Audience adopting Strategic Partnership Programs and Resources - Incentives, Ratings, Certifications and automated data services and EMIS, Benchmarking/ENERGY STAR	CRM, evaluation survey/interviews and market research

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MPI#	Outcome	Market Progress Indicator (how will you measure the success or failure of achieving this Outcome)	Data Sources
VII	Target Audience understand benefits of utility programs, Resources and Data	Increase in number of Target Audience that understand benefits of utility programs, Resources, and Data	Market evaluation surveys/interviews, market research
VIII	Target Audience deepen relationship with NEEA, provide ideas to advance Programs, and request more solutions by predominately utilizing NEEA BetterBricks CRE Navigator to access Resources and Tools	Increase in percentage of Target Audience that have deepened relationship with NEEA, provided ideas to advance Programs, and requested more solutions by predominately utilizing NEEA BetterBricks CRE Navigator to access Resources and Tools. Increase in percentage of Target Audience adopting NEEA, Strategic Partnership, and utility programs, Resources, and Tools	Market evaluation surveys/interviews. BetterBricks registry, CRM, market research

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APPENDIX C. BETTERBRICKS RESOURCE CENTER LOGIC MODEL AND MPIS

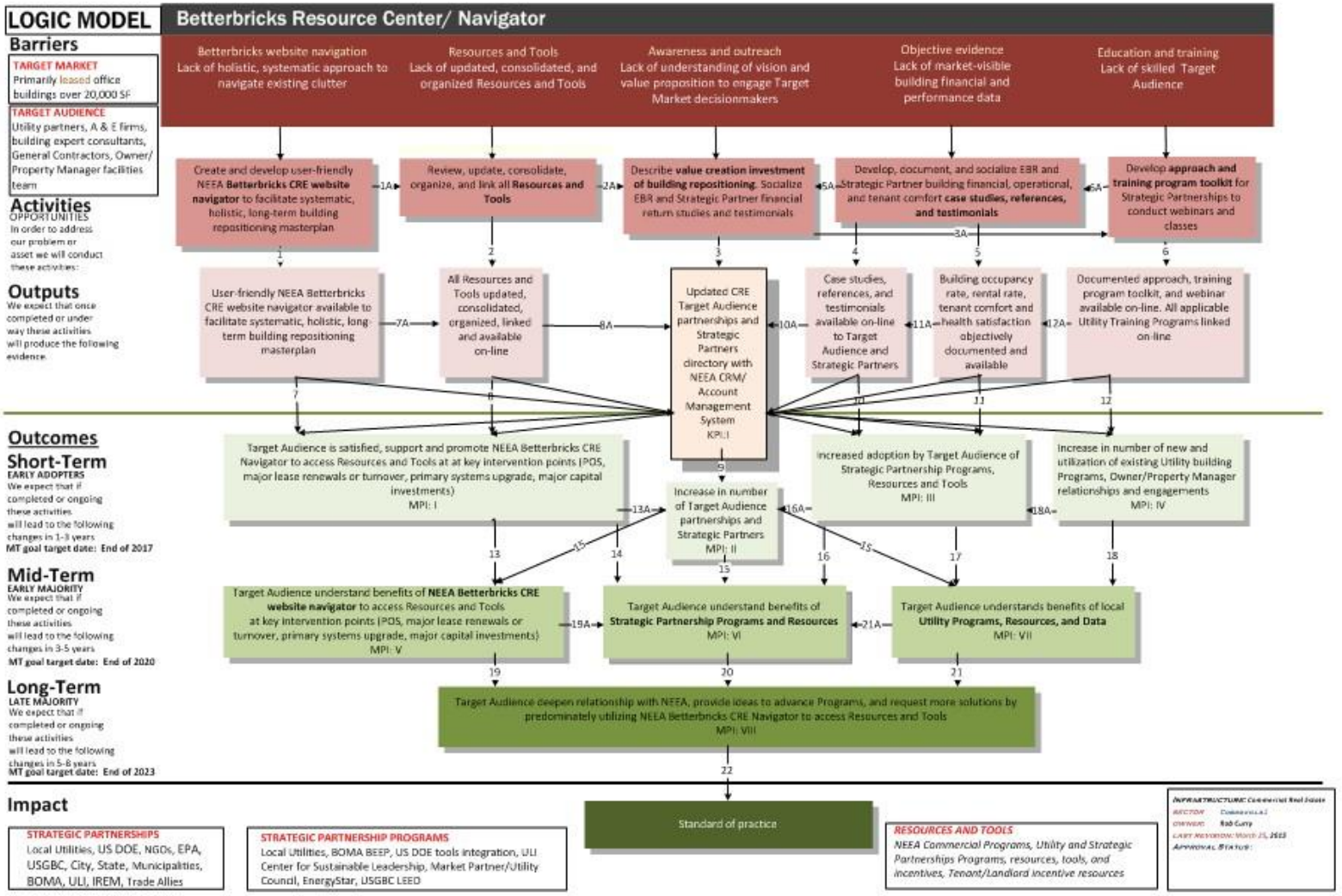

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Table C-1. CRE Resource Center MPIs

MPI#	Outcome	Market Progress Indicator (how will you measure the success or failure of achieving this Outcome)	Data Sources
I	Target Audience utilize BetterBricks website navigator Resources and Tools at key market intervention points (POS, lease renewals, operations upgrade, investments)	Number of Target Audience which have utilized BetterBricks website navigator Resources and Tools at key market intervention points	BetterBricks website hits
II	Increase in number of Target Audience partnerships	Increase in percentage of Target Audience Partnerships from CRM baseline	CRM, Evaluation
III	Increased adoption by Target Audience of Strategic Partnership Programs, Resources, and Tools	Number of Target Audience leaders adopting Strategic Partnership Programs, Resources, and Tools	Surveys/interviews
IV	Increase in number of new and utilization of existing Utility Building Programs, Owner/Property Manager relationships and engagements	Number of new and utilization of existing Utility building Programs, Owner/Property Manager relationships and engagements	CRM, Market evaluation
V	Increase in number of Target Audience understanding benefits of NEEA BetterBricks CRE website navigator to access Resources and Tools	Number of Target Audience understand benefits of NEEA BetterBricks CRE website navigator to access Resources and Tools at key intervention points	Surveys/interviews
VI	at key intervention points	Increase in percentage of Target Audience understanding benefits of Strategic Partnership Programs and Resources	CRM, market evaluation
VII	Target Audience understand benefits of Strategic Partnership Programs and Resources	Increase in number of Target Audience that understand benefits of Utility Programs, Resources, and Data	Surveys/interviews
VIII	Target Audience understand benefits of Utility Programs, Resources and Data	Increase in percentage of Target Audience that have deepened relationship with NEEA, provided ideas to advance Programs, and requested more solutions by predominately utilizing NEEA BetterBricks CRE Navigator to access Resources and Tools	Market evaluation surveys/interviews, market research, and BetterBricks website hits

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APPENDIX D. CRE INFRASTRUCTURE LOGIC MODEL REVIEW MEMORANDUM

This memo provides Navigant Consulting's findings and recommendations regarding NEEA's three logic models for programming in the CRE sector.

CRE Infrastructure Logic Model Review

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NAVIGANT

1001 Officers Row
Vancouver, WA 98661
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Memorandum

To: Rita Siong, NEEA

From: Rob Russell, Navigant

Date: December 4, 2015

Re: CRE Infrastructure Logic Model Review – Please provide review on or before December 11, 2015

This memo provides Navigant Consulting's findings and recommendations regarding NEEA's three logic models for programming in the commercial real estate sector.

Overall

All three logic models illustrate NEEA's theory of change and have clear logical linkages between program activities, outputs and outcomes. Each model provides a concise description of target market, target audience and relevant partnerships. In addition, all of the models track expected outcomes to both a general timeline and a market segment per Everett Rogers' diffusion of innovation taxonomy.[1]

For each outcome, the models provide a Market Progress Indicator (MPI) as well as one or more data sources. The outcomes and indicators clearly indicate the expected trend (e.g. "increased") within a specific population. As detailed below, some of the data sources are not well defined and may be too reliant upon a Customer Relationship Management (CRM) database or under-specified registry/report.

On the whole, the logic models show NEEA's use of best practices and provide an understanding of the programs' intent. The remainder of this memo provides specific comments for each logic model.

Commercial Real Estate Program (Infrastructure)

Barriers: this logic model lists five barriers that read more like desired outcomes than market conditions that prevent the greater adoption of energy efficient goods and services among the target

[1] *Rogers, Everett M. (1962). Diffusion of Innovations (first edition). Glencoe: Free Press.*

audience. However, the barrier statements provide sufficient context that a reader can infer the intended meaning.

Navigant recommends that NEEA restate the barriers as follows:

- The target audience lacks awareness of energy efficiency best practices
- Existing tools and resources are not tailored to the business needs of the target audience
- The target audience does not understand the business case for energy efficiency
- Building performance data is not visible to the market (commercial building owners and tenants)
- The target audience lacks necessary skills to implement best practices

Impact: The impact statement "Standard of Practice" does not indicate if NEEA intends to replace an existing standard of practice with a new version or to establish a standard of practice where none now exists.

Navigant recommends, based on the assumption that there is no standard of practice extant, that NEEA revise the impact statement to read "Establish a Standard of Practice."

Data Sources: of the eight outcomes and MPIs, CRM is listed as a data source in six. The specifications for this CRM are not listed nor is it clear which individuals or entities are responsible or accountable for providing input to the CRM. If the CRM lacks sufficient information to inform an evaluation, it will not be possible to track market progress for these six indicators. If an evaluation cannot assess market progress, it will not be possible to quantify the program's success or value to NEEA's funders.

Navigant recommends that NEEA specify CRM requirements and identify who/which entities will provide input and maintain data integrity.

In addition, three of the outcomes for this program list "company reports" or "utility reports" as data sources. The logic model does not define this term nor does it designate a repository for such reports.

Navigant recommends that NEEA define this term and indicate where an evaluator could find such reports. NEEA should also specify which individuals or organizations are responsible for developing and maintaining these reports.

Building Renewal Tool

Impact: The impact statement "Adopted by Market as Standard Practice" does not indicate if NEEA intends to replace an existing standard of practice with a new version or to establish a standard of practice where none now exists.

Navigant recommends, based on the assumption that there is no standard of practice extant, that NEEA revise the impact statement to read "Establish a Standard of Practice."

Data Sources: of the eight outcomes and MPIs, CRM is listed as a data source in six. The specifications for this CRM are not listed nor is it clear which individuals or entities are responsible or accountable for providing input to the CRM. If the CRM lacks sufficient information to inform an

evaluation, it will not be possible to track market progress for these six indicators. If an evaluation cannot assess market progress, it will not be possible to quantify the program's success or value to NEEA's funders.

Navigant recommends that NEEA specify CRM requirements and identify who/which entities will provide input and maintain data integrity.

In addition, three of the outcomes for this program list "BetterBricks Registry" as a data source. The logic model does not define this term nor does it specify the information expected to be contained in this registry.

Navigant recommends that NEEA define this term and indicate what information an evaluator would find in this registry. Minimum evaluation sufficiency for such a registry would include the following elements:

- Location of building (address)
- Name of building owner (individual or corporate entity)
- Building owner contact information (contact name, title,, mailing address, telephone number(s), e-mail address(es)
- Start date of BetterBricks participation
- Names of serving utilities (electricity, natural gas, water and steam)
- Services provided by NEEA programming at each location
- Start date of each NEEA-sponsored service

NEEA should also specify which individuals or organizations are responsible for maintaining this registry.

BetterBricks Resource Center/Navigator

Impact: The impact statement "Standard of Practice" does not indicate if NEEA intends to replace an existing standard of practice with a new version or to establish a standard of practice where none now exists.

Navigant recommends, based on the assumption that there is no standard of practice extant, that NEEA revise the impact statement to read "Establish a Standard of Practice."

MPI #1: This MPI states that the "number of Target Audience which have utilized BetterBricks website navigator resources and tools at market intervention points" and lists "BetterBricks website hits" as a data source. The number of website hits indicates the level of traffic but not necessarily the number of unique visitors.

Navigant recommends that the BetterBricks website require registration to use resources and tools so that program staff can track use by individual user.

Data Sources: of the eight outcomes and MPIs, CRM is listed as a data source in four. The specifications for this CRM are not listed nor is it clear which individuals or entities are responsible or accountable for providing input to the CRM. If the CRM lacks sufficient information to inform an evaluation, it will not be possible to track market progress for these six indicators. If an evaluation

cannot assess market progress, it will not be possible to quantify the program's success or value to NEEA's funders.

Navigant recommends that NEEA specify CRM requirements and identify who/which entities will provide input and maintain data integrity.

In addition, one of the outcomes for this program list "BetterBricks Registry" as a data source. The logic model does not define this term nor does it specify the information expected to be contained in this registry.

Navigant recommends that NEEA define this term and indicate what information an evaluator would find in this registry. Minimum evaluation sufficiency for such a registry would include the following elements:

- Location of building (address)
- Name of building owner (individual or corporate entity)
- Building owner contact information (contact name, title,, mailing address, telephone number(s), e-mail address(es)
- Start date of BetterBricks participation
- Names of serving utilities (electricity, natural gas, water and steam)
- Services provided by NEEA programming at each location
- Start date of each NEEA-sponsored service

NEEA should also specify which individuals or organizations are responsible for maintaining this registry.

APPENDIX E. NAVIGANT REVIEW OF COMMERCIAL REAL ESTATE SECONDARY RESEARCH MEMORANDUM

This memorandum summarizes the findings from the secondary research review. The purpose of this memo is to inform NEEA's CRE evaluation efforts by identifying areas of existing sufficient research. The evaluation team intends to use this research to stand in for and supplement ongoing data collection efforts relating to adoption of CRE programming among market actors in the Northwest real estate market.

NEEA CRE Secondary Research

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NAVIGANT

Memorandum

To: Sarah Hall, Rita Siong, Rob Curry, NEEA

From: Jay Luboff, Sonrisa Cooper, Navigant

Date: May 6, 2016

Re: Navigant Review of Commercial Real Estate Secondary Research

This memorandum summarizes the findings from the secondary research review. The purpose of this memo is to inform NEEA's Commercial Real Estate (CRE) evaluation efforts by identifying areas of existing sufficient research. The evaluation team intends to use this research to stand in for and supplement ongoing data collection efforts relating to adoption of CRE programming among market actors in the Northwest real estate market.

The existing research focused on large leased commercial office buildings not occupied by owners, which assumes a minimum 50,000 square foot building for Washington and Oregon, and a 20,000 square foot building for Idaho and Montana. Additional data collection efforts focusing on smaller buildings will be addressed in a separate memorandum or report. The recommendations in this memorandum only apply to the additional research requested to characterize the CRE market for buildings above 50,000 square feet, as this is the focus of the existing secondary research.

Summary of Findings

Through a review of secondary research sources provided by NEEA, Navigant found that the secondary research contained adequate information for the majority of the market characterization research objectives contained in the RFP. Table 1 outlines the nine research objectives, whether or not the secondary research offers adequate information to address each objective, and Navigant's recommendation for additional data collection or verification as applicable.

NEEA's 2016 priority is to understand the market for buildings below 20,000 square feet ("small market"). The information needs and evaluation activities identified in Table 1 will be carried out in 2017.

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Table 1. Market Characterization Research Objectives - Findings

#	RFP Market Characterization Research Objective	Adequate Information to Address Objective?	Navigant Recommendation
1	Number of building owners in the region	Yes	N/A
2	Number of building management companies	Yes	N/A
3	Key ownership structures and business drivers	Yes	Verify through market observer interviews
4	Barriers and opportunities	Yes	Verify through market leader and actor interviews; identify any additional barriers or opportunities
5	Incremental costs to market actors in adopting CRE programming	**No**	**Conduct interviews with 8 to 10 market observers and/or utilities; supplement with targeted interviews with 5 NEEA-suggested market leaders or actors**
6	Key regional commercial real estate actors	**No**	**With NEEA's help, leverage existing resources and databases to identify key regional CRE actors**
7	Attitudes and awareness of key market actors towards energy efficiency	Yes	Verify through market leader and actor interviews
8	General market trends	**No**	**Identify additional market trends through interviews with 8 to 10 market observers and operator surveys**
9	Possible emerging or declining indicators	**No**	**Identify indicators through market observer and utility interviews and operator surveys and perhaps a limited number of market actor/market leader surveys**

As shown in the table above, the secondary research contains adequate information for all but the following market characterization research objectives:

5. Incremental costs to market actors in adopting CRE programming

The secondary research resources do not contain any specific information or methodology for estimating the incremental costs for market actors to adopt CRE programming. All reports identified upfront costs and other financial concerns as barriers to adoption, but none offered a dollar amount or percentage-based cost estimation.

Navigant recommends conducting interviews with market observers and utility program staff to determine incremental costs of adoption. Navigant also recommends supplementing and verifying these findings through targeted interviews with NEEA-suggested market leaders or market actors.

6. Key regional commercial real estate actors

The secondary research includes inputs from key regional commercial real estate actors, but does not specifically identify any of these actors as their contributions to the research are presented anonymously.

Navigant intends to leverage existing resources, such as NEEA's institutional knowledge, the BOC database and other sources and databases to identify key regional CRE actors.

8. General market trends

The secondary research review does not specifically outline very many market trends, but overall describes a market shift toward energy efficiency.

Navigant recommends verifying the existing market trends elaborated on in a later section through interviews with market actors; Navigant will also use these interviews to identify any new market trends that may have emerged after the previous research was conducted.

9. Possible emerging or declining indicators

The existing research discusses current adoption of CRE programming; Navigant recommends conducting interviews with market leader, market actor, market observer, and utility program staff to identify any emerging or declining indicators, as well as to note new MPI progress as outlined in the logic model.

In addition to collecting data to address information gaps in the secondary research, Navigant recommends using the interview and survey findings to verify and supplement the findings from the secondary research. The secondary research review presented incomplete findings for many of the market characterization research objectives; thus, the data collection efforts may identify additional gaps that that are unclear at this stage of the evaluation. Table 2 outlines recommended further research to address information gaps.

Table 2. Recommended Further Research

Target Audience	Number of Interviews
Market Observers	5
Market Leaders or Actors	8 to 10
Utility Program Staff	4

Review Methodology and Sources

Navigant conducted in-depth reviews of three reports recommended by NEEA in order to determine outstanding research objectives for NEEA's Commercial Real Estate Market Characterization Study. The purpose of the secondary research review was to identify research objectives for which sufficient market data already existed; this information would be used to inform the evaluation team's additional data collection efforts, specifically by identifying research areas not necessary to explore through interviews or surveys with other market actors.

Navigant reviewed the following three reports, as recommended by NEEA staff, for relevant existing data, as well as contextual information on the commercial real estate market.

- *Market Characterization and Establishing the Baseline for the Commercial Real Estate Initiative*, prepared by Cadmus Group, 2014.

This report characterizes the leased commercial real estate market in the Northwest, measures strategic energy management (SEM) adoption, and establishes a market baseline of SEM between the years 2000 and 2033 under the assumption that NEEA, Bonneville Power Administration, Energy Trust of Oregon, and local utilities had not intervened in the market. The report's analysis includes leased commercial office buildings in the Northwest, which assumes a minimum 50,000 square foot building and a 20,000 square foot building for Idaho and Montana.

- *Commercial Real Estate Participant Cohorts Market Progress Report*, prepared by Cadmus Group, 2015.

  This study looks at NEEA's delivery methods for its CRE SEM initiative (the Market Partners Program and office energy efficiency competitions) and assesses the presence of SEM among participant firms, estimates 2013 energy savings, and determines the savings rate for planning purposes.

- *Commercial Real Estate (CRE) Market Test Assessment: Understanding Delivery, Partnership Strategies and Program Channels*, prepared by New Buildings Institute, 2015.

  This study reviews the delivery of NEEA's CRE programs and identifies key themes and potential strategies for NEEA to address in future program offerings. The study interviews CRE executives, conducts a "Bright Spot analysis" with CRE firms whose approach to energy efficiency is substantially better than market norms, and reviews licensing, credentialing, and accreditation trends (LAC) to provide insights on how future LAC trends might reduce market barriers.

Secondary Research Review Findings

Navigant reviewed the secondary research documents for evidence of the nine market characterization objectives listed in the table above. The findings of the document review are below.

Objective #1: Number of building owners in the region

The number of building owners in the NEEA region is contained in the market characterization developed by Cadmus Group. The report found that in 2013, there were **1,110 building owners** in the region. Of these, 435 were in Washington, 258 in Oregon, 285 in Idaho, and 132 in Montana.

Objective #2: Number of building management companies

The number of building management companies in the NEEA region is contained in the market characterization developed by Cadmus Group. The report found that in 2013, there were **281 property management companies** in the region. Of these, 164 were in Washington, 76 in Oregon, 32 in Idaho, and 9 in Montana.

Objective #3: Key ownership structures and building drivers

The Cadmus market characterization describes firms' decision-making processes for energy efficiency investments as based on financial payback, rather than on marketing or brand positioning. According to the report, if a company purchases a building and does not realize a return on investment within three years or less, the company will not invest in additional improvement projects.

For firms who choose to invest in energy efficiency upgrades, one of the main drivers is achieving increased asset value.

Firms interviewed for the market characterization varied in how they set energy reduction goals: about half of the participating firms said that they set energy reduction goals for the entire organization; the other half were split between setting energy reduction goals for a particular portfolio, or for a specific building. Companies also vary in how closely they pay attention to energy reduction. About half of the building operators interviewed in the market characterization said that they monitor reduction through management reviews of energy goals for the entire organization, while 35% do it for a single building and 9% do it at the portfolio level. Only 39% of the firms interviewed conduct their reviews annually.

The CRE Market Test Assessment explored key business structures among commercial real estate firms, particularly "Bright Spot"[1] firms that participate in NEEA's CRE programs. The report found that CRE firms manage properties as a team; decisions about energy efficiency investment and property management are made by a team that typically includes the property manager, engineering staff, and one or more senior executives. Decision-making is usually driven by an internal champion who must get buy-in from the other team members, but these champions may have different leverage points depending on their role. For example, the internal energy champion could be an executive-level employee who lacks critical details about the project, or they could be a lower-level employee who does not have full authority to implement upgrades. Market leader (Bright Spot) firms will typically have a dedicated sustainability or energy staff member at a senior level who works across different teams.

The CRE Market Test Assessment also found that decision-making and business structures vary widely among firms. Financial goals and performance help set key parameters and drive decisions but the actors in these decisions depends on the company. The report identifies three main business structures:

- Larger investor/owners and real estate investment trusts (REITs)
    - Driven by investment
    - Typically have a sustainability director

- Third-party property managers
    - Compete to meet owner/investor needs
    - Concerned with meeting near-term financial performance goals in order to maintain clients

- Smaller independents
    - May be family-owned
    - Usually focus properties in a geographical area
    - Tend to take a longer perspective on financial concerns, which helps alleviate energy efficiency investments

[1] "Bright Spot" refers to CRE firms that have well-established energy efficiency practices, making them excellent examples for others. The three Bright Spot firms analyzed in the CRE Market Test Assessment were each recognized for their practices, which included: 2014 Energy Star Partner of the Year Sustained Excellence Award, multiple buildings recognized by Energy Star for demonstrating excellence in energy management, and a recipient of a 2014 Energy Star Partner of the Year award.

Objective #4: Barriers and opportunities

The evaluation team identified several barriers to CRE market adoption of NEEA programs, including awareness of NEEA CRE programs, financial concerns, and information overload of energy efficiency offerings in the CRE market.

Low awareness is a key barrier to greater adoption of NEEA CRE programs. According to the Cadmus market characterization, more than half of the people responsible for energy decisions in the target market were not aware of strategic energy management (SEM) or the NEEA CRE Initiative at the time of the market characterization. Additionally, firms have a poor understanding of NEEA's role in the market. The CRE Market Test Assessment found that none of the firms interviewed understood NEEA's goals or its relationships with utilities, and they had limited knowledge of NEEA's range of offerings.

All three sources reviewed also identified financial concerns as major barrier to adoption. The Cadmus market characterization discussed the high initial cost as the primary barrier to full SEM adoption, as well as competition for funding with other company priorities and lack of staff time. The market characterization also described barriers to energy efficiency investments, such as the upfront cost of projects, the insufficient return on investment, and competing needs. Respondents said that while there are sufficient resources and tools in the market that are tailored to commercial real estate, budgeting money is the challenge to utilizing the tools and knowing which tools will produce the highest impacts.

The Commercial Real Estate Participant Cohorts Market Progress Report similarly identified budget limitations and high upfront costs as the largest barriers to implementing SEM or other CRE energy efficiency projects. Five of nine firm-level respondents, four of five building-level respondents, and ten of nineteen Office Competition respondents named financial concerns as their primary challenge.

The CRE Market Test Assessment discussed information overload in the CRE market as another barrier to market adoption. According to the report, there is too much "noise" in the CRE energy efficiency market; the surplus of information, education, ideas, proposals, and businesses related to energy efficiency causes confusion for CRE teams, and can delay or eliminate energy efficiency decisions. The information overload also provides teams with conflicting or unreliable information, and firms may lack the time and expertise to resolve information gaps and conflicts. Additionally, the poor understanding of NEEA's role contributes to the feeling of noise in the marketplace. For market leader firms, the primary barrier related to information overload was not knowing which new energy efficiency measure would potentially constitute best practices; for less sophisticated firms, the barrier was not knowing where to start. Respondents also said that they did not have the time to verify or research particular energy efficiency technologies, and expressed that they did not trust vendor claims.

Similar to the preceding findings from other reports, the CRE Market Test Assessment found that financial concerns were a limiting factor in energy efficiency investments. CRE executives try to make energy efficiency a priority, but as a fee manager they are limited by their client's needs and goals for the building, so energy efficiency becomes a priority only if it is also a priority for the client.

Objective #5: Incremental costs to market actors in adopting CRE programming

The secondary research is lacking in findings relating to this research objective. While all three reports found that cost is a key factor in energy efficiency in the CRE market, none of them offer a dollar amount or specific methodology for estimating incremental costs.

Objective #6: Key regional commercial real estate actors

All three studies included in this review interviewed cohort participants and market leader firms, reported anonymously. The evaluation team will leverage existing resources, such as NEEA's institutional knowledge, the BOC database and other sources and databases to identify key regional CRE actors.

Objective #7: Attitudes and awareness of key market actors towards energy efficiency

The Cadmus market characterization found that market actors tend to find energy efficiency important only if it has a tangible economic benefit; this was true for tenants as well. CRE firms interviewed in the market characterization reported that their tenants only find energy efficiency valuable if it lowers their utility bills, operating costs, or rents, and that efficiency may attract some tenants but it is not one of the most important factors in their decision. The report found that the majority (75%) of market actors have identified practices to reduce energy use, suggesting that it is on the radar of most firms, and also noted that this was higher among cohort respondents.

Firms interviewed in the market characterization disagreed on whether adoption of SEM practices offers a competitive advantage or not; those who believed it offered a competitive advantage said that it helped them maintain higher occupancy levels and filled new buildings faster, while those who disagreed said that SEM is not an advantage if it results in increased operating costs for the firm.

The CRE Market Test Assessment found that awareness of energy efficiency is present, but firms often lack fully developed energy efficiency plans. Benchmarking is increasing being utilized by the CRE industry, but not as part of a corporate or portfolio-wide approach to energy efficiency. Properties and energy efficiency investments are generally considered on a case-by-case basis, with utility incentives being a major motivator. Even among market leader ("Bright Spot") firms, sustainability and energy policies were common but detailed energy management plans were not.

The Market Test Assessment also found varying attitudes towards energy efficiency among different types of market actors. For example, the younger workforce is most interested in immediate action activities, such as education or training that can give them knowledge and provide for career advancement in the immediate term. Long-term credentials and education are secondary to their goal. This has impacted the number of professionals enrolling in multi-year accreditation programs which are either not well understood or known and therefore not valued.

The role of service providers (HVAC and lighting contractors) and consultants is important because the executives interviewed indicated them as having the highest level of influence (behind utility rebates) when it came to the adoption of energy efficiency measures. They were also ranked high as being sources of education and knowledge, although, as noted above, there was a feeling by CRE professionals that the education provided did not always add value as the "vendors" did not understand CRE and related business operations.

Objective #8: General market trends

The secondary research review does not specifically outline very many market trends, but overall describes a market shift toward energy efficiency.

The Cadmus market characterization outlines a general shift toward energy efficiency in CRE firms' practices through energy management and better technology. The report found that companies are beginning to integrate energy-management plans into their operations and are hiring sustainability managers. Companies are also beginning to benchmark energy use and may tie staff bonuses to energy use. More companies will be looking at energy consumption at the portfolio level and at adopting energy management.

Objective #9: Possible emerging or declining indicators

Possible emerging or declining indicators in the secondary research review are below.

The Cadmus market characterization found that the majority of CRE firms implement planned SEM practices as part of their energy management, and that about half of firms had established energy reduction goals in the last five years.

The Commercial Real Estate Participant Cohorts Market Progress Report found that the majority of CRE cohort members intend to fully implement SEM, having had success through NEEA's CRE SEM initiatives. Among participant cohorts, SEM adoption is higher than the market baseline and the SEM initiatives encouraged cohorts to implement more energy efficiency activities.

The CRE Market Test Assessment found that almost all firms in the survey had done some form of energy benchmarking. However, while a number of firms claimed to have benchmarked their properties, this information was rarely used as part of a corporate or portfolio-wide approach to energy efficiency.

Conclusions

Through a review of the secondary research, the evaluation team concluded that information gaps exist in the following areas:

- Determining incremental costs to key market actors
- Key regional commercial real estate actors
- General market trends
- Possible emerging or declining indicators

The evaluation team recommends conducting additional market research to explore the information objectives above through interviews of market actors, market observers, and participating and non-participating commercial real estate firms.

APPENDIX F. NAVIGANT ANALYSIS OF COSTAR SMALL BUSINESS DATA ON OFFICE, RETAIL ESTABLISHMENTS AND WAREHOUSES IN THE NORTHWEST

The purpose of this memo is to inform NEEA's CRE infrastructure effort by describing the characteristics of the commercial building stock for buildings with less than 20,000 square feet. This assessment focuses on four Northwest states, Oregon, Washington, Idaho, and Montana, and prioritizes the CRE target market, leased offices, leased retail/service establishments and leased warehouses. NEEA obtained this data from CoStar and furnished it to Navigant for further analysis.

NW
office-retail-wareho

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NAVIGANT

Memorandum

To: Sarah Hall, Rita Siong, Rob Curry

From: Jay Luboff, Chris Chambers, Navigant

Date: April 29, 2016

Re: Navigant Analysis of Co-Star Small Business Data on Office, Retail Establishments and Warehouses in the Northwest

The purpose of this memo is to inform NEEA's Commercial Real Estate infrastructure effort by describing the characteristics of the commercial building stock for buildings with less than 20,000 square feet. This assessment focuses on four Northwest states, Oregon, Washington, Idaho, and Montana, and prioritizes the CRE target market, leased offices, leased retail/service establishments and leased warehouses. NEEA obtained this data from Costar and furnished it to Navigant for further analysis.

Summary of Findings:

The majority of smaller offices and retail/service establishments are in Washington and Oregon. They also cluster around major metro areas that allows an infrastructure program to focus on a handful of cities; the three largest cities each in Oregon and Washington would cover about a quarter of all office and retail/service locations in the Northwest. Appendix A prioritizes the cities in each state to target office and retail/service locations. Warehouses are far less common than offices and retail/service establishments, but also cluster in the major metro areas to a lesser degree. Focusing on the three largest cities in Oregon and Washington would still reach 15 percent of warehouses in the region.

The data shows close similarity between office space and retail/service space in terms of square footage—median 6,000 square feet—and building age—median year built 1978. Warehouses, on the other hand, are generally larger and newer. Office and retail/service buildings are also 100 times more numerous in the Northwest than warehouses. Based on these differences, reaching owners and managers of warehouse space will require a distinct approach from the one used to reach owners and managers of office or retail/service space. These conclusions are supported by figures and tables in the sections below.

Table 1 identifies the key locations for 2016 market research[1] for office buildings less than 20,000 square feet, along with related utility service areas. This list reaches 44% of the office locations in the region, while also identifying the best opportunities to partner with small urban utilities in the Northwest.

[1] Per prior discussions with NEEA staff, Navigant plans to undertake market characterization research on small building retail establishments and warehouses in the 2017, 2018 period.

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Table 1. Target Cities for Market Research

Cities	Office Locations	Utility
Oregon		
Portland	638	PGE or Pacific Power
Salem	189	Salem Electric or Pacific Power
Bend	189	Pacific Power
Eugene	145	EWEB or Pacific Power
Washington		
Seattle	478	Seattle City Light
Spokane	356	Inland Power & Light or Avista
Tacoma	274	Tacoma Public Utilities
Vancouver	248	Clark PUD
Bellevue	241	Puget Sound Energy
Everett	145	Snohomish PUD
Yakima	111	Yakima Power or Pacific Power
Idaho		
Boise	477	Idaho Power
Montana		
Billings	86	Northwestern Energy
Total	3,577	
Percent of total Northwest locations	44%	

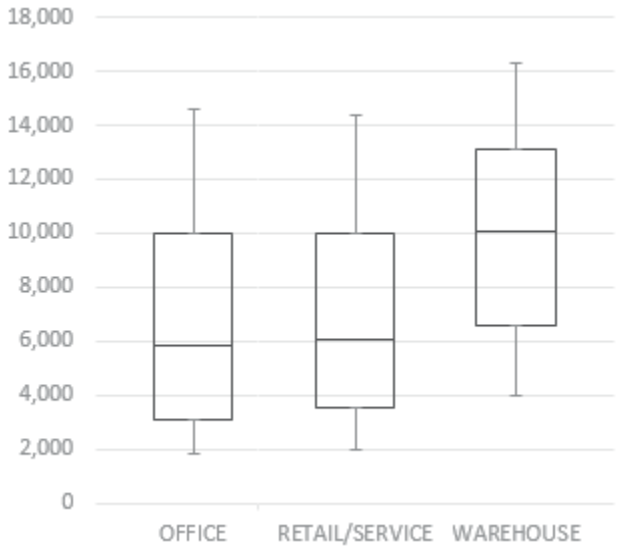
Source: Navigant Analysis; CoStar data, utility websites

As Navigant currently understands it, NEEA wishes to identify several representative smaller utilities with which to partner with to determine fundamental market characteristics needed to further develop small business focused goals and objectives for CRE infrastructure. A representative sample will consist roughly of 30 percent Oregon, 50 percent Washington, 15 percent Idaho, and 5 percent Montana locations for office buildings. Table 3 of this memo shows the exact proportion of offices, retail/service, and warehouse locations among the four states.

The Market by Square Footage

Figure 1 below shows the distribution of square footage in small buildings (less than 20,000 square feet) by building type.

Figure 1. Square footage of office, retail/service, and warehouse buildings in the Northwest



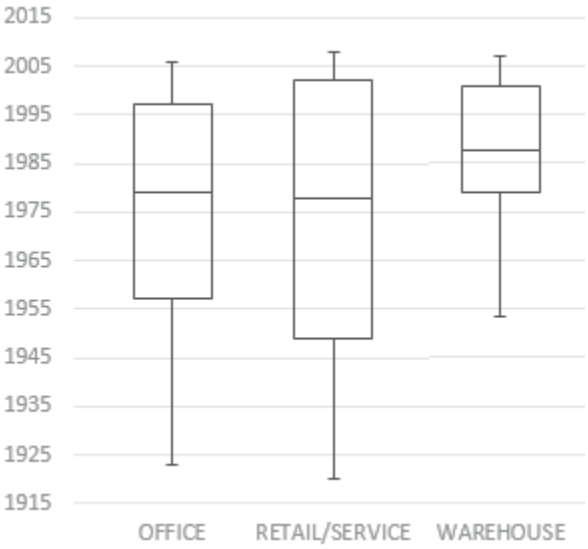
Note: The whiskers on this plot are not the minimum and maximum data points, they denote the bottom 10th and top 90th percentiles. Thus, these plots depict 80% of buildings.
Source: Navigant Analysis, CoStar data

The office and retail/service building stock do not vary greatly. These have similar median square footages, and approximately 50 percent of buildings of both types fall between 3,000 and 10,000 square feet. Warehouses in the small building segment that is the focus of this analysis, tend to be larger, with a median size of 10,000 square feet and a majority between 6,500 and 13,000 square feet. Within each state in the Northwest, there is little variation in the size of buildings from that depicted in Figure 1 above.

The Market by Year Built

Like their size in square footage, the distribution of age of office and retail/service buildings is also similar. The median year built of office space is 1979 and 1978 for retail/service space, respectively. Warehouses are newer, with an average year built of 1986. To get a sense of the range of years the building stock was built, consult Figure 2 below.

Figure 2. Year built median and interquartile range of buildings in the Northwest



Note: The whiskers on this plot are not the minimum and maximum data points, they denote the bottom 10th and top 90th percentiles. Thus, these plots depict 80% of buildings.
Source: Navigant Analysis, CoStar data

The figure shows that warehouses are generally newer than offices and retail/service establishments. Within the Northwest, there are some variations of note on the age of buildings. Table 2, below, shows the regional median building age as graphed above, but also the median in each state and the percentage difference from the regional median.

Table 2. Year built median across Oregon, Washington, Idaho, and Montana

State	OFFICE	+/- median	RETAIL/SERVICE	+/- median	WAREHOUSE	+/- median
Oregon	1976	-3	1973	-5	1982	-6
Washington	1979	0	1978	0	1986	-2
Idaho	1993	+14	1990	+12	1998	+10
Montana	1982	+3	1976	-2	2001	+13
Regional Median	**1979**		**1978**		**1988**	

Source: Navigant Analysis, CoStar data

Buildings of each type are newer in Idaho than the other states. Its offices are 14 years newer, retail/service establishments are 12 years newer, and warehouses are roughly 10 years newer in Idaho compared to the Northwest average. Warehouses in Montana are also newer than average. Buildings of each type in Oregon tend to be a bit older than the regional average. Washington's buildings are close to the midline, which is partly because there are many more buildings in Washington than the other states, making it the most influential for to the overall average.

The Market by Location

Table 3 shows the distribution of these data between states.

Table 3. Location of building types by state

	OFFICE	RETAIL/SERVICE	WAREHOUSE	All buildings
Oregon	2,225	3,227	30	29%
Washington	4,128	5,542	62	51%
Idaho	1,462	1,513	27	16%
Montana	379	423	9	4%
	8,194	**10,705**	**128**	

Source: Navigant Analysis, CoStar data

Most of the buildings are in Washington, followed by Oregon. Idaho and Montana represent only approximately 20% of the buildings in this analysis. Also, note that the amount of warehouses is small relative to the number of office and retail/service locations in the Northwest.

Target Cities

The differences in density between states also mirrors the distribution of buildings. Washington and Oregon have denser urban centers, causing the majority of office and retail/service locations to be in a few major cities. Table 4 shows the concentration of locations in the three largest cities in each state, and how that compares to the regional total.

Table 4. Number of building locations in each state's three largest cities

	OFFICE	% of region	RETAIL/SERVICE	% of region	WAREHOUSE	% of region
Oregon	972	12%	1,360	13%	9	7%
Washington	1,108	14%	1,541	14%	10	8%
Idaho	761	9%	534	5%	18	14%
Montana	223	3%	179	2%	6	5%
Largest 3 cities total	3,064	37%	3,614	34%	43	34%
Other cities total	5,130	63%	7,091	66%	85	66%
All cities total	**8,194**	**100%**	**10,705**	**100%**	**128**	**100%**

Note: Largest cities by total locations, not just locations of the office type. Thus, similar but not identical to office-only Table 1.
Source: Navigant Analysis, CoStar data

In Oregon, the cities of Portland, Salem, and Eugene represent about 13 percent of the office and retail/service locations in the Northwest and 7 percent of the warehouses. In Washington, Seattle, Spokane, and Tacoma represent 14 percent of the office and retail/service locations and 8 percent of the

warehouses in the Northwest. Together, these six cities in Oregon and Washington represent a quarter of the region's small offices.

Building locations are concentrated in the three largest cities each in Idaho and Montana also, but within the region these large cities represent a small portion. For context, the largest five cities in Washington hold as many offices and retail/service establishments as all of Idaho (see Appendix A for a full listing of the building locations by city). However, warehouses are, by contrast, over represented in Idaho and Montana compared to the region. The largest three cities in each Idaho and Montana account for 21 percent of the region's warehouses.

APPENDIX A. CITY CONCENTRATIONS

The tables below show the cities that constitute two thirds of the total locations in each state. These tables rank cities by their total number of buildings. Because offices represent 43 percent and retail/service establishments represent 56 percent of total locations, this makes these tables a priority ranking for targeting the cities with the most offices and retail/service locations for CRE infrastructure. The majority of warehouses are in the 'other' category.

Table 5. City Building Concentrations in Oregon

City	OFFICE	RETAIL/ SERVICE	WAREHOUSE	TOTAL	% of State	Cumulative %	% of Northwest
Portland	638	985	6	1,629	30%	30%	9%
Salem	189	184	2	375	7%	37%	2%
Eugene	145	191	1	337	6%	43%	2%
Bend	189	122	4	315	6%	48%	2%
Beaverton	83	114	2	199	4%	52%	1%
Hillsboro	53	101	1	155	3%	55%	1%
Medford	92	57	.	149	3%	58%	1%
Gresham	47	85	.	132	2%	60%	1%
Albany	42	81	2	125	2%	62%	1%
Lake Oswego	53	63	.	116	2%	64%	1%
Springfield	32	81	1	114	2%	67%	1%
Others	662	1,163	11	1,836	33%	100%	10%
Total	**2,225**	**3,227**	**30**	**5,482**			**29%**

Source: NEEA Analysis, CoStar Data

Table 6. City Building Concentrations in Washington

City	OFFICE	RETAIL/ SERVICE	WAREHOUSE	TOTAL	% of State	Cumulative %	% of Northwest
Seattle	478	695	7	1,180	12%	12%	6%
Spokane	356	466	3	825	8%	21%	4%
Tacoma	274	380	.	654	7%	27%	3%
Vancouver	248	355	3	606	6%	34%	3%
Everett	145	212	.	357	4%	37%	2%
Bellevue	241	108	2	351	4%	41%	2%
Olympia	192	117	5	314	3%	44%	2%
Puyallup	87	151	.	238	2%	46%	1%
Yakima	111	88	.	199	2%	49%	1%
Kent	70	118	8	196	2%	51%	1%
Kirkland	98	73	7	178	2%	52%	1%
Bellingham	63	107	1	171	2%	54%	1%
Renton	71	95	.	166	2%	56%	1%
Lynnwood	61	102	3	166	2%	58%	1%
Gig Harbor	82	77	1	160	2%	59%	1%
Lakewood	45	103	1	149	2%	61%	1%
Federal Way	71	69	.	140	1%	62%	1%
Lacey	51	75	1	127	1%	63%	1%
Redmond	58	62	2	122	1%	65%	1%
Kennewick	58	58	.	116	1%	66%	1%
Bremerton	42	62	1	105	1%	67%	1%
Others	*1,226*	*1,969*	17	3,212	33%	100%	17%
Total	**4,128**	**5,542**	**62**	**9,732**			**51%**

Source: NEEA Analysis, CoStar Data

Table 7. City Building Concentrations in Idaho

City	OFFICE	RETAIL/ SERVICE	WAREHOUSE	TOTAL	% of State	Cumulative %	% of Northwest
Boise	477	279	11	24	26%	26%	0%
Meridian	182	127	5	23	10%	36%	0%
Nampa	102	128	2	22	8%	44%	0%
Coeur D Alene	105	96	.	17	7%	51%	0%
Twin Falls	65	77	.	16	5%	56%	0%
Eagle	67	65	1	15	4%	60%	0%
Idaho Falls	74	51	.	13	4%	64%	0%
Caldwell	49	69	3	13	4%	68%	0%
Others	341	621	5	2859	32%	100%	5%
Total	**1462**	**1513**	**27**	**3002**			**5%**

Source: NEEA Analysis, CoStar Data

Table 8. City Building Concentrations in Montana

City	OFFICE	RETAIL/ SERVICE	WAREHOUSE	TOTAL	% of State	Cumulative %	% of Northwest
Billings	86	99	4	3	23%	23%	0%
Missoula	61	48	2	3	14%	37%	0%
Bozeman	76	32	.	3	13%	50%	0%
Kalispell	41	41	1	3	10%	61%	0%
Helena	26	31	2	3	7%	68%	0%
Others	89	172	0	796	32%	100%	1%
Total	**379**	**423**	**9**	**811**			**1%**

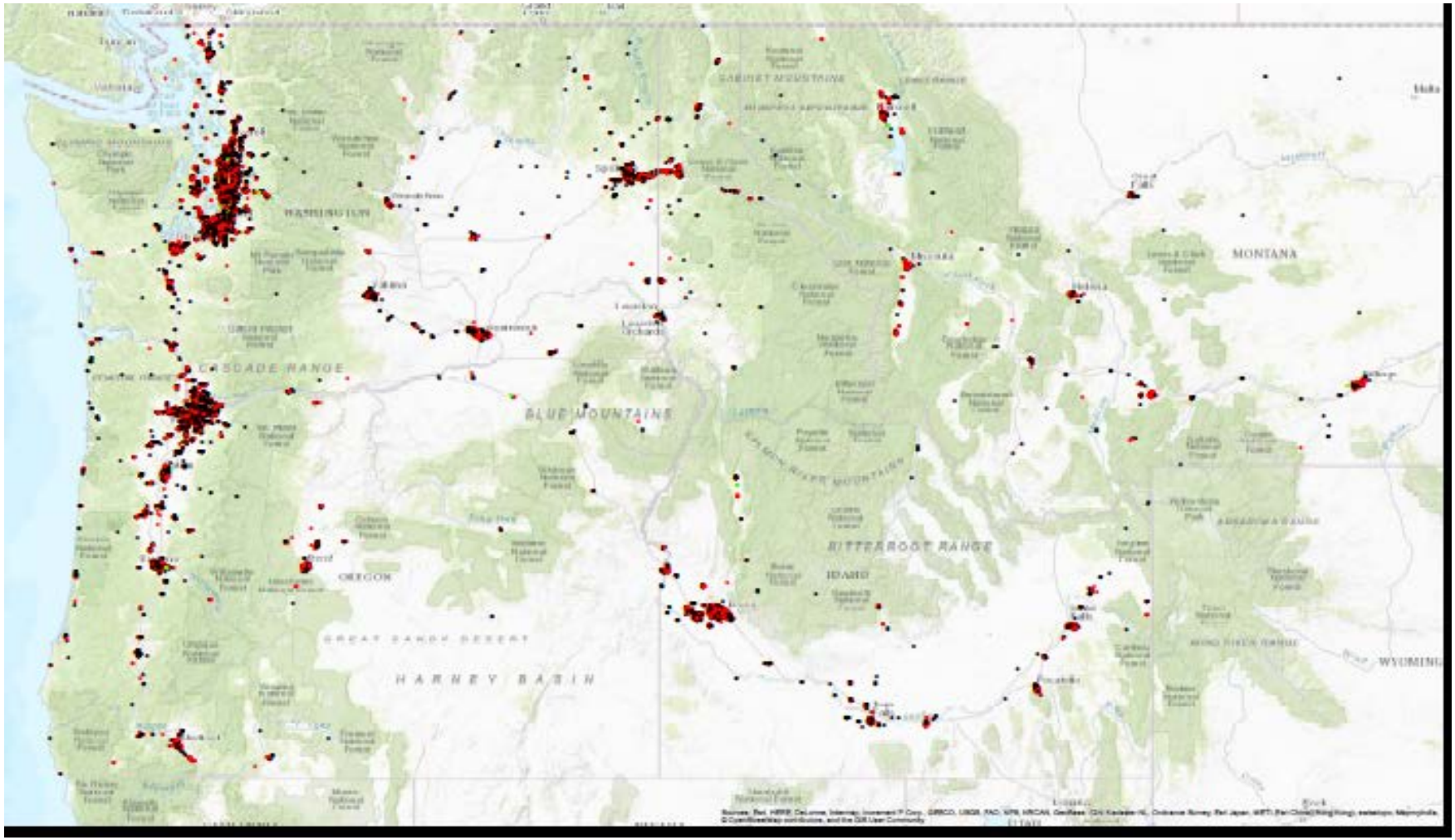
Source: NEEA Analysis, CoStar Data

APPENDIX B. MAPPED LOCATIONS OF BUILDINGS BY STATE

The majority of below twenty-thousand square foot offices and retail/service establishments are in Washington and Oregon. They also cluster around major metro areas, primarily in the Seattle-Spokane metro area and the Portland metro area. Secondary clusters are found in Kennewick and Spokane in Washington, and Eugene and Bend in Oregon.

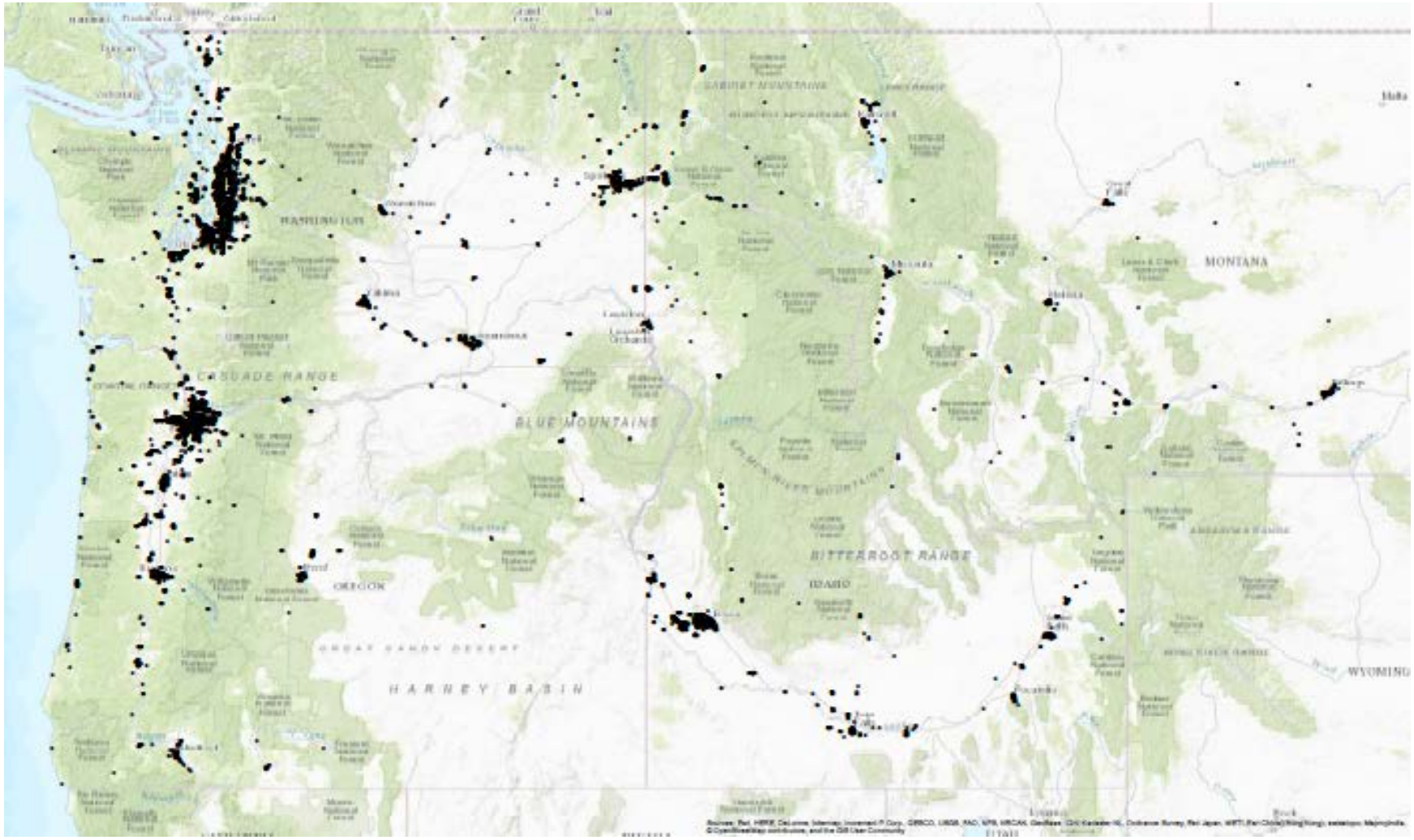
Warehouses are far less common than offices and retail/service establishments, but also cluster in the major metro areas, though less so. Focusing on the three largest cities in Washington and Oregon would still reach 15 percent of warehouses in the region.

Figure 3. Map of Small Office Locations in the Northwest



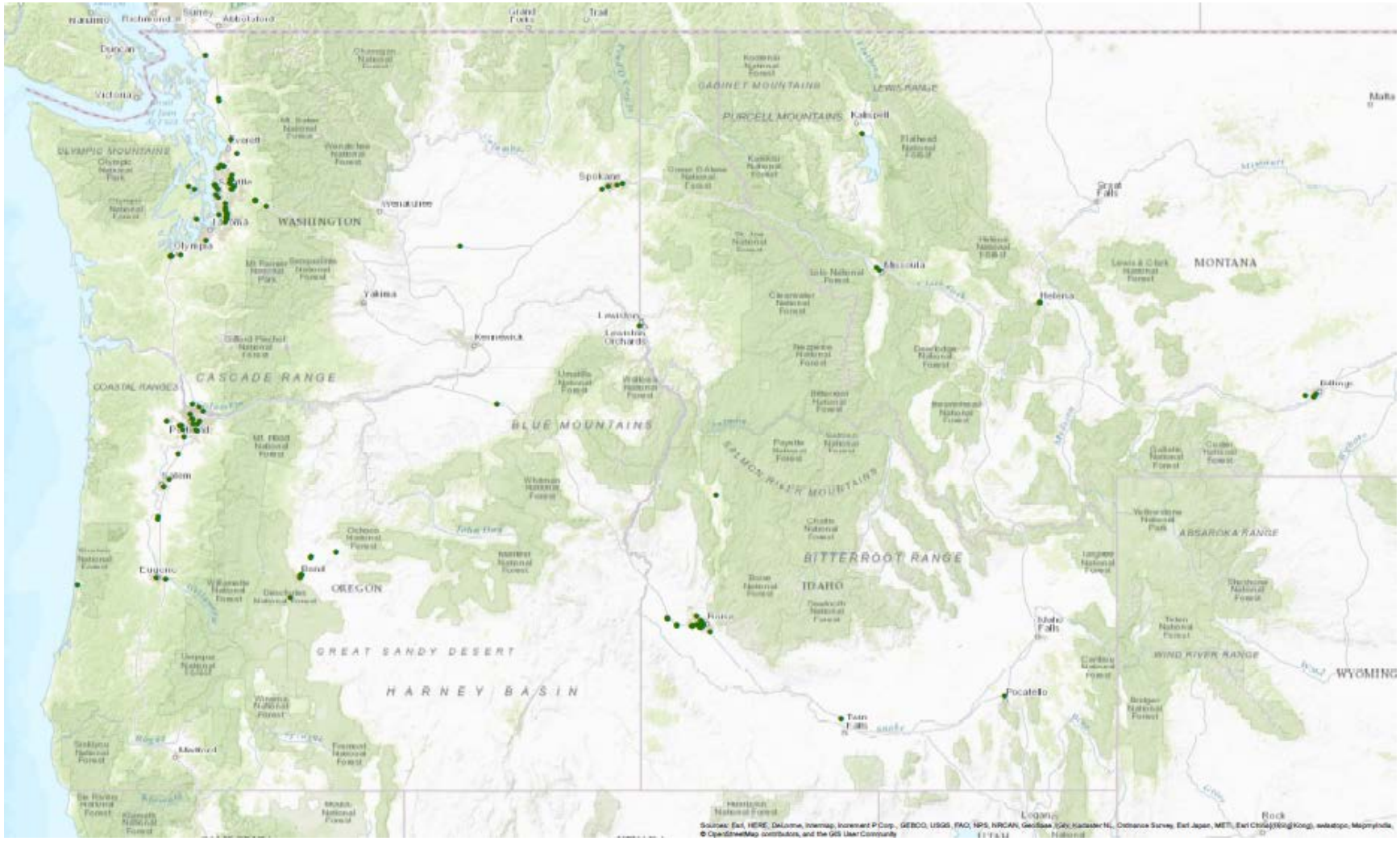
Source: NEEA Analysis, CoStar Data

Figure 4. Map of Smaller Retail/Service Locations in Northwest



Source: NEEA Analysis, CoStar Data

Figure 5. Map of Smaller Warehouses in Northwest



Source: NEEA Analysis, CoStar Data

APPENDIX G. EXISTING BUILDING RENEWAL DEMONSTRATION BUILDING PROCESS EVALUATION

NEEA engaged Navigant to conduct a process evaluation of its former EBR Initiative demonstration projects. The NEEA EBR Initiative demonstration projects, a component of NEEA's overall CRE effort, aim to address the barriers and opportunities for the commercial office building market in the Northwest to conduct whole-building deep energy retrofits of existing assets, rapidly revamping existing stock to achieve a minimum energy savings of 35 percent, but targeting 50 percent or more. While many of the region's utilities offer incentives for equipment retrofits, either alone or in combination with other measures, the EBR program seeks to enable significantly more aggressive energy and operating cost savings through synergies. It addresses the integration of energy savings strategies across building systems to achieve large load reductions through highly optimized systems, resulting in much greater energy savings per building.

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NAVIGANT

Existing Building Renewal Demonstration Building Process Evaluation

For Commercial Real Estate Infrastructure

Prepared for:

Northwest Energy Efficiency Alliance

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EXECUTIVE SUMMARY

The Northwest Energy Efficiency Alliance (NEEA) engaged Navigant to conduct a process evaluation of its former Existing Building Renewal (EBR) Initiative demonstration projects. The NEEA EBR Initiative demonstration projects , a component of NEEA's overall Commercial Real Estate (CRE) effort, aim to address the barriers and opportunities for the commercial office building market in the Northwest to conduct whole-building deep energy retrofits of existing assets, rapidly revamping existing stock to achieve a minimum energy savings of 35 percent, but targeting 50 percent or more. While many of the region's utilities offer incentives for equipment retrofits, either alone or in combination with other measures, the EBR program seeks to enable significantly more aggressive energy and operating cost savings through synergies. It addresses the integration of energy savings strategies across building systems to achieve large load reductions through highly optimized systems, resulting in much greater energy savings per building.

The EBR pilot initially intended to complete one demonstration project in each of the four states where NEEA is active: Washington, Oregon, Idaho, and Montana. The evaluation team conducted a process evaluation of the completed buildings in Portland, Oregon and Missoula, Montana. The process evaluation had two major goals:

1. Identify areas of success and challenges faced during each phase of the demonstration project, focusing on three main phases:
    a. Analysis and modeling
    b. Implementation
    c. Post-completion
2. Determine lessons learned for each project and make recommendations to NEEA for future deep energy retrofit projects

The evaluation also strives to compare the projects' performance against the EBR objectives: inform tools to scale the adoption of deep energy retrofits in the market; offer proof that deep energy retrofits are technically and financially viable; and provide case studies for education, training, and marketing for future regional use.

To determine whether these retrofit projects have been successful and learn how the program infrastructure can better bring about building renewal, the evaluation team interviewed the following: NEEA staff, IDL staff, building owners and operators, the general contractors providing the retrofits, and surveyed building tenants for one of the two buildings. Whereas a previous EBR evaluation focused on the expectations and decision-making of the involved parties, this round of evaluation focused on the experience of the involved parties through implementation and their lessons learned.

In addition to the process evaluation, Navigant also conducted an energy savings validation of the EBR pilot projects intended to true-up the energy savings estimated through the Integrated Measure Packages (IMPs) deployed in 2013 and 2014, as well as to account for any additional savings from the new measures deployed in 2015. The research team addressed these findings in a companion energy savings impact analysis report provided separately to NEEA.

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Findings

For purposes of anonymity, this report identifies the demonstration buildings as Project A and Project B. Stakeholders involved in the evaluation included NEEA staff, building owners, building operators, project implementers from the Boise and Seattle Integrated Design Labs, general contractors, and equipment vendors. Overall, these stakeholders felt that the deep energy retrofit projects were beneficial to them and the building tenants, with building owners understanding the value of deep energy retrofits and the upgrades offering significant non-energy benefits in addition to energy savings.

Across the board, stakeholders were pleased with NEEA's contribution; everyone interviewed felt that NEEA's role in facilitating the projects was valuable. For both projects, NEEA took advantage of existing retrofit efforts on which to piggyback their proposals, but the two projects differed significantly. One project ran smoothly from initiation to completion, while the other encountered large hurdles beginning with the implementation phase that still persist in the monitoring phase. More specifically, the project ran into issues relating to daily project oversight, a misunderstanding of NEEA's responsibilities, and problems with usage and cost monitoring post-completion. However, both teams appreciated the role that NEEA played throughout the process.

The evaluation team also found that aggressive energy savings are not the only driver for a building to participate in a deep energy retrofit. As Table 1 indicates, non-energy benefits were a major point of success, particularly for Project A, despite the significant obstacles that that project faced. Even though the ongoing process of the project was difficult, Project A was an overall success from the building owner and tenant perspectives. Building owners and operators rated various non-energy benefits on a scale from one to five, in which one was "very dissatisfied" and five was "very satisfied."

Table 1. Building Owner and Operator Satisfaction Ratings

Topic Area	Project A	Project B
Ease and cost of building maintenance	5	TBD
Tenant retention	4	4
Building occupancy	5	4
Reputation in the community	4	4
Building property value	5	3
Net operating income	5	3
Competitive positioning	5	3
Ability to comply with regulations	5	4
Marketing and ability to attract tenants	4	4
EBR project overall	3[1]	4

Note: Navigant inferred these scores from a combination of ratings and detailed replies
Ratings were on a 1-5 scale in which 1=very dissatisfied and 5=very satisfied
Source: Navigant analysis

[1] The owners explained that their overall score of "3" would have been higher except for several issues related to the inability due to meter issues to track savings and the fact that NEEA had not assisted them in achieving an ENERGY STAR® certification as yet. NEEA has since followed up on the building's certification, and is currently in the certification process.

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The evaluation team suggests that, for future retrofit projects, NEEA should ensure that there is a clear delineation and understanding of NEEA's role in the project, and to provide a structured oversight and tracking process when appropriate in order to manage unexpected problems. The building owner perceived a lack of daily oversight to be the primary source of Project A's challenges; however, NEEA's intended role was to provide oversight during the concept and design phase, but not the construction phase. Many of Project A's challenges stemmed from communications issues around roles and responsibilities, rather than a lack of oversight on NEEA's part. The evaluation team also suggests that NEEA develop a project viability template or checklist for future projects because successful deep energy retrofits, such as the one for Project B, are rare. They require a specific set of circumstances, like an existing system replacements and external support like a local EcoDistrict, to maximize the benefits.

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1. INTRODUCTION

The Northwest Energy Efficiency Alliance (NEEA) develops program infrastructure for the Northwest for its member utilities and regional stakeholders. One infrastructure effort, Existing Building Renewal (EBR), sought to demonstrate the financial viability of deep energy retrofits in existing buildings, where buildings owners are less likely to perceive the benefits of new investments in energy efficiency. Through bill savings, increases to tenant comfort, satisfaction, and potential benefits related to increased occupancy rates, valuation, and other non-energy benefits, NEEA hopes to establish an attractive return on investment for building owners and drive energy efficiency into this neglected sector.

In 2013, NEEA began demonstration projects in four Northwest cities: Boise, Idaho; Seattle, Washington; Missoula, Montana; and Portland, Oregon. NEEA, through collaboration with two Integrated Design Labs (IDLs) at the University of Idaho (Boise IDL) and the University of Washington (Seattle IDL), presented building owners with an integrated measure package (IMP) and corresponding financial estimates on project costs. In return, building owners committed to implementing those retrofits through contractors of their choice. This report evaluates the process for the Missoula and Portland buildings; subsequent sections present interviewees' anonymized responses.

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2. METHODS

The evaluation team interviewed three key stakeholders for each project: the project implementer, represented by the Seattle and Boise IDLs; the building owner and operator; and the retrofit service provider or contractor. Additionally, the evaluation team conducted a web survey among a small group of building tenants from Project A.

The evaluation team interviewed project implementer staff to learn important context for the demonstration projects. The IDLs served a unique role within the EBR demonstration projects, as they were responsible for the energy modeling used as a roadmap for the retrofit. Table 2-1 outlines the research objectives included in the in-depth interview guide for building implementers.

Table 2-1. Building Implementer Research Objectives

Research Objective	Interview Topic Area			
	Background	Energy Modeling and Financial Analysis	Project Implementation	Overall Process
Understand implementer's role throughout process	X	X	X	
Assess existing and future barriers to success		X	X	X
Understand most important aspects of deep energy retrofit projects		X	X	
Explore challenges relating to different phases of project		X	X	
Explore engagement with NEEA processes and tools		X	X	
Explore satisfaction of program overall		X	X	X

Source: Navigant

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Table 2-2 outlines the research objectives for the building owner and operator interviews. These interviews focused primarily on the experience of the owner and operator as well as identifying non-energy benefits and anecdotal findings related to tenant experience.

Table 2-2. Building Owner and Operator Research Objectives

Research Objective	Interview Topic Area				
	Background	Tenant Relations, Retention, Experience	Building Occupancy and Rent-up	Building Value and Reputation	Building Performance and Project Implementation
Understand owner experience throughout implementation process	X				X
Quantify satisfaction with different program aspects	X	X	X	X	X
Assess project's impact on building operations, including tenant relations, retention, occupancy, and performance		X	X	X	
Understand owner- and tenant-perceived value of building	X			X	X
Identify areas of success and improvement	X	X	X	X	X

Source: Navigant

Table 2-3 shows the research objectives for the retrofit service provider or contractor interviews. These interviews helped identify any additional issues that the implementer or building owner may not have been aware of as well as to better understand the breakdown of roles within each project.

Table 2-3. Retrofit Service Provider Research Objectives

Research Objective	Interview Topic Area		
	Background	Challenges and Successes	Retrofit Service Provider Experience
Understand retrofit service provider experience throughout implementation process		X	X
Identify key roles and processes in project	X		
Quantify satisfaction with different program aspects			X
Identify areas of success and improvement		X	X

Source: Navigant

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Additionally, the evaluation team conducted a short online survey of tenants in one of the buildings. The survey informed the evaluation team about tenants' motivations for leasing space in the building, assess their comfort level and satisfaction with their tenancy, and, when possible, to compare their experience before and after the retrofit. Tenants received the survey by email; out of 10 tenants contacted, six responded to the survey. Section 3.2 presents the results of the tenant survey.

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3. DEMONSTRATION PROJECT A

3.1 Introduction

The deep energy retrofit at Project A succeeded in the modeling phases but encountered significant hurdles during the implementation and post-completion monitoring periods. Most of these issues did not originate with NEEA, instead stemming from problems with the retrofit service provider and coordination with the local utility. However, these problems are avoidable. Any future retrofits that NEEA undertakes should take care to include a third-party implementation oversight component and diligent follow-up on data monitoring during the first year after implementation.

3.2 Project Successes

Project A ran smoothly throughout the modeling phase of the project and, overall, succeeded particularly well in improving and creating non-energy benefits such as tenant comfort, occupancy rates, and increased market value. Overall building performance also improved, though the building ownership and management team lacks exact energy consumption measurements due to issues related to metering.

Across the board, NEEA's involvement in the project from the outset was a major point of success, particularly regarding NEEA's role in scope development. The building owner and manager mentioned that they found NEEA's comprehensive energy modeling outside of the HVAC system to be a value-add beyond the initial engineering analysis. Initially, the retrofit scope did not include many of the final project elements, such as lighting replacements, new ceilings, or other modernization elements. The building owner and manager described NEEA's contribution as "flawless" and "an immense joy to work with." Despite the HVAC system overhaul affecting four floors of the building, NEEA's involvement, specifically their determination of the correct system type and associated modeling, helped the installation go smoothly and minimized impact on tenants.

All project stakeholders interviewed said that they found NEEA's modeling processes to be a valuable component of the project. For example, Project A's building owner was already planning to replace the building's leaking HVAC system when NEEA approached them about the EBR pilot; the ability of NEEA's team to complete an entire building energy model in a short timeframe was key to meeting the owner's needs for replacing the HVAC system. As a result of NEEA's proposal, particularly the immediate recommendation to seal the building envelope, the owner was able to install a smaller HVAC system than originally planned.

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Non-energy benefits were another successful component of the project, as indicated by building owners in Table 3-1.

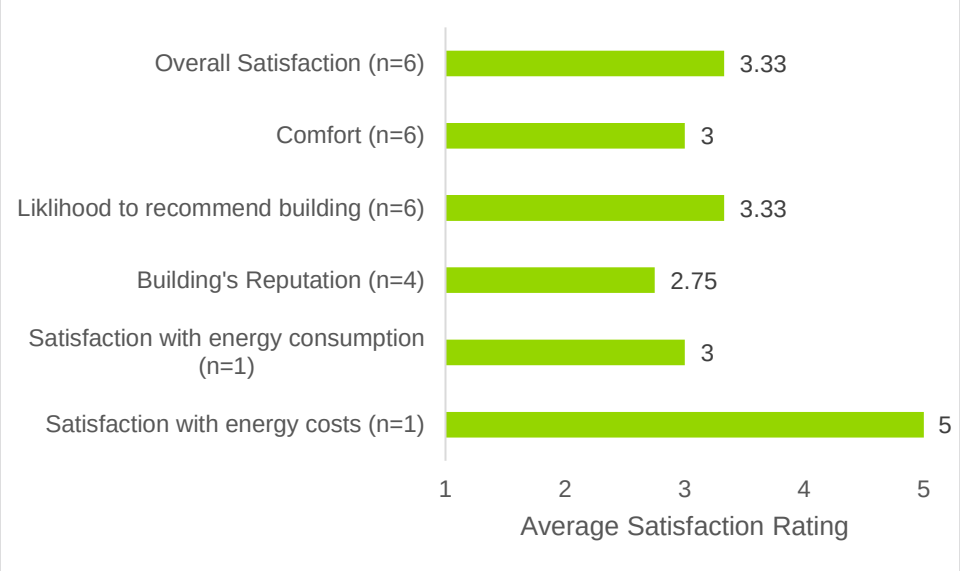
Table 3-1. Building Owner and Operator Satisfaction Ratings

Topic Area	Project A	Project B
Ease and cost of building maintenance	5	TBD
Tenant retention	4	4
Building occupancy	5	4
Reputation in the community	4	4
Building property value	5	3
Net operating income	5	3
Competitive positioning	5	3
Ability to comply with regulations	5	4
Marketing and ability to attract tenants	4	4
EPR program overall	3	4

**These scores were inferred based on detailed replies*
Ratings were on a 1-5 scale in which 1=very dissatisfied and 5=very satisfied
Source: Navigant analysis

Enjoyment of non-energy benefits was not as pronounced in the tenant survey of Project A. They do, however, suggest satisfaction with energy costs. Figure 3-1 displays different dimensions of tenant satisfaction on a scale from one to five, in which one was “very dissatisfied” and 5 is “very satisfied.”

Figure 3-1. Project A Tenant Satisfaction Metrics



Ratings were on a 1-5 scale in which 1=very dissatisfied and 5=very satisfied
Source: Navigant analysis

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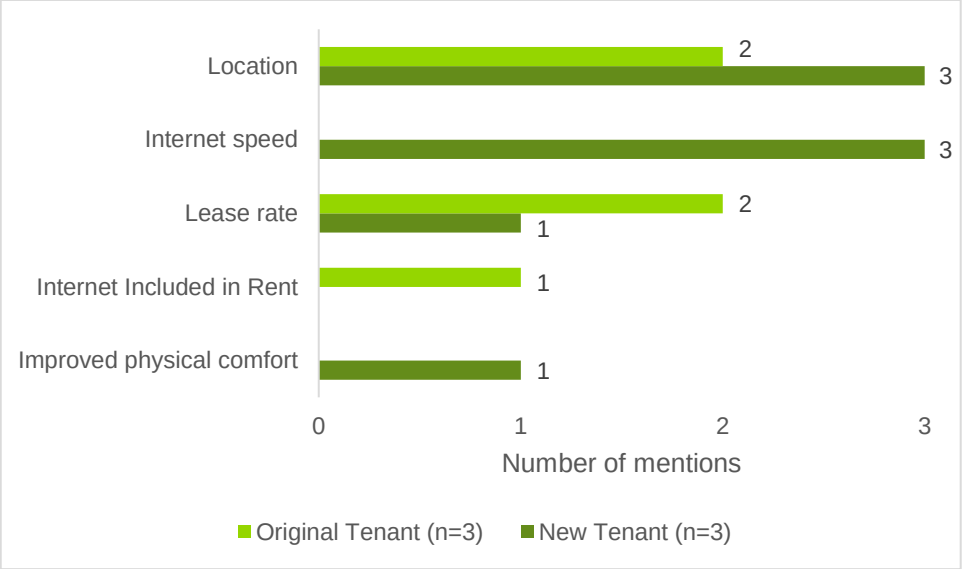
Only one tenant received a bill and had awareness of his or her office's energy costs and usage, rating them a 5 and 3 respectively. The other tenants responded that they did not know. These scores demonstrate moderate satisfaction with most aspects of the building but do not indicate what the scores for the building would be without the deep energy retrofit. To ascertain how the retrofit impacted tenant decisions at Project A, Figure 3-2 compares existing tenants and new tenants on their reasons for leasing. In addition to the reasons in the figure below, the research team also asked tenants about having lower energy costs, better indoor air quality, desire to be in a green building, the building's reputation in the community, and whether their company had a sustainability requirement to meet. None of the tenants named any of these items as reasons for leasing space.

Figure 3-2. What were your main reasons for leasing space in the building? (Select all that apply)



Ratings were on a 1-5 scale in which 1=very dissatisfied and 5=very satisfied
Source: Navigant analysis

The retrofit impact on being green or comfort are secondary to other business concerns of location, cost, and solid Internet connections.

The financial performance metrics for Project A have improved since the retrofit. For example, rents in the building increased from an average of $15 per square foot to $17 or $18 per square foot for new tenants. In addition to increasing rents, the building owner changed the lease structure for new tenants from a triple-net structure to a gross lease structure, which allows the building to recoup the costs of the retrofit more quickly. Building occupancy also increased from 50 percent prior to the retrofit to a current occupancy rate of 94 percent. The ownership team was holding space vacant in preparation to replace their HVAC system, so this increase is not entirely attributable to the improvements of the deep energy retrofit, but the high occupancy and low turnover rates suggest that the building is appealing to tenants.

The building's market value has also increased since the retrofit: based on market comparables, Project A's ownership team believes its building is more valuable and desirable to tenants than it was before the upgrade. Although it is an old property, the owners reported that the building can now compete with Class A office spaces in its area. The local newspaper also ran a story praising one of the building's tenants for energy efficiency. The team does not emphasize the green building aspect in its marketing materials—the building has the fastest Internet speeds in its city, so marketing efforts focus on this element rather than

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the energy efficiency aspect. However, the building owner and manager mention the retrofit during onsite tours for potential tenants. The tenant survey showed that the green building aspect is not a major selling point for tenants: none of the tenants surveyed mentioned the green aspect as a reason for leasing the space, instead mentioning the location and Internet speed as the main draws. Additionally, tenants rated the influence of the deep energy retrofit in their leasing decision at an average of 1.6 out of 5.

3.3 Project Challenges

Project A ran into obstacles throughout the process, specifically relating to quality control and oversight during the implementation phase and usage monitoring in the post-completion phase. The project's quality control issues arose from a lack of oversight between the primary contractor and a subcontractor that lacked experience with heating systems of the size and complexity required for Project A. At the beginning of the project, NEEA recommended that the building owner and manager hire a third party to oversee the day-to-day installation and act as a liaison between the different stakeholders. The ownership team chose not to hire someone for oversight, which they noted afterward may have been a mistake. Another stakeholder involved in the equipment installation process suggested that the project would have benefited from weekly or biweekly meetings between NEEA and all the other parties involved to ensure that everyone was aware of changes to the project's progress.

Project A also faced challenges with monitoring energy consumption due to problems with electricity metering and commissioning. Initially, the building had used two meters, one for occupancy and one for a data center in the building that would have allowed the owner and property manager to monitor energy usage in aggregate. The data center expanded to a second floor, requiring additional power to their space; during the expansion, an engineer from the local utility removed the meters and replaced them with a master meter and submeters without the owner's consent. This complicated energy billing practices and affected the owner's ability to compare pre- and post-retrofit energy consumption. Additionally, the inconsistent billing forced the project implementer to throw out the building data and start over. The problems stemming from the meter replacement did not involve NEEA directly, but any agency implementing a deep energy retrofit in the future should be aware of this potential issue.

While the building ownership team was pleased overall with NEEA's energy modeling documents, they expressed disappointment that they were unable to implement all of NEEA's proposed measures. Additionally, other project stakeholders mentioned that they wished the building had been commissioned or certified by ENERGY STAR® (NEEA has since followed up on ENERGY STAR® certification and is currently working to certify the building). Since engineers in a different state produced NEEA's model, Project A required a local architect and engineer to sign off a second time on the building plans before implementing the measures. NEEA was the catalyst for many of the building improvements, but its role was also redundant in some ways; for future retrofits, NEEA should consider working closely with a local firm from the early stages of the project to avoid any redundancies.

3.4 Lessons Learned

Project A would have benefited from a **more structured oversight and process tracking system**. All stakeholders interviewed mentioned that increased documentation and daily oversight processes were key lessons learned from the project. One stakeholder suggested that NEEA should establish operations and maintenance (O&M) documents to persist beyond the end of the contract period, such as a documented process protocol from analysis through implementation and post-implementation. Another stakeholder suggested that NEEA created a shared online repository where all team members can

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access project documents. Other suggestions from stakeholders included weekly or biweekly meetings among all parties to ensure plans do not change without oversight.

Another key takeaway from Project A is the **importance of local input in design and decision-making**. While NEEA's financial and energy modeling were crucial to the initiation and implementation of the project, the requirement to have a local engineer sign off on the project plans created a bottleneck when the owner was ready to start the installation. One interviewee suggested that NEEA prepare multiple models, if possible, in order to allow for local decision-making. Having a local person either from NEEA or working on behalf of NEEA to be on site would have also helped streamline the process, potentially avoiding some of the quality control issues associated with the installation contractor. Working with an implementer that was geographically closer to the project may also have helped avoid the data monitoring problems related to the meter replacements and improved follow-up during the post-implementation period.

Finally, Project A demonstrated the need for **clearer communications relating to roles and responsibilities**. The building owner and NEEA differed in their expectations for each party's respective responsibilities during the project, which contributed to many of the larger project hurdles. NEEA initially intended to provide guidance to project teams in a way that replicated the normal market process for implementing a deep energy retrofit. Additionally, NEEA planned to provide oversight during the concept and design phase, but not the construction phase, and for owners to manage their own contractors and implementation processes. For future retrofit projects, NEEA should make a point to delineate and document roles and responsibilities in order to identify and avoid any communications issues further down the line.

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4. DEMONSTRATION PROJECT B

4.1 Introduction

Project B succeeded overwhelmingly throughout all phases of the project due to a combination of timing, an enthusiastic and experienced project team, extensive day-to-day involvement from NEEA, and local support. The building has logged significant energy savings and has had noticeable improvements in non-energy benefits including financial performance and building publicity.

4.2 Project Successes

NEEA's role in facilitating the pre-analysis and ongoing implementation of Project B was key to the project's overall success. The implementer called out NEEA staff's skill in locating a suitable project for the pilot program; between the sympathetic owners, supportive design team, and striking at the right time in their redevelopment of the site, the implementer was happy with NEEA's ability to identify a well-suited project. NEEA's assistance also streamlined the building owner's budgeting process for 2016 by setting out a capital plan for the remaining improvements and their anticipated payback.

The implementer enjoyed the experience working with the ownership team and NEEA to put together the technical analysis. In spite of the complexity of coordinating the technical analysis with the financial analysis in order to accommodate tenant rollovers and other sequential changes, the formation of the integrated measures package (IMP) went smoothly. Since the owner was already planning a major retrofit of the building, Project B was well-positioned for the pilot project to piggyback on planned changes. The owner wanted to implement measures that tenants could touch and feel, or that would improve the market perception of the building, such as ground floor lighting in retail spaces, window coverings, and interior tenant improvement standards. Additionally, the owner wanted to optimize their central plant to accommodate new construction at the same site as the existing building retrofit, so they took particular interest in a chiller replacement.

NEEA also helped facilitate and streamline the installation contractor's process. NEEA's proposed changes to the central plant scope resulted in an expanded HVAC system that maintained a similar energy footprint. The contractor credited NEEA for giving them what they needed to make decisions by providing design concepts, establishing their financial viability, and working together with their team to create construction cost estimates.

Although Project B does not yet have a year of official post-implementation data, the building has already shown significant savings. In concert with an affiliated local strategic energy management program, the owner reported that the building's overall energy consumption dropped 30 percent from 2014 to 2015, saving almost $89,000. The ownership team expects to reduce consumption by another 10 percent as it finishes the last parts of the measure implementation, which will allow them to reach their project goal of 40 percent energy reduction overall.

In addition to the early energy savings, initial non-energy benefits have already materialized since the retrofit was completed. The building has already met its key financial performance targets: rents increased from an average of $26 per square foot to $30 per square foot, and occupancy also increased from 76 percent before the retrofit to 98 percent after the retrofit. The building owner stated that that the retrofit was very influential on their ability to increase the rents, particularly considering the age of the

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building, which is nearly fifty years old. The upgrades have allowed the building to remain competitive within an up-and-coming EcoDistrict. Relations between the management staff and tenants has also improved due to the upgrades; despite the ongoing construction, complaints about tenant comfort decreased by eight percent, and the management expects this to fall further when the project is fully completed.

The deep energy retrofit has also contributed to the building owner's global reputation as a sustainable development firm. The green credentials the project brought allowed them to secure a major, environmentally conscious commercial customer. They have also been able to advertise their green reputation to residential customers at an associated building on the same site. However, the ownership team cites the holistic analysis as the most valuable aspect of their participation. NEEA analysis offered a model that exceeded simple measure payback estimates, allowing the building's owner to take a tired building in a tired neighborhood to a new level.

Overall, NEEA was hugely successful in facilitating the project smoothly. The building owner was unable to cite any aspects of their participation that were not valuable; they even ended up installing recommended measures that they had originally declined. To take advantage of the new equipment and controls installed in the deep energy retrofit, the ownership team in Project B has had to "upskill" its building engineers to operate the building efficiently, improving their overall operations as a company. The availability of NEEA team members to answer any questions significantly eased the process for the building owner and installation team.

4.3 Project Challenges

The installation contractor for Project B ran into challenges relating to scope changes. One of NEEA's primary contributions to the project was additions to the central plant design concept. The contractor had already completed an initial round of scoping for the central plant before NEEA provided its proposals, but incorporating NEEA's proposals required several iterations to price and engineer the necessary changes. While the changes were relatively small within the larger project, the contractor's team found it challenging to incorporate these within the larger scope because of the ripple effect into other building systems. The contractor described NEEA's redesigns as "inconvenient" but not a problem.

4.4 Lessons Learned

One of the key takeaways from Project B is that one of the most important parts of successful implementation is **having the right timing**. The deep energy retrofit proposal needs to coincide with momentum from the ownership team to have energy efficiency attached onto other work. The implementer stressed that Project B was an "exceptional project" that does not come around often. The implementer suggested that for NEEA to identify another project as successful as Project B, it may require several shallow engagements to "turn over a lot of rocks" in order to find another good scenario.

One drawback of targeting existing buildings is that it can be harder to move budgets around in an existing building retrofit than in a new construction project. Coordinating improvements around multiple existing tenants can also be difficult. However, these challenges can be overcome with the **proper leverage**; for example, during a major system replacement, introduce energy efficiency measures to ownership teams that may otherwise overlook them. Keeping the overall costs of the retrofit low is necessary because owners will not typically implement energy efficiency measures on bill savings alone.

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5. CONCLUSIONS

Tenant survey feedback and owner/operator interview feedback suggest that deep energy retrofits create incremental improvements to tenant comfort, relations, and satisfaction. This small impact translates into a big increase in competiveness for older buildings that may otherwise be outclassed in the real estate market. The boost was enough to increase rental rates and occupancy rates in both buildings, and the ownership teams expect boosts to tenant relations and retention going forward. These findings indicate that the value proposition of building renewal is delivering on its promise to building owners and should be technically and financially viable for similar projects.

One stakeholder warned that the majority of candidate projects would not be as well suited to a deep energy retrofit as these demonstration projects were, so NEEA should cast a wide net across the region and focus on numerous short engagements in order to identify the best potential projects to prioritize for fewer in-depth engagements.

NEEA's EBR team received high marks from everyone interviewed. Interviewees described the team as effective communicators and capable analysts. The building owners for both demonstration projects cited the combination of comprehensive financial and technical packages as the most valuable part of the EBR process. However, obstacles increased as project elements and phases became further removed from NEEA, leading the ownership team, implementer, and retrofit service provider for Project A to request greater NEEA oversight into the physical work of the project. Respondents offered four possibilities to increase oversight:

1. Scout out and vet local contractors to ensure they are capable of doing the work as designed or act as the owner's representative on the project
2. Use an implementer that is closer geographically to monitor post-completion data and follow up on issues that may arise after the retrofit is complete
3. Build redundancies into the communication network to minimize the impact of weak links or the chance that the installation deviates from the plan as modeled
4. Include a process protocol through the whole project, not just individual phases, and include the protocol in O&M documentation so it does not sunset at the end of a contract period

The evaluation team recommends NEEA continue encouraging building owners to hire a third party to oversee the process end-to-end. As Project A demonstrated, having a third party managing contractors, communications, and disseminating project updates to team members would likely have meant a smoother process that avoided potential obstacles later in the process.

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APPENDIX H. ESTIMATES OF VALIDATED ANNUAL ENERGY SAVINGS FROM COMMERCIAL REAL ESTATE PROGRAM

Navigant has reviewed energy consumption and project tracking data to validate energy savings for the Market Partner, Kilowatt Crackdown and EBR programs.

2015 CRE Savings Validation - Final.pc

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Estimates of Validated Annual Energy Savings from Commercial Real Estate Infrastructure Program

Incorporates Final NEEA Comments and Anonymizes Buildings

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1. INTRODUCTION

Navigant has reviewed energy consumption and project tracking data to validate energy savings for the Market Partner, Kilowatt Crackdown and Existing Building Renewal programs. As shown in Table 1, the preliminary estimate of validated savings for 2015 is 0.68 aMW.

Table 1. Summary of 2015 Validated Energy Savings from Commercial Real Estate Programming

Program	Validated Savings
Existing Building Renewal	0.31 aMW
Kilowatt Crackdown	0.39 aMW
Market Partner Program	0.69 aMW
Total	1.39 aMW

In consultation with NEEA, Navigant will finalize these savings in a forthcoming report.

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2. MARKET PARTNER PROGRAM AND KILOWATT CRACKDOWN

The Northwest Energy Efficiency Alliance's (NEEA) Commercial Real Estate (CRE) initiative seeks to lower energy usage among commercial office buildings through Strategic Energy Management (SEM) practices. The SEM approach includes both hardware updates and behavioral changes along with staff engagement at all levels. NEEA provides technical advice and training to organizations participating in the CRE initiative to ensure that they have the expertise and tools necessary to implement energy-saving procedures.

The two programs in NEEA's CRE initiative are the Market Partners Program (MPP) and Kilowatt CrackDown program (KWCD), both of which stopped in 2013.This report section seeks to determine the extent to which gas and electricity savings persisted or increased in the post-program period. Below are Navigant's methods as well as energy savings estimates for a sample of buildings that participated in MPP and KWCD programs.

2.1 Methodology

To determine electric and gas savings for KWCD and MPP, Navigant first prepared the data, then used regression analysis to calculate the change in energy usage per square foot during the program period relative to the post-program period. We then applied the results from this analysis to the square footage of participating buildings to calculate overall savings.

2.2 Data Preparation

NEEA provided Navigant with billing data for 33 KWCD buildings and 15 MPP buildings. Billing data was divided into two 12 month timeframes – the program period (January 2013 through December 2013) and the post-program period (October 2014 through September 2015). Bills were then adjusted to calendar months to normalize billing periods across buildings.

In compliance with the methodology of the review of 2014 savings, the following are the data cleaning steps taken on the resulting dataset:

- Combine meter usage for buildings that had more than one meter
- Remove long or short bills (those with more than 40 or less than 20 billing days)
- Remove customers that had fewer than 6 bills[1]
- Remove outliers (bills with usage levels more than 10 times the median)

The results from these data cleaning steps for buildings in KWCD and MPP programs are presented below in Table 2 and Table 3.

[1] Having a minimum of six bills allowed for variation in usage when comparing monthly figures.

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Table 2. Data Cleaning Overview for the Kilowatt CrackDown Program

	# of Participants	# of Observations	Avg. Daily Usage	Total Floor Area (sqft)
Elec pre-cleaning	33	1,165	4,467 kWh	5,240,910
Elec post-cleaning	30	673	5,782 kWh	3,781,846
Gas pre-cleaning	24	618	101 therms	3,868,847
Gas post-cleaning	20	418	43 therms	3,258,411

Table 3. Data Cleaning Overview for the Market Partners Program

	# of Participants	# of Observations	Avg. Daily Usage	Total Floor Area (sqft)
Elec pre-cleaning	15	588	5,860 kWh	2,588,021
Elec post-cleaning	14	308	10,220 kWh	2,568,818
Gas pre-cleaning	11	262	39 therms	2,136,263
Gas post-cleaning	11	224	15 therms	2,136,263

In addition to the data cleaning above, Navigant included weather information in the regression analysis. To do this, Navigant downloaded from the National Oceanic and Atmospheric Administration the number of heating degree days[2] (HDD) and cooling degree days[3] (CDD) for each building's location during the study period.

2.2.1 Data Details

Waypoint provided the Navigant team with a subset of the sample population from 2014 evaluation. The number of participants Navigant evaluated in 2015 evaluation was approximately 1/3 of those in the 2014 study. As a result, the 2015 savings estimates are not directly comparable with results from the 2014 analysis.

Navigant also applied several data management steps that were described in the previous section in order to prepare the data for regression analysis. Navigant applied similar data management steps to those used in the 2014 evaluation, particularly removal of the outliers in which some customers were dropped from the analysis. Removal of long/short bills and combining multiple metered buildings did not change the number of customers in fact, reduced the number of observations in the analysis. However, removal of the customers with incomplete bills dropped 2 electric customers and 3 gas customers from KWCD and 1 electric customer from MPP. Finally, removal of the outliers dropped 1 electric and 1 gas customer from KWCD and had no impact on the MPP participants. Table 4 shows the data management steps, the number of customers, and the number of observations after each data management step.

[2] These are defined as each degree above 65 for a single day. For example, a day with a temperature of 75 would have a HDD of 10. A week of 75 degree days would have HDD of 70.
[3] These are defined as each degree below 65.

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Table 4: Data Management Steps and Number of Participants

		Raw Data	Removal of long/short bills	Combine multiple metered buildings	Removal of customers with incomplete bills	Removal of Outliers
KWCD Electric	Customers	33	33	33	31	30
	Observations	1,165	1,157	737	712	673
KWCD Gas	Customers	24	24	24	21	20
	Observations	618	617	508	466	413
MPP Electric	Customers	15	15	15	14	14
	Observations	588	588	328	314	308
MPP Gas	Customers	11	11	11	11	11
	Observations	262	261	240	240	224

2.3 Data Analysis

Per the evaluation methodology of the validation of 2014 savings, Navigant employed the following first-difference fixed-effects model to estimate MPP and KWCD energy savings:

Equation 1. Model used to analyze KWCD and MPP Program Energy Savings

$$\Delta kWh_{it,t-12} = \beta_1 \Delta HDD_{it,t-12} + \beta_2 \Delta CDD_{it,t-12} + \emptyset \Delta Post_{it,t-12} + \Delta \varepsilon_{it,t}$$

kWh_{it} = Electricity use per square foot of floor space in building *i* in month *t*
HDD_{it} = Heating degree days for building *i* in month *t*
CDD_{it} = Cooling degree days for building *i* in month *t*
$Post_{it}$ = An indicator variable that takes the value 1 when building *i* is in the program and 0 when the building is not in the program.
ε_{it} = Random error term for building *i* in month *t*

In the above model, energy usage is specified as a function of monthly weather and an indicator variable defining whether a building received a bill during the program or post-program period. Navigant estimated the model using Ordinary Least Squares and employed robust standard errors clustered on buildings.
The model in Equation 1 uses the difference in kWh per square foot in the post-program period relative to the program period as the dependent variable (i.e., subtracting electric usage in a month during the program period from the electric usage in the same month during the post program period). The independent weather variables are the difference in HDD and CDD from the program and the post-program periods. The coefficient on the $Post_{it}$ variable provides an estimate of energy savings for the post-program timeframe. Finally, the ε variable captured variation within a building. This differenced model specification controls for the variation between buildings and between months. Further, this model controls for the unobserved effects specific to a building and a month.

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2.4 Results

Electricity and gas savings for the MPP and KWCD programs are detailed below.

2.4.1 Electricity Savings

KWCD participants saved approximately 0.89 kWh per square foot during the 12-month post-program period relative to the 2013 program period. During the same timeframe, MPP participants saved approximately 2.36 kWh per square foot. This is equivalent to 5.6 percent average savings for the 30 KWCD participants and 10.5 percent savings for the 14 MPP participants. Both results were significant at the 90% confidence level and are detailed below along with relevant confidence intervals (CI) in Figure 1. Total annual electric savings were approximately 0.38 aMW for KWCD and 0.69 aMW for MPP.

Figure 1. Results from KWCD and MPP Electricity Savings Programs

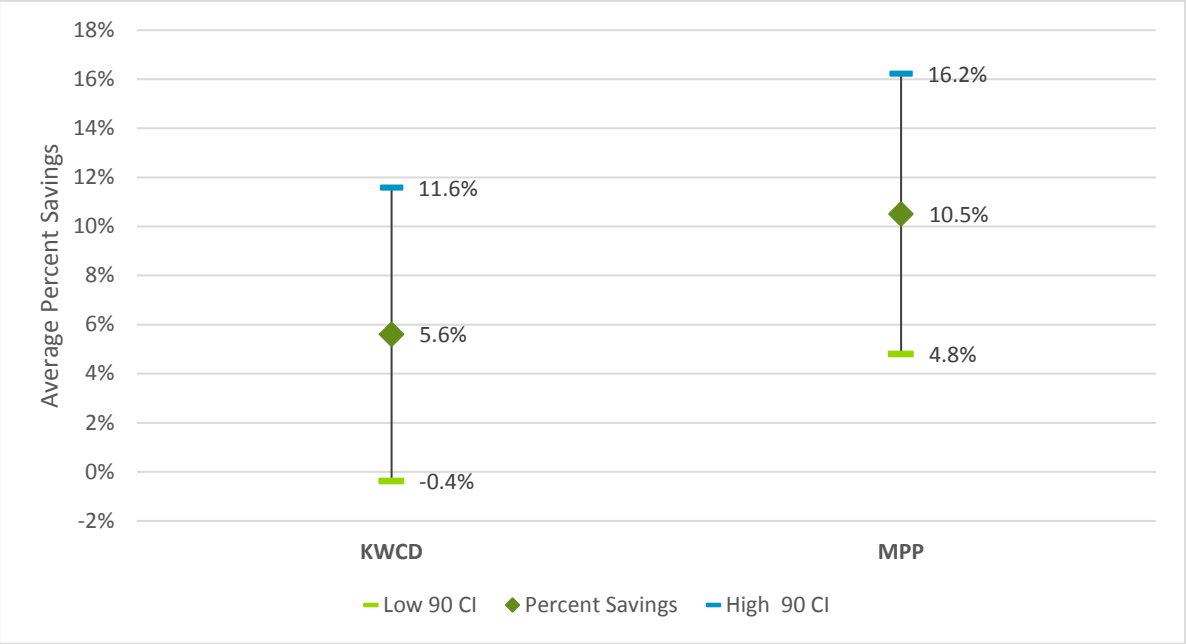

Table 5 and Table 6 below compare the results from Navigant's 2015 KWCD and MPP electricity analysis to a previous study that examined 2013 program savings rates relative to 2012.

Table 5. Comparison of KWCD electricity results from 2014 and 2015

	Number of Buildings	Total Square Footage	Monthly Savings kWh/sqft	90% CI Low	Annual Savings kWh/sqft	90% CI High	Percent Savings	Total Savings (aMW)
2014	91	14,991,580	0.02	0.02	0.47	0.92	1.84%	0.472
2015	30	3,781,846	0.07	0.89	0.89	1.84	5.6%	0.380

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Table 6. Comparison of MPP electricity results from 2014 and 2015

	Number of Buildings	Total Square Footage	Monthly Savings kWh/sqft	90% CI Low	Annual Savings kWh/sqft	90% CI High	Percent Savings	Total Savings (aMW)
2014	47	6,182,073	0.05	0.02	0.42	0.82	3.79%	0.420
2015	14	2,568,818	0.19	2.36	2.36	3.65	10.5%	0.690

Table 5 and Table 6 show an increase in KWCD and MPP electricity savings rates in the post-program period relative to the 2014 study. However, because the 2015 sample size was so much smaller than that in 2014, it is important to exercise caution when drawing results from comparing the two analyses. It is important to note that buildings sample of 2015 evaluation is only a subset of the 2014 evaluation and the savings estimates of 2015 and 2014 evaluation are not directly comparable for these two programs, unless 2015 evaluation is re-estimated with the same sample as 2014 evaluation. Savings estimates for 2015 evaluation is unique to the sample provided by NEEA in 2015.

2.4.2 Gas Savings

Results from the regression analysis of the KWCD and MPP gas bills were not statistically significant, and thus were indistinguishable from zero. Figure 2 provides an illustration of the estimated savings rate and related confidence bounds.

Figure 2. Results from KWCD and MPP Gas Savings Programs

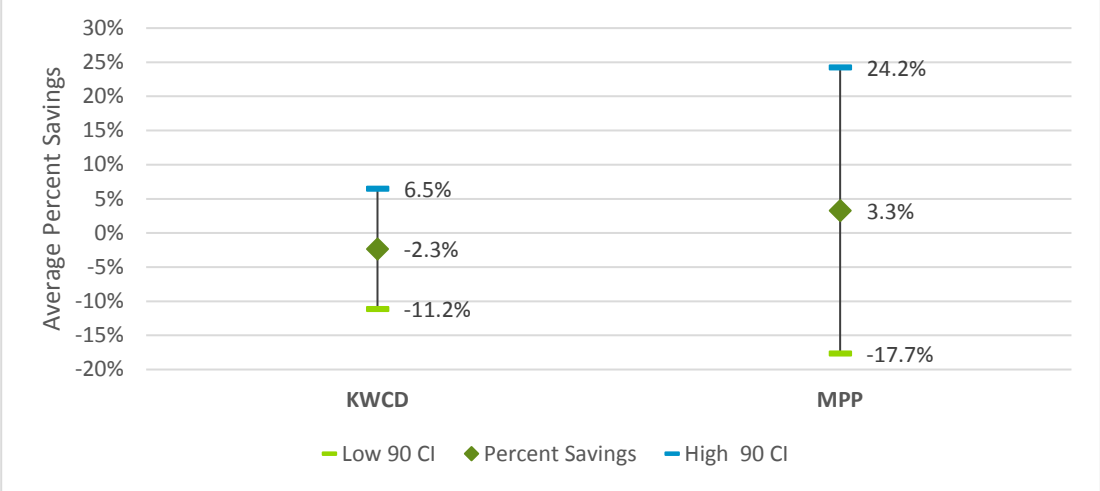

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Table 7. Comparison of KWCD gas results from 2014 and 2015

	Number of Buildings	Total Square Footage	Monthly Savings therms/sqft	90% CI Low	Annual Savings therms/sqft	90% CI High	Percent Savings	Total Savings (aMW)
2014	65	11,021,742	0.0010	*	0.012	*	7.53%	0.001
2015	20	3,258,411	-0.0003	-0.004	-0.004	-0.004	-2.33%	-0.001

Table 8. Comparison of MPP gas results from 2014 and 2015

	Number of Buildings	Total Square Footage	Monthly Savings therms/sqft	90% CI Low	Annual Savings therms/sqft	90% CI High	Percent Savings	Total Savings (aMW)
2014	27	3,625,579	0.0010	*	0.012	*	7.95%	0.001
2015	11	2,136,263	0.0002	0.002	0.002	0.002	3.28%	0.001

Table 7and Table 8 show a decrease in KWCD and MPP gas savings rates in the post-program period relative to the 2014 study. However, caution should be applied for any comparison of results between the two analyses because the 2015 gas programs were not statistically significant. By not being statistically significant, the results from the KWCD and MPP gas programs are indistinguishable from zero.

2.5 Conclusions

Navigant's analysis determined that, after KWCD and MPP programs ended, electricity savings for the buildings in this study's sample increased by 5.6 percent and 10.5 percent respectively. This result suggests that electricity savings from SEM approaches persist even after programs have ended, perhaps due to a maturation of the SEM methods. An additional process analysis could be used to determine the cause of the energy saving persistence. From the program design perspective, adoption of SEM practices may result in long-term electricity savings.

Gas metered buildings did not show any statistically significant savings after the KWCD and MPP programs ended.

2.6 Recommendations

The accuracy of the savings rates could be improved in two key ways:

- increasing the sample size
- including control customers

Including the same customers as the 2014 study would provide a better basis for comparison between the two time periods. Furthermore, expanding the number of buildings in the study could have the added benefit of greater overall savings figures because the energy reduction rate would be applied to more square feet. Adding control customers would allow NEEA to more reliably determine the extent to which energy savings were due to the CRE initiative or other factors.

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3. EXISTING BUILDING RENEWAL – BOISE, ID

The EBR initiative is designed to achieve whole-building deep energy efficiency retrofits of existing assets through the integration of savings strategies across building systems. The specific objectives of this evaluation study are to validate the energy savings estimated as a part of the Integrated Measure Packages (IMP) deployed in 2015 for each building. This report summarizes research conducted for the Northwest Energy Efficiency Alliance (NEEA) as part of the evaluation of the Existing Building Renewal (EBR) pilot projects.

3.1 Boise, Idaho Building

Navigant did not perform an impact evaluation for the Boise, Idaho Building for 2015. Based on discussions with the building account manager, the building owners did not implement energy savings measures in the building in 2015. The account manager says:

> "We simply replaced an outdated and failing controller. We are controlling the same equipment and nothing has really changed except the potential to add DDC [direct digital control] to the rest of the building at some point."[4]

3.2 Recommendations

Navigant recommends that NEEA implement the following steps to assist the evaluation team in calibrating building energy models and calculating verified savings for the program in future years if energy efficiency measures are implemented:

- Provide comprehensive implemented measure details
- Provide operation date of implemented measure
- Utilize end-use sub-metering of electricity and/or gas usage as applicable for future efficiency

[4] Email conversation with building account manager, 12/21/2015

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4. EXISTING BUILDING RENEWAL – PORTLAND, OR

4.1 Portland, OR Building

This evaluation involved a review of the energy efficiency efforts undertaken at the NEEA EBR participating owner demonstration building in Portland, Oregon during the period 2014 through 2015 in order to validate savings. The Portland Building is a 16-story office building, originally built in 1971, located in Portland, Oregon.

4.1.1 Methodology

4.1.1.1 Data Collection

Navigant utilized the following sources of information as input assumptions and data sources for the building energy models:

- Integrated Design Lab's (IDL) Portland Building Existing Building Models
- IDL's Portland Building Initial Design Baseline Models
- Portland Building Technical Assessment Report
- IDL's Memo for EBR Measure Implementation at Portland Building
- Monthly electric data - January 2006 through October 2015 and monthly natural gas data - February 2015 through October 2015
- Emails from onsite engineer at Portland Building

Navigant started the analysis using the existing building models and initial design baseline models provided by IDL. In addition, Navigant referenced the IDL's Portland Building technical assessment report and memo for implemented measures at the Portland Building. The Navigant analysis team was able to collect input assumptions to baseline and proposed modeling using these two documents.

Navigant used monthly electric and gas data provided by the onsite engineer to calibrate both the baseline models and proposed models to actual energy consumption in the building. Phase 1 of the project was completed in March of 2014 and Phase 2 of the project was completed in end of January 2015.

For Phase 1 of the project, the building onsite engineers adjusted the fan system in March of 2014. The fan static set point used to be based off of a worst case scenario variable air volume (VAV) damper position before the adjustment. VAV system is a type of heating, ventilating, and/or air-conditioning (HVAC) system supplying a variable airflow rate at a constant temperature. Since the flow probes on the VAVs were not calibrated during installation, many of them were not reading properly. The onsite engineers then based the set-point off of an average damper position for all VAV's throughout the building. By doing this, the fan speed were able to lower with no effect on tenant comfort. Additionally, the onsite engineers lowered the building hot deck maximum set point to 85 degrees Fahrenheit and minimum to 70 degrees Fahrenheit to limit the amount of simultaneous heating and cooling during the summer. During the winter they raised the hot deck maximum set point back up to 110 degrees Fahrenheit and minimum to 90 degrees Fahrenheit to make sure enough heat is provided throughout the building. The Phase 1 model includes primarily static pressure control and reset temperature control changes, which are not applicable to the Phase 2 model.

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For Phase 2 of the project, the building owners implemented a central utility plant (CUP) replacement and a partially implemented efficient lighting retrofit. The fully implemented CUP replacement measures include installation of two new open tower cells, two new high efficiency centrifugal chillers, three gas-fired condensing hot water boiler, and corresponding pump and fan controls.

Navigant utilized calibrated simulation models (IPMVP: Option D) to validate the savings achieved from Phase 2 from this project[5].

4.1.1.2 Baseline Model Development

The Portland demonstration building has retail tenants on the lower level and office tenants in the tower floors above. The existing building HVAC systems are dual duct with three air handling units which have been retrofitted to VAV operation about 15 years ago. Controls are full direct digital control (DDC). The existing HVAC plant includes a heat recovery chiller, a second cooling-only chiller, and two electric boilers. Heat rejection for the chillers and process loads was combined into the cooling tower. No natural gas was consumed until three new gas-fired condensing boilers were installed and operational.

To evaluate savings for Phase 2 of the EBR project, Navigant first calibrated the baseline modeling to the pre-retrofit billing data (January 2011 to March 2014) for the building. Navigant revised the existing building modeling developed by IDL[6] in eQUEST 3.64[7] to the baseline modeling.

Table 9 provides an overview of baseline building characteristics for the Portland Building.

[5] Per IPMVP 2012, Volume 1, p. 28: "Option D simulation tool allows you to also estimate the savings attributable to each ECM within a multiple-ECM project."

[6] IDL provided Navigant four energy modeling, including existing building modeling, initial baseline design modeling, optimized IMP (integrated measure packages) modeling, comprehensive IMP modeling. Navigant decided to utilize the existing building modeling for baseline modeling, and initial baseline design modeling for proposed modeling.

[7] eQUEST is an advanced whole-building energy simulation program developed by the US Department of Energy (DOE). Energy Plus is an hourly simulation tool that models heating, cooling, lighting, ventilation, and other energy flows within the building. Navigant used version of 3.65 for analysis.

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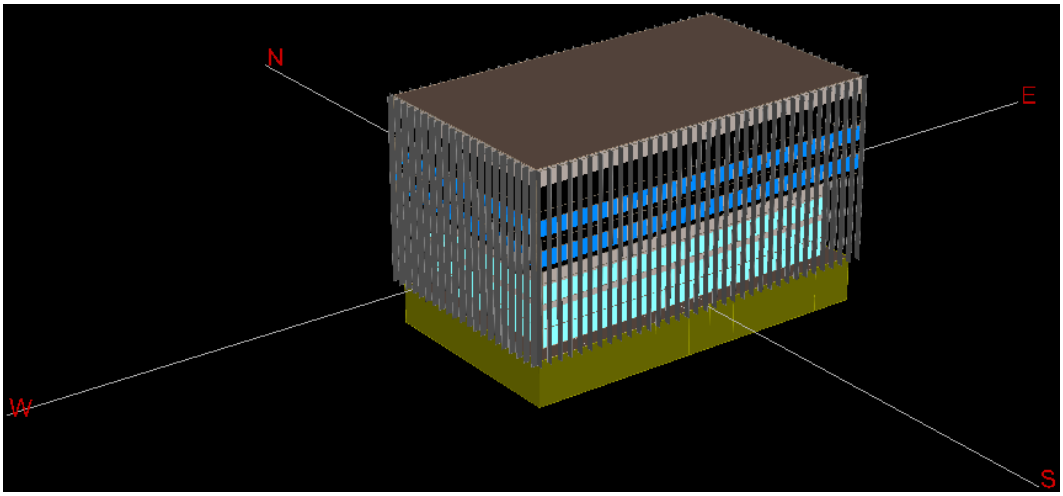
Table 9 Baseline Building Characteristics

Building Characteristic	Assumption
Vintage (Year)	1971
Location	Portland, Oregon
Building Type	Office
Total Floor Area (sq. ft.)	244,866
Number of Floors	16
Heating Type	Electric Boiler
Cooling Type	Electric Chiller
Distribution	Dual Duct with Air Handling Units, Upgraded to Variable Air Volume Operation

Source: IDL's Portland Building Technical Assessment Report and existing building modeling

Figure 3 shows a 3D eQUEST modeling image for the Portland Building.

Figure 3. 3D eQUEST Modeling Image for Portland Building



Navigant used the following process to finalize the baseline model calibration:

- Run baseline building simulation for 2011 through 2014 using actual meteorological year (AMY) weather files for Portland, Oregon
    - Revised the existing building modeling provided by IDL to the baseline modeling

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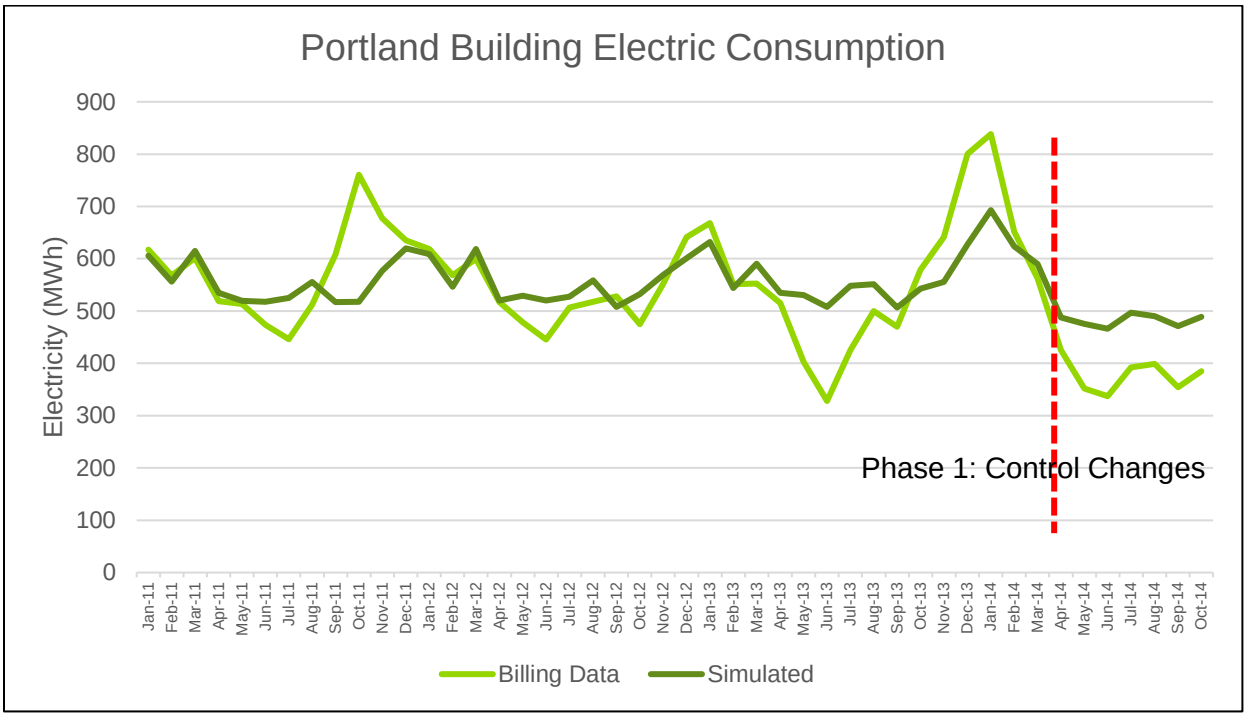
- Compare simulated energy consumption to actual electric readings for the Portland Building from 2011 through 2014

- Calibrate building energy model by refining inputs: calibrate models according to the procedures in ASHRAE Guideline 14:[8]
  - » Compare monthly simulated energy and gas use to actual billing data
  - » Adjust inputs[9] iteratively until the recommended Guideline 14 metrics are satisfied[10], using an appropriate level of effort relative to the magnitude of the savings being evaluated:
    - Coefficient of Variation of the Root Mean Square Error
      - CVRMSE ≤ 15%
    - Normalized Mean Bias Error
      - NMBE ≤ 5%

Navigant applied the procedure outlined above to calibrate the baseline model for the Portland Building. Navigant calibrated the baseline demonstration model to 46 months of monthly electric data from 2011 through 2014. Figure 4 showcases the results of the calibration results for electricity consumption.

Figure 4. Calibration Results – Electric Meter Data Compared to Simulated Data (MWh)



[8] ASHRAE Guideline 14-2002, Section 6.3.2, p. 33.
[9] ASHRAE Guideline 14-2002, Section 6.3.3.3.9, p. 37.
[10] ASHRAE Guideline 14-2002, p. 18.

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The red dashed line in Figure 4 shows the HVAC control changes implemented in Phase 1. The modeling team implemented the HVAC control changes (fan static pressure control and reset temperature control) in April of 2014, however, the "post-retrofit" period for this analysis starts in Phase 2, which includes the gas boiler conversation, other HVAC equipment upgrades, and partial efficient lighting upgrades.

The Guideline 14 CVRMSE and NMBE metrics for electric and gas consumption calibration are shown in Table 10 for the "Baseline" period.

Table 10 Guideline 14 Metrics for Calibrated Model during the "Baseline" period – CVRMSE and NMBE

Calibration Metric	Percentage
Electric CVRMSE	0.33%
Natural Gas CVRMSE	N/A
Electric NMBE	-3.11%
Natural Gas NMBE	N/A

No gas was consumed in the existing building. According to Table 10, Electric consumption metrics are within the Guideline 14 tolerances (CVRMSE ≤ 15% and NMBE ≤ 5%). The baseline model is reasonable for later analysis of efficiency measure savings.

4.1.1.3 Phase 1 and Phase 2 Model Development

This section details Navigant's approach in creating the Phase 1 and Phase 2 versions of the eQUEST models. The Phase 1 model incorporates the fan static pressure control and reset temperature control, which was completed in March, 2014. The Phase 2 model incorporates the new CUP installation. The new CUP was brought online in the end of January, 2015.

Phase 1:

Phase 1 were mainly static pressure control and reset temperature controls, which won't be applicable to Phase 2. Phase 1 modeling was developed but still used to calibrate baseline modeling for the months of April through October in 2014.

- Phase 1 Efficient Case – supply fan static pressure is 0.50 inch WG and return fan static pressure is 0.15 inch WG
    - Phase 1 Baseline Case – supply fan static pressure and return fan static pressure were 4.00 inch WG and 1.33 inch WG, respectively
- Phase 1 Efficient Case – lowered the building hot deck maximum set point to 85 degrees Fahrenheit and minimum to 70 degrees Fahrenheit during summer months, and raised the hot deck maximum set point back up to 110 degrees Fahrenheit and minimum to 90 degrees Fahrenheit during winter months
    - Phase 1 Baseline Case – building hot deck maximum set point and minimum hot deck set point were 90 degrees Fahrenheit and 75 degrees Fahrenheit for SF-1 (VAV) and

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SF-2 (VAV), and 92 degrees Fahrenheit and 75 degrees Fahrenheit respectively for SF-3 (VAV)

Phase 2:

Navigant developed a Phase 2 model to incorporate the efficiency measures implemented at the building in end of January, 2015. The building owners implemented CUP replacement and partially implemented an efficient lighting retrofit. The fully implemented CUP replacement measures include installation of two new open tower cells, two new high efficiency centrifugal chillers, three gas-fired condensing hot water boiler, and corresponding pump and fan controls. For the efficient lighting retrofit measure, the building owners replaced 7,575 ft^2 of two and three lamp lay-in T8 fixtures with 1 38W LED lay-in replacement fixtures. The efficient lighting retrofit measure was partially implemented in the office tower.

Table 11 documents the key input variables the modeling team changed between the baseline and proposed, post-retrofit model.

Table 11 Modeling Variables and Approach for Baseline Model and Proposed Model

Building Input	Baseline Model	Proposed Model
Building HVAC controls: Occupied/ Unoccupied Periods and Ventilation	• No ventilation lock-out during warm-up period • Minimum ventilation rate =1%	• OSA ventilation lock-out through 7AM • Minimum ventilation rate =10%
Building HVAC controls: Discharge air temperature (SF-1 & 2-dual duct VAV systems)	• Maximum cold deck reset temperature =70 degrees • Cooling coil valve type = 3-way	• Maximum cold deck reset temperature =69 degrees • Cooling coil valve type =2-way
Building HVAC controls: Fan speed control (SF-1, 2 &3 -dual duct VAV systems)	• Minimum fan speed =60%	• Minimum fan speed =40%
Building HVAC controls: Discharge Air temperature (SF-3, dual duct VAV system)	• Maximum hot deck reset temperature =92 degrees • Minimum cold deck reset temperature =48 degrees • Cooling coil valve type =3-way	• Maximum hot deck reset temperature =90 degrees • Minimum cold deck reset temperature =50 degrees • Cooling coil valve type =2-way
Chilled Water Pumps	• Two at 100 gpm each	• Two at 720 gpm each
Condenser Water Pumps	Two Condenser Water Pumps • Flow rate =1,050 gpm • Condenser water loop temperature drop =10 degrees	Two Condenser Water Pumps • Flow rate = 600 gpm • Condenser water loop temperature drop =15 degrees

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Chillers	Heat Recovery Chiller • Capacity =350 tons • EIR=0.2796 Original Centrifugal Chiller • Capacity =350 tons • EIR=0.1458	Two centrifugal chillers with VFD capacity controls • Capacity =300 tons each • EIR=0.1021
Heat Rejection	Two open cooling towers • Capacity =default sizing to match peak heat rejection needs • Condenser water set point =80 degrees (fixed)	Two open cooling towers • Capacity =300 tons each • Condenser water set point =reset based on load (80 degrees maximum)
Heating Plant Prime Movers	Electric resistance hot water boiler • Capacity =1000 kW (full season operation) • Capacity =100 kW (shoulder season operation) • EIR=1.0905 Heat Recovery Chiller • Capacity =350 tons • EIR=0.2796	Three gas-fired condensing hot water boilers • Capacity =2,000MBH • Min. output =1% of capacity • Heat Input Ratio = 1.050
Heating water pumps	• Two at 350 gpm each	• Two at 350 gpm each • Three boiler loop pumps at 30 feet of head
Supply Fan Static Pressure Controls (SF-1, 2, &3, dual duct VAV system)	• 4.00 inch WG	• 0.50 inch WG
Return Fan Static Pressure Controls (SF-1, 2, &3, dual duct VAV system)	• 1.33 inch WG	• 0.15 inch WG
Overall Efficiency of Supply Fan	• 0.55 for SF-1 &2 • 0.50 for SF-3	• 0.65
Overall Efficiency of Return Fan	• 0.50	• 0.55 for SF-1&2 • 0.65 for SF-3

4.1.1.4 Calibration of Proposed Modeling

Navigant received 9 months of electric and gas billing data from onsite engineers for the Portland Building during the post-retrofit period (February 2015 through October 2015). Navigant -calibrated the proposed model using the 9 months of electric and gas billing data. Figure 5 and Figure 6 show the calibration results for electric and gas consumption, respectively.

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Figure 5. Calibration Results – Electric Meter Data Compared to Simulated Data (MWh)

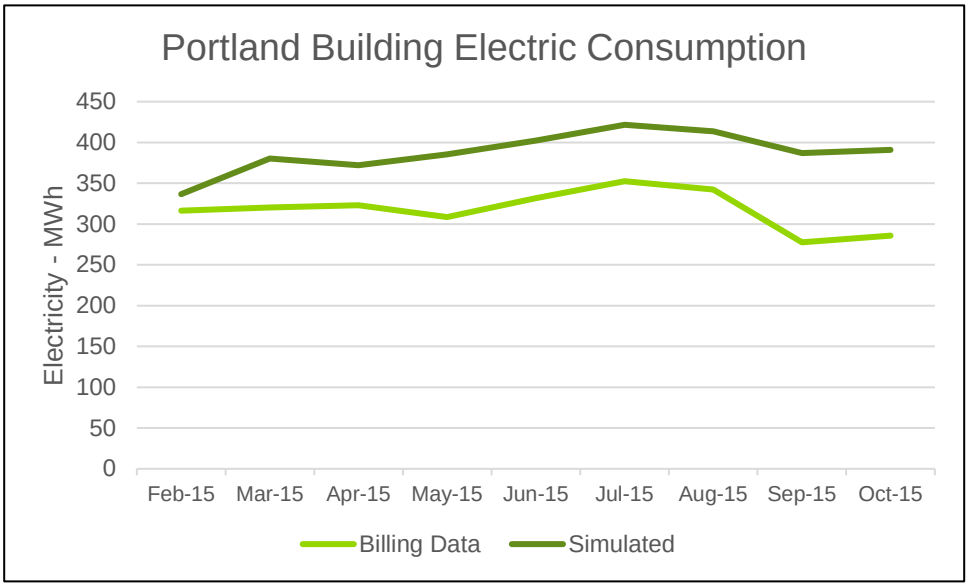
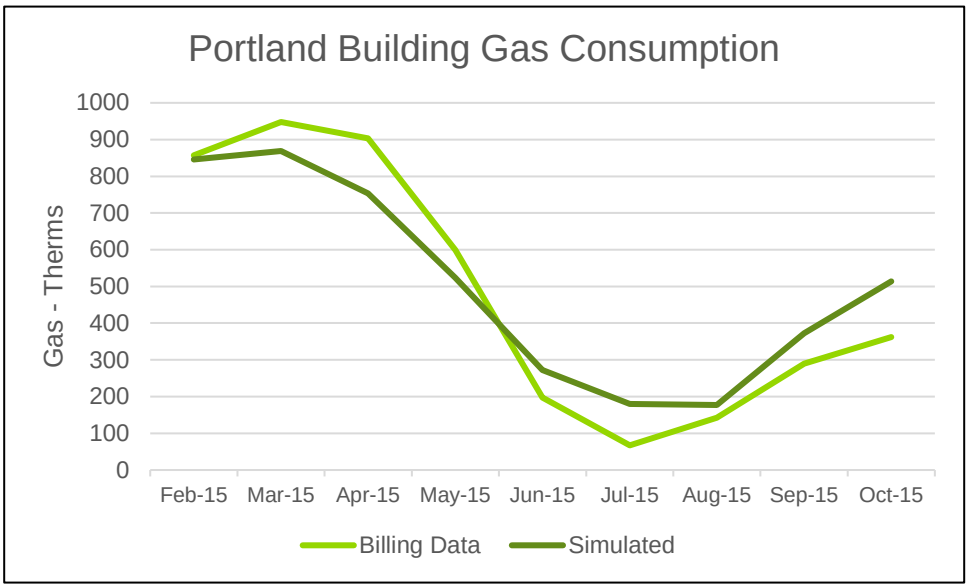


Figure 6. Calibration Results - Gas Meter Data Compared to Simulated Data (MMBtu)



The Guideline 14 CVRMSE and NMBE metrics for electric and gas consumption calibration are shown in Table 12.

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Table 12 Guideline 14 Metrics for Calibrated Model – CVRMSE and NMBE

Calibration Metric	Percentage
Electric CVRMSE	2.25%
Natural Gas CVRMSE	0.83%
Electric NMBE	-24.87%
Natural Gas NMBE	-3.63%

Gas consumption metrics are within the Guideline 14 tolerances (CVRMSE ≤ 15% and NMBE ≤ 5%). However, electric consumption metrics are outside of the required tolerances for NMBE. Navigant could improve the calibrated model through further clarification of HVAC system design and operating parameters for the post-retrofit system, such as actual chiller COPs, fan static pressure setpoints, and changes in DDC control settings. Navigant calibrated the baseline and post-retrofit models with the data sources listed in Section 4.1.1.1, including the Technical Assessment Report and emails with the onsite engineer.

4.1.1.5 Savings Calculations

This section discusses Navigant's annual energy savings approach for Phase 2. In order to calculate annualized energy savings for Phase 2 of the project, Navigant used typical meteorological year 2 (TMY2) weather data for Portland, Oregon[11]. Navigant ran the baseline modeling as the pre-retrofit model and the Phase 2 modeling as the post-retrofit, proposed model. The baseline model reflected the existing building conditions correctly. The Phase 2 model used the baseline model and added the CUP and lighting measures. By taking the difference in annual energy consumption between the Phase 2 model and the baseline model, Navigant was able to isolate the marginal savings attributable to the CUP measures and efficient lighting measures implemented in 2015.

4.2 Results

4.2.1.1 Phase 2 Savings Calculations

This section discusses the annualized electric and gas energy savings for Phase 2 measures, calculated as the difference between the baseline eQUEST model and Phase 2 eQUEST model utilizing TMY2 data for Portland, Oregon.

The total electric savings for Phase 2 of the project relative to baseline of the project was 37.7 percent (2748.4 MWh). There was no gas consumption until the CUP measures were implemented in the end of January 2015. Therefore, the gas intensity is zero in the baseline case while 34.1 kBtu/sqft in the Phase 2 case.

Figure 7 illustrates the savings in the building energy intensity for the baseline and Phase 2 scenarios.

[11] National Renewable Energy Lab (NREL), http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/

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Figure 7. Baseline vs. Phase 2 Building Energy Intensity

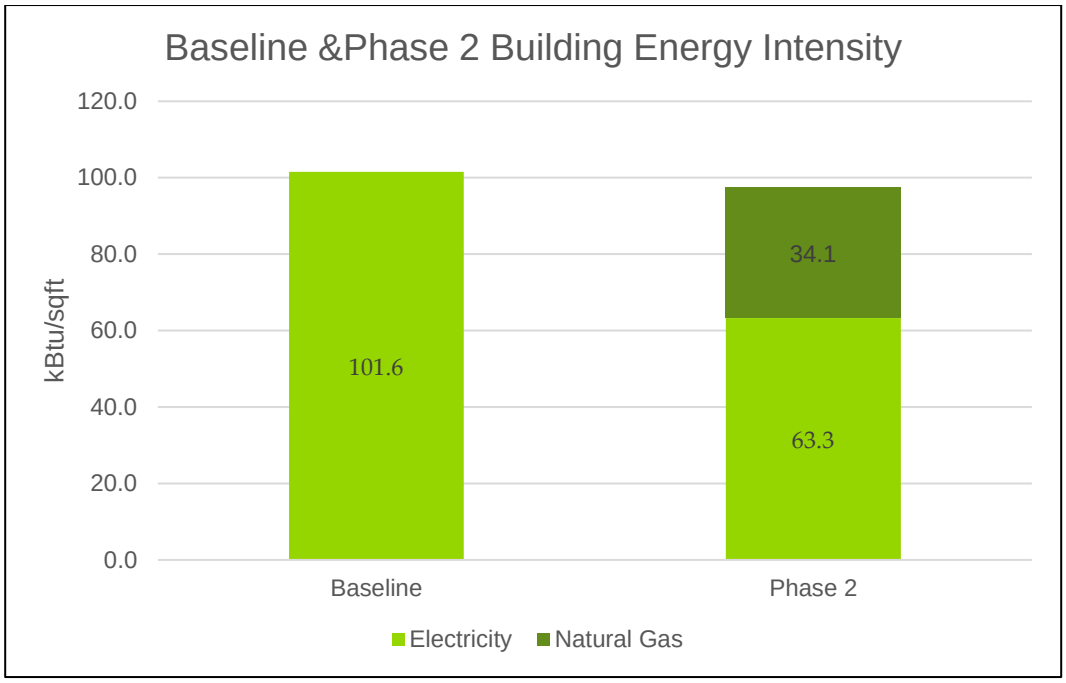

Table 13 presents the Phase 2 electric and gas savings in tabular format.

Table 13 Portland Building Phase 2 Project Savings

Savings Metric	Phase 2 Incremental*
Electric Savings	37.7%
Natural Gas Savings**	N/A
Electric Savings (MWh)	2748.4
Natural Gas Savings (MMBtu)	N/A
Natural Gas Savings (Therms)	N/A
Electric Savings (aMW)	0.3137

Note: Annual Average MW (aMW) = (MWh annual saved) / 8760 hours
**Phase 2 Project Savings represent the savings of Phase 2 relative to baseline modeling.*
*** No gas consumption in the baseline modeling (pre-retrofit)*

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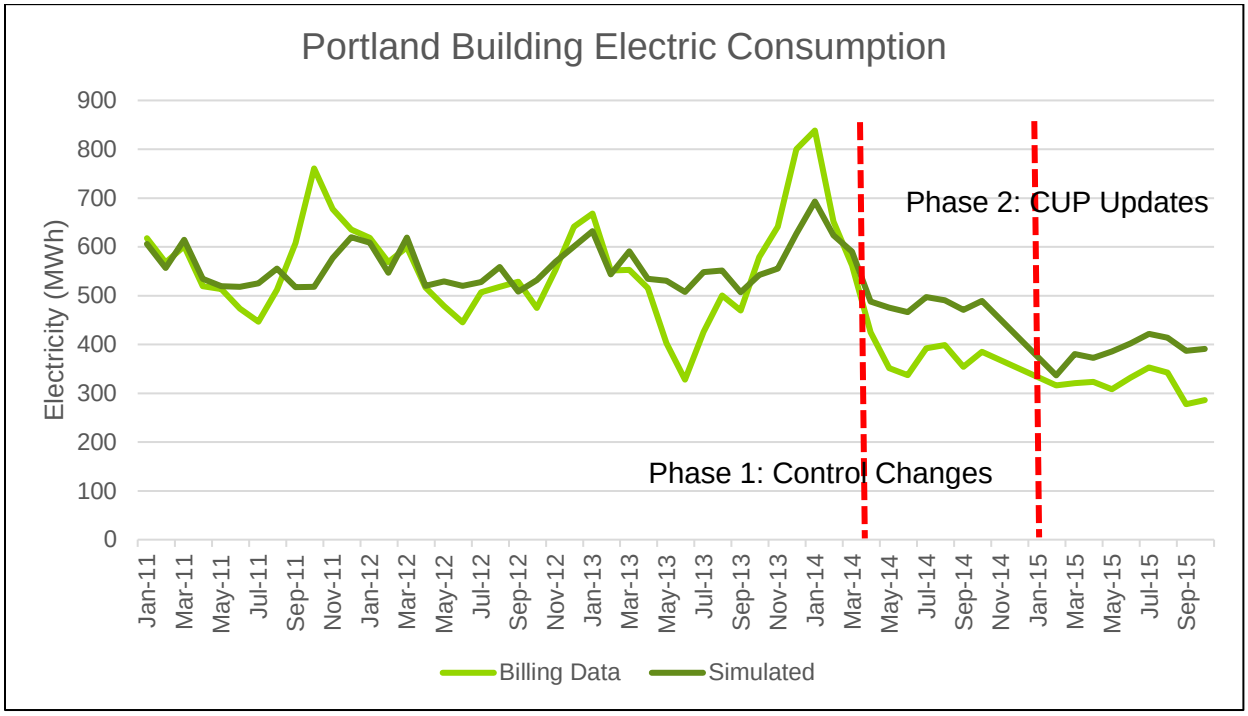
4.2.1.2 Validated Savings

Navigant compared the simulated building energy data to meter energy data to validate savings where possible throughout the course of Phase 1 and Phase 2 of the project. Figure 8 and Figure 9 show the simulated and metered electric and natural gas consumption, respectively. Phase 1 and Phase 2 of building models were created to reflect the energy efficiency measures. This chart indicates that the simulation energy consumption matches the billing data after calibration the two models.

Figure 8. Comparison of Building Electric Consumption (Billing vs. Simulated)



Note: For simulation data, baseline model is used for Jan-11 through Oct-14 (including Phase 1 model Apr-14 through Oct-14), and Phase 2 model is used for Feb-15 through Oct-15.

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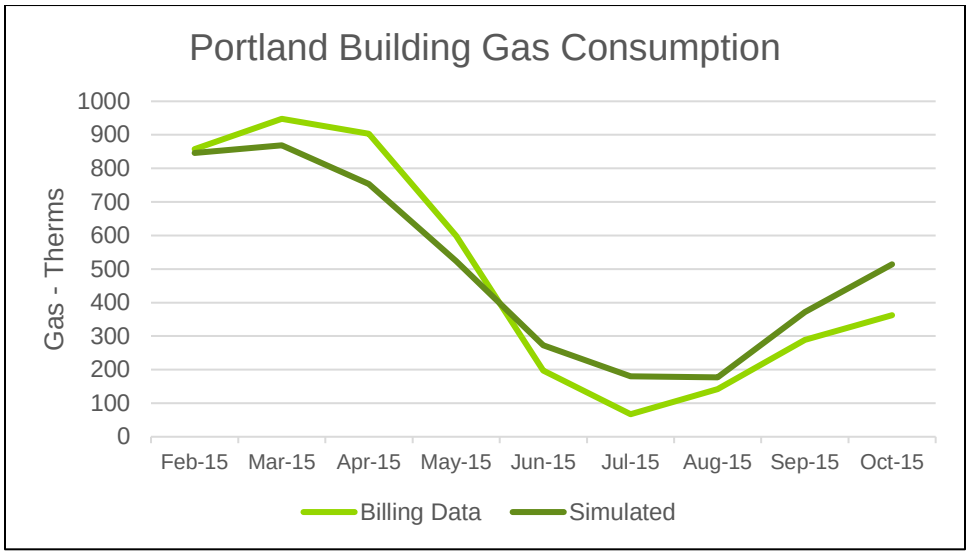
Figure 9. Comparison of Building Natural Gas Consumption (Billing vs. Simulated)



Note: For simulation data, baseline model is used for Jan-11 through Oct-14 (including Phase 1 model Apr-14 through Oct-14), and Phase 2 model is used for Feb-15 through Oct-15. Only has gas consumption after the post-retrofit.

4.3 Recommendations

Navigant recommends that NEEA implement the following steps to assist the evaluation team in calibrating building energy models and calculating verified savings for the program:

- Provide comprehensive implemented measure details
- Provide operation date of implemented measure

Utilize end-use sub-metering of electricity and/or gas usage as applicable for future efficiency measures

4.4 References

ASHRAE Guideline 14-2002. *Measurement of Energy and Demand Savings*, American Society of Heating, Ventilating, and Air Conditioning Engineers, Atlanta, Georgia.

International Performance Measurement and Verification Protocol (IPMVP). *Concepts and Options for Determining Energy and Water Savings*, Volume 1, EVO 1000-1:2012.

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5. EXISTING BUILDING RENEWAL – MISSOULA, MT

5.1 Missoula, MT Building

The specific objective of this evaluation study is to true-up the energy savings estimated as a part of the IMP deployed in 2013 and 2014, and account for any additional savings from the new measures deployed in 2015. This update includes a review of the energy efficiency efforts undertaken at the NEEA EBR participating owner demonstration building in Missoula, Montana during the period of 2013 through 2015 in order to validate savings. The IMP was deployed in phases and this review deals with Phase 2 measures which included:

1. HVAC – Variable Refrigerant Volume HVAC System
2. HVAC – Installing Direct Digital Controls System
3. HVAC - Testing and Balancing
4. HVAC - Recommissioning Flow Rate
5. HVAC - Decommissioning Main Exhaust Fan
6. Lighting - Delamping
7. Lighting - Energy Efficient Lighting
8. Lighting - Occupancy Sensors
9. Lighting - Re-circuiting Lighting
10. Water Heating - 50 gallon Domestic Hot Water Heater

In 2015, the building owner indicated that the building owner had not implemented any new measures, and the occupancy of the building had increased considerably. Navigant adjusted both baseline and post-retrofit models[12] to reflect this change in the occupancy and kept the remaining variables the same. As mentioned in the report from 2014, there was an issue related to submeters connected to the data center load which was fixed during the summer of 2014 by rewiring the submeters, according to the Integrated Design Lab (IDL). For 2015, Navigant received a full year worth of electric meter data from the building owner for post September, 2014, after a lost year in 2014. Navigant attempted to use these new meter data for the post-retrofit case to calibrate the post-retrofit model and provide more robust validated savings values compared to the 2014 report to support NEEA's EBR initiative.

However, after interviews with the building owner and the IDL staff, and a thorough comparison of the meter data to Navigant's post-retrofit building simulation model results before calibration, it became apparent that the variance in the electric meter data of the building load was unexpectedly high. Figure 10 illustrates the variance in the electric meter data for post September, 2014. The building owner calculated the building load by subtracting the two data center loads from the main meter (total) load, which may be the reason for the high variance in the electric meter data. This was particularly important because the data center load accounted for a significantly high proportion of the total load. This means any uncertainty in the submeter data for the data center load could have a major impact on the accuracy of the building load data. Figure 11 shows the two data centers' loads measured by the submeters, the main meter (total) load, and the calculated building load for post September, 2014.

[12] Navigant did not favor either pre- or post-retrofit models based on different occupancy inputs because occupancy is considered as an exogenous variable and not an indigenous variable.

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Figure 10. EBR Montana Monthly Building Meter Data

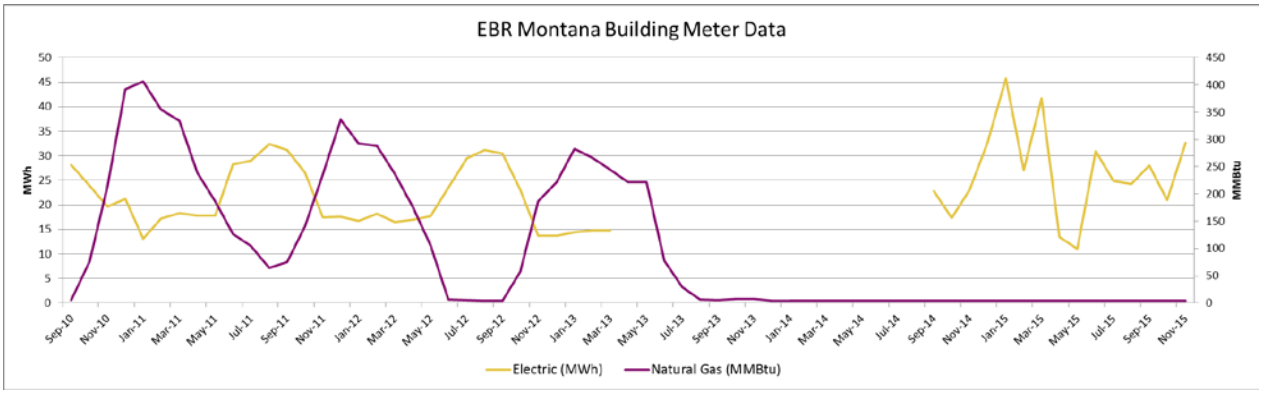
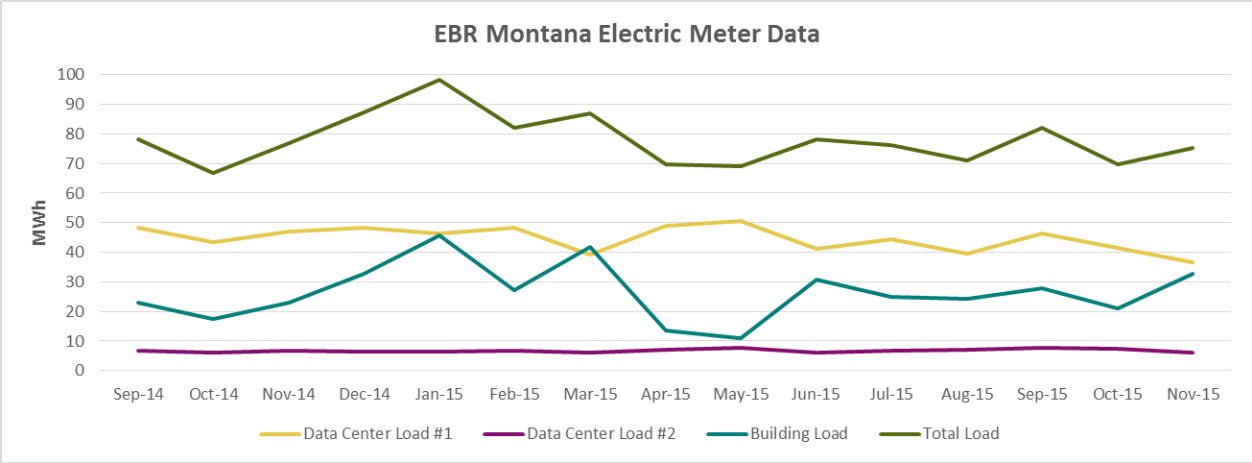


Figure 11. EBR Montana Monthly Main Meter and Submeter Data



As such, Navigant concluded that the electric sub-meter data accuracy did not meet the minimum standards of the IPMVP: Option D metrics for post-retrofit case simulation model calibration. Nevertheless, the sub-meter data were still indicative of the building performance. The data showed the building was operating at a higher level of energy consumption than what Navigant had predicted in the last year's report.

Figure 12 shows the electricity consumptions for the sub-meter data, the baseline modeled energy data, and the post-Phase 2 modeled energy data. This graph demonstrates the variance in the sub-meter data and how it is compared to the simulated energy model electricity consumption data for the post-Phase 2 case. The data consistently showed higher consumption than the simulated data regardless of all the calibration efforts by the engineering team, given the input to the models were kept same or adjusted slightly within the allowable limits of the ASHRAE 14 guideline.

5.2 Results

In 2014 report, Navigant reported that the building had negligible electricity savings due to the change from fuel-based heating to electricity-based heating during Phase 2 and the on-going use of seven electric heaters at a rated total capacity of approximately 10,000 W for heating on the 4th floor. That said, given the

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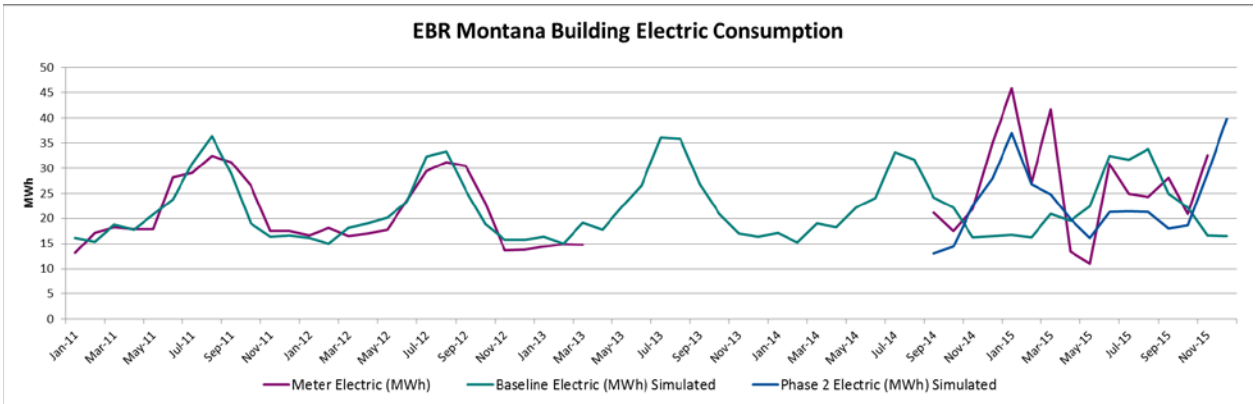
findings from the new meter data analysis and discussions with the building owner and the IDL lab staff, Navigant determined validated electricity savings compared to the baseline to be less than the reported electricity savings in 2014. Therefore, Navigant has concluded that there are still no electric savings realized from Phase 2 measures for this building in 2015.

Figure 12. Building Electric Consumption

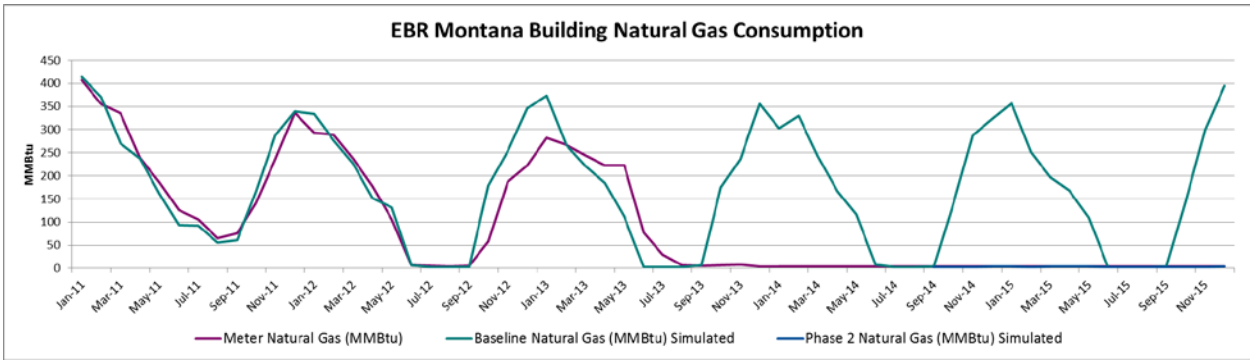


Navigant expects a significant reduction in the electricity usage once the current tenants in the 4th floor move out and it turns into a data center, but it is still unknown when this will happen. To accurately represent the current conditions, Navigant included this extra load in its model analysis, which ended up negatively impacting electricity savings realized from the building. Navigant also expects installing lighting measures to the remaining 1st and 6th floors can provide additional reduction in the electricity usage.

On the natural gas side, the natural gas consumption is almost zero because the boiler, which was the main source of the natural gas consumption of the building, was decommissioned in September 2013. The only natural gas usage remained for the domestic water heating, which was also retrofitted to a smaller size of 50 gallons. Navigant concluded all the savings are realized on the natural gas side and calculated the validated savings to be 98%, which is consistent with the values reported in the report from 2014.

Figure 13 shows the natural gas consumptions for the meter data, the baseline modeled energy data, and the post-Phase 2 modeled energy data.

Figure 13. Building Natural Gas Consumption



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Navigant calculated the annualized electric and gas energy savings for Phase 2 measures for a typical year. To do this, Navigant calculated the difference between the Baseline and Post-Phase 2 annual calibrated eQuest model utilizing typical weather data (TMY3) for Montana. If there were any anomalies with the weather conditions in 2015, this analysis would reveal it and potentially discover some savings that would have existed during a typical year. Navigant calculated the total electric savings still to be negative and the total gas savings to be 98 percent (1977.4 MMBtu) over the baseline energy consumption. The building total savings is equal to 63.7 percent (-46.4 MWh and 1977.4 MMBtu) which translates into 82.9 kBtu/ft^2 reduction in the total building energy intensity for gross building area[13]. Figure 14 illustrates the drop in the building energy intensity due to Phase 2 measures.

Navigant calculated the uncertainty in the gross Phase 2 savings based on the equation expressed in the ASHRAE Guideline 14[14]. The uncertainty in the final Phase 2 savings is approximately 23 percent of the calculated savings at 68 percent confidence, which is significantly better than the maximum allowed uncertainty of 50 percent at 68 percent confidence per ASHRAE Guideline 14.

Navigant also calculated the savings relative to the minimally code compliant design the engineer could legally have designed under the code considering Phase 2 retrofits to be able to truly assess the incremental benefits of the EBR initiative. During Phase 2, the HVAC system was completely redesigned by a professional engineer in Montana. Since it is reasonable to expect that the engineer should follow the state energy code, Navigant modeled an alternative baseline building utilizing minimally code compliant systems that the engineer had the option to use according to Section 6—Heating, Ventilating, and Air Conditioning of ASHRAE 90.1-2007[15]. The ASHRAE 90.1-2007 code requirement for a new Variable Refrigerant Volume (VRV) installation of this type is air cooled 10.4 EER (cooling mode) and 3.2 COP (heating mode) rated electrically operated heat pump units, which suggests a change from fuel-based heating to electric-based heating system compared to the baseline case. Based on the alternative baseline, Navigant estimated savings of 41.1 MWh electric and 15.2 MMBtu for Phase 2 measures, resulting in an alternate total savings of 13.0% over the code baseline and an 8.2 kBtu/ft^2 reduction in the building energy intensity.

[13] Gross building area (conditioned and unconditioned) is 21,952 ft^2. Conditioned space area is 18,816 ft^2.
[14] ASHRAE 14 Guideline, Equation B-13a, p. 107.
[15] Navigant determined that Appendix G of ASHRAE 90.1-2007 is not applicable since the program design does not require the building upgrades to exceed code.

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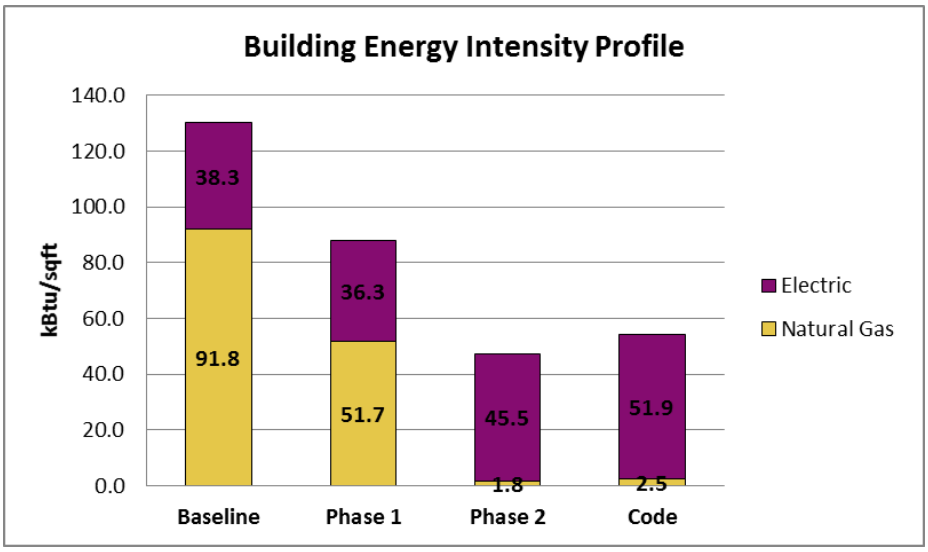
Figure 14. Building Energy Intensity Profile



The change from natural gas based to electric based heating in the alternative baseline case increased the electric energy consumption of the building to a level that is higher than the existing baseline, which made the existing baseline appear to be more efficient than the alternative baseline used for code savings considering only electric savings. However, in reality, the alternative baseline is more efficient because the amount of natural gas heating load offset in the alternative baseline case if converted into electric load is more than the amount of electric heat load introduced in the alternative baseline. In no instances where a building of this age has not gone under any major retrofits should the code make the building less efficient than the existing case. As such, it is important to understand that when a change from fuel-based heating to electric-based heating system is taken into account properly these electricity savings are "paper savings," meaning they do not exist and would not have existed in any scenario when the building is considered as a whole; in fact, Navigant found no electricity savings in 2015 from Phase 2 measures and, therefore, Navigant does not recommend these savings be part of any reported savings.

Table 14 shows the final validated savings from Phase 2 measures and the incremental savings in 2015 compared to savings validated in 2014 for Phase 2 measures.

Table 14. EBR Montana Phase 2 Savings

	Phase 2 Total Savings	Phase 2 Incremental Savings (2015)
Electric Savings	0%	0%
Natural Gas Savings	98%	0%
Electric Savings (MWh)	0	0
Natural Gas Savings (MMBtu)	1,997.9	N/A
Natural Gas Savings (Therms)	19,979.0	N/A
Electric Savings (AMW)	0	0

Source: Navigant Analysis
Note: Annual Average MW (AMW) = (MWh annual saved) / 8760 hours

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5.3 Recommendations

Navigant believes there is no need to do more evaluation on this building unless new measures are installed – the new meter data and one and a half year of customer experience with the new equipment revealed that this building will likely not achieve electricity consumption significantly below baseline due to fuel-switching and operational inefficiencies such as ones described above. On the natural gas side, the savings are already achieved so there is no more room to achieve gas savings in the coming years.

Navigant recommends the items below for future projects, in addition to the recommendations from the previous reports:

- Making sure submeters are installed correctly and readings are accurate.
- Engaging the building owner and manager during retrofits and new measure installations. As found from this evaluation, due to an unknown reason to the owner, the electric contractor and utility company unified these two electric meters into one electric meter resulting in the dramatic change in the usage trend. This not only made this evaluation more difficult, but also affected the building owners' accounting of the tenant electricity bills. The building owner expressed frustration on this issue multiple times. Customer satisfaction will be a key element to achieve increased adoption of deep energy retrofits.
- Treating data centers carefully and isolating them from the rest of the building load as the amount of electricity load for data centers are generally much higher than the rest of the building load.

5.4 References

ASHRAE Guideline 14-2002. *Measurement of Energy and Demand Savings*, American Society of Heating, Ventilating, and Air Conditioning Engineers, Atlanta, Georgia.

International Performance Measurement and Verification Protocol (IPMVP). *Concepts and Options for Determining Energy and Water Savings*, Volume 1, EVO 1000-1:2012.

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APPENDIX A. PORTLAND BUILDING SIMULTAION RESULTS

TMY2 Baseline and Post-Retrofit Phase 2 Results

Electric Consumption (kWh)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Baseline Model	686341	620432	683540	569246	531390	544501	569695	570788	539595	561422	663159	747917	7288024
Phase 2 Model	368070	335335	376713	370478	382147	391547	407656	406637	389417	381378	355527	374730	4539635

Gas Consumption (kBtu)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Baseline Model	0	0	0	0	0	0	0	0	0	0	0	0	0
Phase 2 Model	1130104	936596	958221	788522	567636	425470	303960	242175	353242	660296	844093	1130361	8340675

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APPENDIX I. MEMORANDUM SUMMARIZING THE PRELIMINARY INSIGHTS FROM THE SPARK TOOL PROCESS EVALUATION

During the months of May and June 2016, Navigant conducted a limited process evaluation of NEEA's building renewal utility trade ally pilot, which focused on introduction and use of the BR Spark Tool ("Spark" or "Tool") by a select group of users. Spark is an online assessment tool developed by NEEA to help inform and inspire investigation of building renewal i.e., deep energy retrofits) in leased commercial office buildings. As a part of this evaluation, Navigant conducted interviews with two previous Energy Trust of Oregon-selected users, from Portland, Oregon, who have since reported that they have discontinued or suspended usage of the Tool. The purpose of these interviews was to gather feedback and lessons learned from these user's experience with the Tool.

NEEA Spark Tool Process Evaluation -

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NAVIGANT

Memorandum

To: Rita Siong, Kim Hughes, Sarah Hall, NEEA

From: Jay Luboff, Robert Firme, Navigant

Date: June 30, 2016

Re: Memorandum Summarizing the Preliminary Insights from the Spark Tool Process Evaluation

Executive Summary

Introduction & Purpose

During the months of May and June 2016, Navigant conducted a limited process evaluation of NEEA's Building Renewal utility trade ally pilot, which focused on introduction and use of the Building Renewal Spark Tool ("Spark" or "tool") by a select group of users. Spark is an online assessment tool developed by NEEA to help inform and inspire investigation of building renewal i.e., deep energy retrofits, in leased commercial office buildings. As a part of this evaluation, Navigant conducted interviews with two previous Energy Trust of Oregon selected users, from Portland, Oregon, who have since reported that they have discontinued or suspended usage of the tool. The purpose of these interviews was to gather feedback and lessons learned from these user's experience with the tool. The interview guide used to gather the information presented in this memorandum can be found in Appendix A.

As Table 1 illustrates, below, the key research objectives of this analysis were to: 1) understand the motivation for participation, 2) evaluate the satisfaction of participants using the tool, 3) evaluate the effectiveness, flexibility, and usability of the tool, 4) determine the extent to which the tool can deliver the business-case for building renewal, and 5) identify the barriers and areas for improvement.

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Table 1. Key Research Objectives

Research Objective	Topic Objective
Motivation for Participation	Understand reasons for participation and why trade ally pilot participants decided to exit the pilot and/or discontinue use of the Spark Tool (as applicable)
Satisfaction	Evaluate the satisfaction of pilot participants in using the Spark Tool and in participating in the pilot
Effectiveness, Flexibility, and Usability	Explore the effectiveness of the Spark Tool in terms of enabling executive consideration and decision-making to explore deep energy retrofit further, by review of deep energy and non-energy benefits, financial gains and building improvement summarized in the tool report.
Business-Case Development	Determine the extent to which the Spark tool helps users more effectively and easily understand the business case for building renewal.
Barriers/Areas for Improvement	Understand the barriers inhibiting further participation in the pilot, use of the tool, and understand areas for improvement

This memorandum summarizes the results of the interviews in relation to the key research objectives identified above.

Results

As part of the interviews, respondents were asked to rate their experience using the tool across a variety of areas including: 1) information received prior to participation, 2) satisfaction of the tool itself and the participation process, 3) effectiveness, usability, and flexibility of the tool, and 4) the tool's ability to develop the business-case. Ratings were provided from a scale of 1 – 10, where a value of 10 indicated the highest, positive rating. Figures 1 – 4 below indicate the ratings across these four areas.

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Figure 1: Information Received Prior to Participation

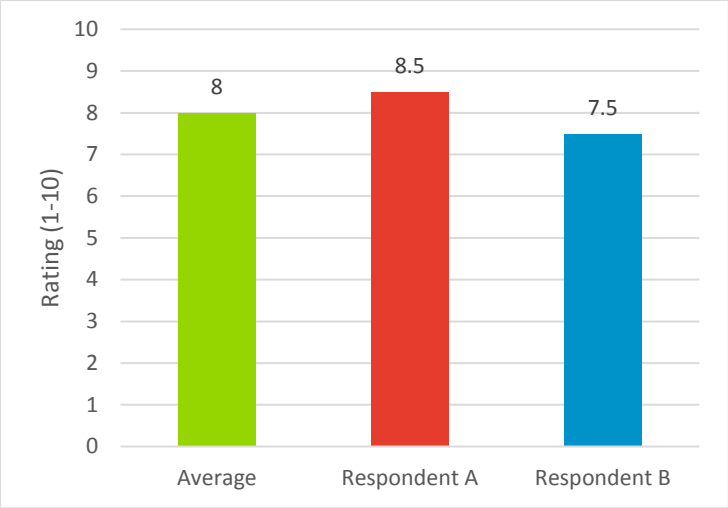
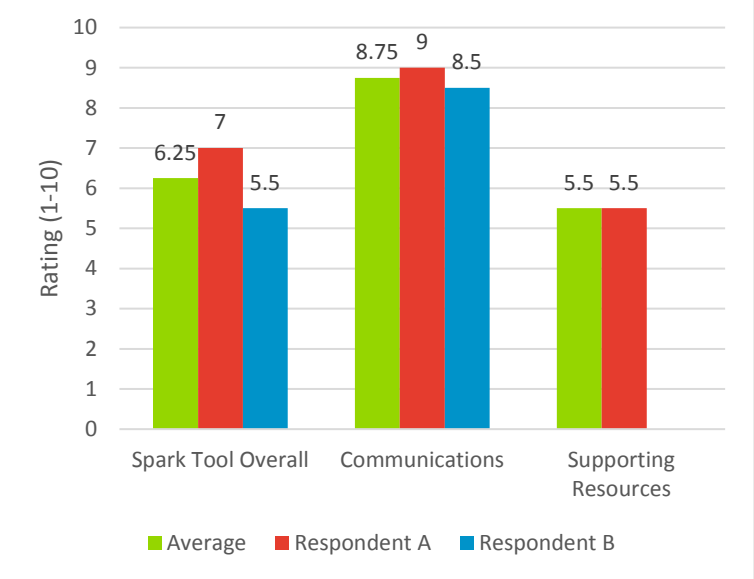


Figure 2: Satisfaction Ratings[1]



[1] Navigant listed the following support resources: training, promotional collateral, orientation documents, workshops, and other physical collateral or support resources. Respondent B did not provide a satisfaction rating for "Supporting Resources" since the respondent recalled interacting only with the online website. As such, the respondent declined to provide a rating in this area, since they felt they were not in a position to provide a valid rating.

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Figure 3: Effectiveness, Usability, and Flexibility

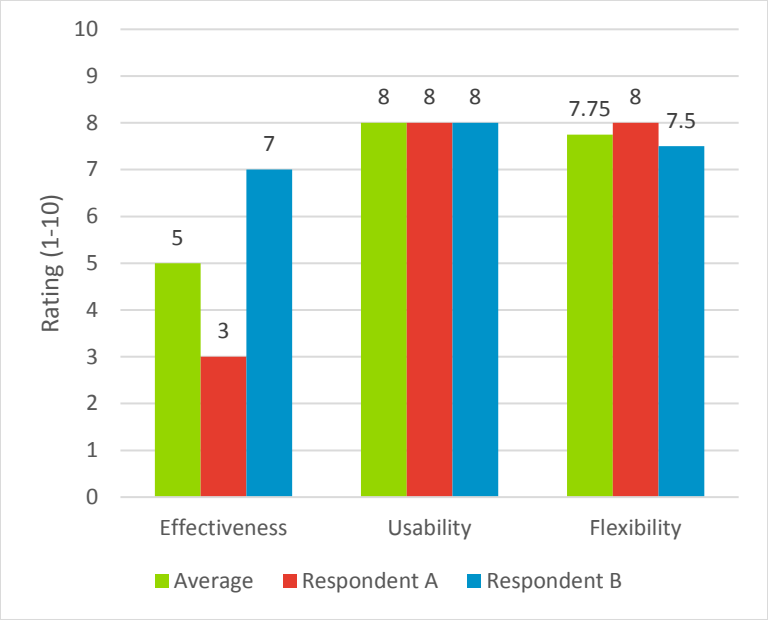
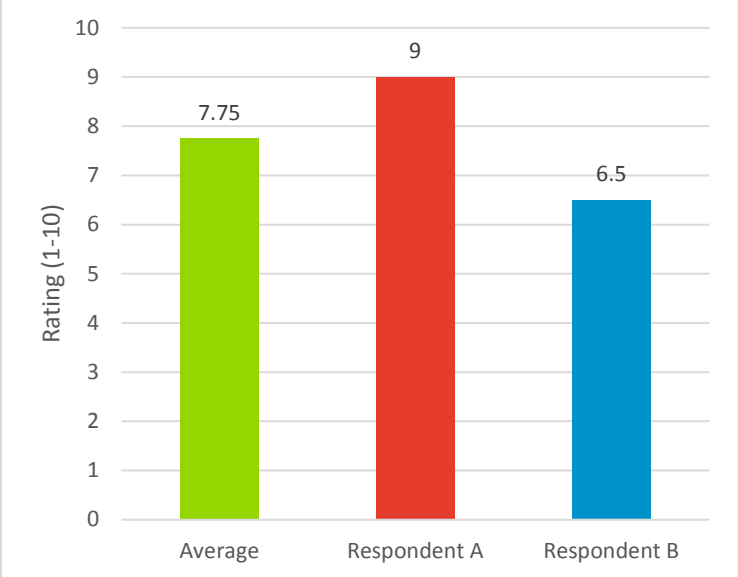


Figure 4: Tool's Ability to Develop the Business-Case for Building Renewal



As Figure 1 indicates, interviewees generally responded positively to the information received prior to participation, mentioning that it was clearly communicated and was sufficient in informing their decision to utilize the tool.

Despite being rated highly on communications (average rating of 8.75), satisfaction with the tool overall was rated relatively low (average rating of 6.25), due to limitations including, the difficulty one user experienced attempting to find and log into the online website, restrictions on users' ability to customize

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the report to remove non-viable recommendations, and restrictions on users' ability to add further detail to their building inputs.

Respondents indicated that the tool was very flexible and very user-friendly, garnering high ratings for both (average ratings of 7.75 and 8, respectively). Despite mentioning that the tool effectively indicated where the potential savings remained, respondents provided a low rating on the tool's overall effectiveness, because they felt that some of the retrofit recommendations (e.g. glass upgrade or window glazing) had too long of a payback period or were too costly to implement with respect to their budget, timelines, and goals.

This latter point largely fed into respondents' ratings of the tool's ability to make what the users believed to be the Spark business-case.[2] Though respondents rated this area with a relatively high average rating of 7.75, one respondent noted that although the business-case was made, it was weak due to the costly nature of some recommendations.

❖ What Worked

- Process:
  - Respondents were satisfied with the communications and correspondences received from NEEA.
  - NEEA staff were very helpful, responsive, and accommodating
  - The presentation, supporting handouts, and other physical collateral resources (as used and reviewed by respondents) were excellent and informative[3]
- Technical:
  - The tool was well rounded, successfully integrating technical engineering analyses into customers' overall business strategy.
  - The tool was user-friendly and comprehensive, probing users with multiple questions to best capture the building's performance and identify where the opportunities lie.

❖ Challenges

- Process:
  - There is a potential perception issue where users may question the validity or reliability of the tool, especially if they are unfamiliar with its technical merits.

[2] Navigant notes that NEEA's description of the Spark building renewal business case is built upon the premise that longer payback measures should be bundled with shorter payback measures into an integrated measure package that will generally need economic support from rent differential. Upon further review, it does not appear that these users continued with Spark exploration long enough to consider the potential for rent differential resulting from repositioning a building as part of their business case response; or were not aware of the need to do so.

[3] Previous comments suggest that one respondent had difficulty accessing the website, but once they received access, they found the content to be very user-friendly, informative, and excellent. They also praised the quality of the presentation, handouts, and other physical collateral. The other respondent only recalled interfacing with the online resource, but was generally pleased with its content.

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- One respondent did not initially understand how the tool would specifically fit into their business model and/or add value to their customers.
- Respondents were not aware of the critical need to incorporate rental differentials into the overall business case analysis.

➢ Technical:

- Estimated savings were sometimes deemed by the user to be too high or unrealistic, and/or costs were seen as excessively prohibitive, which can potentially weaken the business case.[4]
- The tool did not provide project ready recommendations; the analysis required supplementary audits or deeper investigation.[5]
- The tool did not allow users to add greater detail about their building when asked about the building specifications, nor did it allow users to adjust the color scheme of the report.[6]

Cognizant of the successes and challenges mentioned in the interviews, Navigant makes the following recommendations:

❖ Recommendations

➢ Process:

- Provide case-studies online and in any promotional collateral to demonstrate the tool's reliability and effectiveness.
- Communicate to customers how the tool fits specifically into customers' business models, and/or how the tool provides additional value to the customers' service offerings, prior to the initial presentation.
- Strengthen training prior to tool usage. Specifically ensure that knowledge of the tool's function (e.g. "packaging" of measures and the incorporation of rent differential in the overall strategy), flexibility, and customizability be clearly conveyed and understood prior to use.
- Effectively train potential users and ensure sufficient understanding of the key tool parameters or features that can be adjusted and/or customized to align results with user goals. Ensure that customers understand the full functionality of the tool in making the business-case for building renewal.

➢ Technical:

[4] One respondent mentioned savings estimates that exceeded 60%. When Navigant inquired about specific recommendations that yielded these high savings, the respondent provided the following examples: lighting (which the respondent is presently doing), envelope/ceiling retrofits, and installation of efficient windows, plug load management, powerstrip, and new VAV boxes. Navigant notes that the high savings estimate may be due to erroneous user inputs when specifying the baseline.

[5] Navigant explained to one of the interviewees that the tool was designed as a first-cut review of deep energy retrofits that is to be followed by a more formal engineering analysis. The respondent did remember seeing reference to this in the tool literature, but was not focused on this in testing the tool.

[6] One respondent mentioned that they would like the option to add further details about their building when they have ready access to such detailed information.

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- Allow users the ability to provide more detailed information when specifying their building inputs.
- Allow users to specify budgetary constraints to help identify recommendations that are within scope.
- To strengthen the business case, package suggested measures or recommendations into case-scenarios (provide estimated costs/payback information and the time/level-of-effort required for each). As an example, package lower cost, simpler, and shorter term measures into a "low-hanging fruit or simple" scenario, and package more complicated, costly, or longer term projects into another scenario. Doing so will help customers with their goal planning, by helping them to identify which suite of measures can satisfy short-term goals, and which can satisfy long-term goals. Overall, this would provide users a potential phased approach to implementation.[7]

➢ Logistical/Other:

- Ensure that the website and the associated online resources are easy to find
- Allow users the ability to adjust the report's color scheme.

The subsequent sections of this memorandum provide further detail on the insights, challenges, and recommendations gleaned from this evaluation. The following sections disaggregate responses by interviewee, as necessary and where additional value can be merited. It is important to note however, that in order to maintain the anonymity of the interviewees, the two respondents will be distinguished as "Respondent A" and "Respondent B".

Market Entrance and Exit

The two respondents were recruited in the context of a utility-supported trade ally pilot. Respondent A mentioned that repositioning commercial buildings is part of their service offerings, and as such, the tool seemed a natural option that could add value to their conventional audit services. Respondent B was introduced to the Spark Tool by NEEA while working on another engagement, and was interested in exploring solutions that could supplement their evaluation work.

When asked about the events leading up to the official adoption of the tool, both respondents indicated that the information and communication prior to participation was well received, and that they were sufficiently informed about how the tool operates. That being said, however, there were notable areas for improvement. Respondent A, in particular, noted that while they were provided with sufficient information on how to use the tool, after the first meeting with NEEA they were still confused as to how the tool specifically fit into their business model or service offerings. Both respondents also commented that while the questions asked in the questionnaire were comprehensive, and were needed in order to best capture the performance of the building, the process of completing the questionnaire required significant effort and extensive research.

[7] Navigant explained to one of the interviewees that the Spark Tool does not make specific, individual measure recommendations, but rather integrated packages of measures. Respondents agreed, stating that their experience could be improved with a better understanding of their ability to customize the packages to better align with their goals

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Reasons for market exit were varied. Respondent A noted that while they were personally satisfied by the tool, there simply was not enough interest internally, especially among superiors, which would warrant continued usage. This was likely due to other competing projects that were simultaneously occurring. Respondent B notes that while they have not yet officially exited the pilot, usage of the tool has been tentatively suspended until additional information is received.

Satisfaction

Communications

Navigant requested that respondents rate their satisfaction with any and all Spark Tool communications, including (but not limited to), face-to-face meetings, phone conversations, and email/online correspondences. Overall, both respondents were highly satisfied with communications. Both respondents mentioned that NEEA staff were very helpful, accommodating, and responsive. Both respondents also mentioned that the initial presentation was very informative, and provided great detail as to the purpose and functionality of the tool. Respondent A, however, noted that while the presentation informed them about how to functionally use the tool, they were still left confused as to how the tool specifically fit in their business models or added value to their customer-facing service offerings.

Supporting Resources

Navigant requested respondents rate their satisfaction with any and all Spark Tool supporting resources, including (but not limited to), training material, promotional collateral, orientation documents, and workshops. Respondent B declined to provide a rating because their only interaction with supporting collateral resources was with the online website; hence, they felt they were not in a position to provide a fair satisfaction rating. Respondent A, on the other hand provided a relatively low rating (5.5). While they were satisfied with the physical collateral resources, Respondent A felt that the online resources and website were difficult to find. Once the website was found, however, they were generally impressed with the tool's user interface and features.

Overall Tool

After providing individual satisfaction ratings for both tool communications and supporting resources, Navigant requested respondents to rate their satisfaction with the tool overall. On average, satisfaction with the overall tool was somewhat high (7). Respondent A appreciated how the tool successfully integrates and leverages engineering analyses to develop the business-case; they note, however, that some of the tool's recommendations were too costly. Respondent A also mentioned that the report results were difficult to leverage directly since the colors used did not align with normal value perceptions. For example, most people associate positive ratings with the color green, and negative ratings with the color red, yet these (among other similar color-value paradigms) were not consistently utilized. Respondent B also provided positive feedback, noting that the tool indicates at a high-level where the financial and energy savings opportunities lie. However, there were limitations to those results. Specifically,

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Respondent B noted that some of the resulting savings estimates were too high for some end-uses[8]. Respondent B also mentioned that the tool was not a stand-alone solution that could provide project-ready recommendations, as they had initially presumed.

Recommendations

- Allow users to remove recommendations that are too costly or out-of-scope.
- Ensure that reported energy saving estimates are within typical bounds for the group of measures and/or end-uses within the recommended packages. One option is to allow users the ability to enter additional, specific details about their building in the questionnaire to fine-tune results
- Clearly communicate the tool's function and purpose (e.g. what it can and cannot do).
- Allow users to adjust the results' color scheme to adhere to normal color-value paradigms.

Effectiveness, Usability, and Flexibility

Effectiveness

Navigant requested respondents to rate the effectiveness of the Spark Tool and associated resources (e.g. webinars, demos, and online material). While Respondent B provided a relatively high score of 7, Respondent A provided a low rating of 3. Respondent A noted that while the tool was able to effectively show the areas of opportunity and remaining potential, some of the large retrofit recommendations were too costly to actually implement. Their main concern was that, without additional incentives or capital resources, the recommendations as they are represented could weaken the business-case for building renewal when presented to decision makers[9].

Usability

Both respondents provided a high score of 8 when asked to rate the tool's usability. Both respondents were pleased with the tool's user interface, noting that it was very user-friendly, simple, and provided various useful features.

Flexibility

Both respondents were pleased with the tool's flexibility, as illustrated by their high ratings (8 and 7.5 by Respondents A and B, respectively). Respondent A praised the tool's flexibility, mentioning that they

[8] Navigant notes that the "unrealistically high" energy savings mentioned by the respondent may be due to erroneous building inputs specified in the questionnaire. Navigant also notes the fundamental gap in user understanding of the savings i.e., that the savings are with respect to the entire package and not to individual measures or end-uses. See Navigant recommendation on future pre-use training for potential pilot users.

[9] The Spark Tool was designed to make the business-case for building renewal by requiring a rent differential to support capital investments. Navigant notes, however, that the two respondents seemed to be unaware of this. The respondents appear to be under the impression that energy efficiency incentives and savings, alone, would support the building renewal premise.

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experienced significant freedom in their ability to select and modify measures, however, there are limitations with the way recommendations are represented. Respondent A specifically mentions that recommendations are posited using an "everything-in-the-kitchen-sink" approach, instead of being contextualized or framed with respect to user goals. Respondent B appreciates the significant amount of flexibility with the questionnaires. They believe the extensive questions enable the tool to best capture the building performance and provide users the ability to customize the tool.

Recommendations

- Limited customization is already allowed in the Spark Tool, in the manner that users can select certain measures and/or opt of out of others. Because it appears that the tool users were not aware of these features, Navigant recommends that training of the tool's customizability be a required and fundamental condition of use of the tool. On a similar note, an additional recommendation would be to train users to customize recommendations to fit according to their budgetary constraints, timelines, or goals.
- Package project recommendations into scenarios or packages that are differentiated by level-of-effort, cost, and time requirements. An example would be to package shorter-term, simpler, and cheaper measures into a "low-hanging-fruit" package; conversely, longer-term, more capital-intensive projects could be separately packaged. This will increase the tool's flexibility and effectiveness by aligning recommendations with user goals.
- Prior to providing the Spark tool to a prospective user, NEEA should make clear (1) the function of the tool (including its "packaging" of energy efficiency measures); (2) the tool's limitation as a measure-by-measure analysis tool; and (3) the absolute need to incorporate rent differential as part of the strategy, in order to offset capital costs and make a positive business case for building renewal.

Business-Case Development

Overall, both respondents were generally pleased with the tool's ability to deliver the business-case for building renewal. Respondent A indicated that the tool is very user-friendly, permitting even non-engineer personnel the ability to quantitatively identify the savings potential and the overall business-case. Although the business-case was developed, it was sometimes weakened by recommendations that were capital and/or time-intensive, or by savings projections that were not within typical bounds (in the user's assessment) for the group of measures specified by the package. Respondent A also mentioned that while they did not personally experience this, there is a potential perception issue whereby non-technically oriented users may misperceive or question the credibility or reliability of the tool, perceiving it simply as a "black-box" with uncertain methodologies and assumptions.

On the other hand, Respondent B commented that the tool was not as self-standing as they initially presumed it to be; specifically, they envisioned Spark to be a tool that would make project-ready recommendations, but soon realized that the tool simply provided high-level recommendations and had to be used in conjunction with deeper analyses or audits.

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Recommendations

- Strengthen training prior to tool usage. Specifically ensure that knowledge of the tool's function (e.g. "packaging" of measures and the incorporation of rent differential in the overall strategy), flexibility, and customizability be clearly conveyed and understood prior to use. This will allow users to better understand the business-case for the tool and align recommendations with their goals.
- Package project recommendations into scenarios that are differentiated by level-of-effort, cost, and time requirements. This will allow users the ability to phase implementation of the project recommendation, and "sell" the deep energy retrofit one-package at a time.
- Provide case-studies of building owners that used the tool, implemented measures, and achieved results to ensure confidence in the tool.

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Appendix

Appendix A: Interview Guide

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NEEA Spark Tool Pilot Process Evaluation In-Depth Pilot Participant Interview Guide

Table 1. Interviewee Information

Contact Name
Title:
Organization Name:
Contact Phone:
Contact Email
Today's Date & Time:
Other Attendees:
Notes:

Table 2. Key Research Objectives

Research Objective	Topic Objective
Background	Understand interviewee's background and role
Motivation for Participation	Understand reasons for participation and why pilot participants decided to exit the pilot and/or discontinue use of the Spark Tool.
Satisfaction	Evaluate the satisfaction of pilot participants in using the Spark Tool and in participating in the pilot
Effectiveness and Usability	Explore the effectiveness of the Spark Tool in terms of driving deep energy and non-energy benefits, financial gains, and building improvement.
Business-Case Development	Determine the extent to which the Spark tool helps users more effectively and easily understand the business case for building renewal.
Barriers/Areas for Improvement	Understand the barriers inhibiting further participation in the pilot, use of the tool, and understand areas for improvement

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NEEA Spark Pilot Process Evaluation

Pilot Participant Interview Guide

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TABLE 3. QUESTION LIST

Topic Area	Questions
Background	B1
Motivation for Participation	MP1 – MP3
Satisfaction	S1a – S1c
Effectiveness and Usability	EU1 – EU4
Business-Case Development	BCD1 – BCD2
Barriers and Areas for Improvement	BAI1 – BAI2
Closing	CL1 – CL2

Introductory Scripting

Thank you for taking the time to speak with me today! Navigant, on behalf of NEEA is conducting an evaluation of the Spark Building Renewal Tool Pilot, a tool developed by NEEA that helps inform and inspire investigation of building renewal in leased commercial office buildings. As a part of this evaluation, we are conducting interviews to gather feedback on your experiences with the Spark Tool. Your feedback is very important and will help NEEA in improving its Spark Tool.

This interview should take about 30 minutes to complete. All reporting for this evaluation will be done in aggregate and no one interviewed for this study will be identified and quotes presented in the text will not be directly attributed to interviewees. Since I'll be taking notes during this session, just to make sure I don't miss anything, is it okay if I record our interview?

IF YES: Great, thanks! As a note, all interview recordings will be deleted once reporting has been completed.

IF NO: No problem. Let's get started.

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Background

Objective: Understand interviewee's background and role

B1 What was your role and/or the extent of your involvement in the Spark Pilot?

Motivation for Participation

Objective: Understand reasons for participation and why pilot participants decided to exit the pilot and/or discontinue use of the Spark Tool.

MP1. Could you please describe how you initially became involved with the pilot?

MP2. On a scale of 1 – 10, with "10" representing "very sufficient" and "1" representing "very insufficient", please rate whether you and/or other staff received enough information to inform your decision to participate?

MP3. Why did you decide to exit the Spark Tool pilot? *[Probe for budget constraints, technical barriers, interest in other tools – how important were these factors in the decision-making process]*

Satisfaction

Objective: Evaluate the satisfaction of pilot participants in using the Spark Tool and in participating in the pilot

S1. On a scale of 1 – 10, with "10" representing "highly satisfied" and "1" being "highly dissatisfied" please rate your satisfaction on the following areas:

S1a. The Spark Tool Overall.

S1a.i. Please elaborate on the score you provided.

S1b. Communications (including meetings, phone, online, email, etc.).

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S1b.i. Please elaborate on the score you provided. *[Probe for whether communication was effective and cordial]*

S1c. Spark Support (including training, promotional collateral, orientation documents, workshops, and other material).

S1c.i Please elaborate on the score you provided.

Effectiveness and Usability

Objective: Explore the effectiveness of the Spark Tool in terms of driving deep energy and non-energy benefits, financial gains, and building improvement.

EU1. On a scale of 1 – 10, with "10" representing "highly effective", how effective were the Spark tool resources (webinars, resources on the website, Spark demos).

EU2a. Please elaborate on the score you provided

EU2. On a scale of 1 – 10, with "10" representing "highly user-friendly or simple", how easy was it to use the Spark Tool?

EU3a. Please elaborate on the score you provided

EU3. On a scale of 1 – 10, with "10" representing "highly flexible", how much flexibility (e.g. customizability) did the Spark Tool provide?

EU4a. Please elaborate on the score you provided

EU4. Are there any other areas, which haven't already been discussed, that you would like to express satisfaction and/or dissatisfaction?

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Business-Case Development

Objective: Determine the extent to which the Spark tool helps users more effectively and easily understand the business case for building renewal.

BCD1. On a scale of 1 – 10, with "10" representing "highly successful", to what extent do you perceive the Spark Tool as a method to successfully build a business case for "deep energy retrofit" or building renewal?

BCD1a. Please elaborate on the score you provided

BCD2. Do you have any suggestions on how to improve the Spark tool to better deliver the business case for commercial building renewal?

Barriers and Areas for Improvement

Objective: Understand the barriers inhibiting further participation in the pilot, use of the tool, and understand areas for improvement

BAI1. What barriers did you encounter in using the Spark tool? (Probe: Any other barriers?)

BAI2. Are you investing in other building renewal tools or technology?

BAI2a. *(If so)* What was it about these offerings that was more appealing than the Spark Tool? How does the Spark tool compare to these tools?

Closing

CL1. Would you consider using the tool again for another property?

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CL1a. *(If no)* What could persuade you to re-use the Spark Tool and/or re-participate in the Pilot? *[Probe for changes to program design, addition of delivery channels, or anything else]*

CL2. Is there anything I didn't ask about your experience with the Pilot that you would like to share? Is there anything else you'd like to share with NEEA?

Thank you very much for taking the time to talk with me. Your contribution is a very important part of the process. Do you mind if we follow-up with you by phone later, if additional questions arise?

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