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## Building Commissioning — 2019 Long Term Monitoring and Tracking (LTMT) Report

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# Key 2019 Building Commissioning Findings

## Introduction

This Long-Term Monitoring and Tracking (LTMT) report, prepared by The Cadmus Group, presents the 2019 findings for NEEA’s Building Commissioning Initiative which actively intervened to remove market barriers from 1999 to 2004, and entered LTMT in 2005. The 2019 LTMT study had four objectives:

- Update the number of commissioning firms and professionals active in the Northwest<sup>1</sup>
- Estimate the total floor area of commissioned commercial space (square footage) for new and existing building by state and by each of four commissioning types
- Determine the total market size of new and existing commercial buildings
- Calculate the market penetration of commissioning and track changes in penetration over time

This 2019 study, conducted by Cadmus, meets these objectives and also provides findings on the types of buildings and systems being commissioned along with project costs, barriers to existing building commissioning, drivers of varying effects of new building codes, and areas of opportunity in the Northwest commissioning market. This report contains key findings and recommendations, followed by five appendices with further detail on the research methodology, references, historical data, survey recruitment, and the survey instrument.

## Summary of Research Approach

Based on internet research, Cadmus updated the population to 97 active commissioning firms in the Northwest in 2019. Cadmus emailed an online survey to the full population and received data from 37 individual commissioning professionals representing 35 firms that were active in the Northwest in 2019. Following the redesign of the participant incentive structure in 2018,<sup>2</sup> the number of participating firms in 2019 met the study target. Cadmus also analyzed data from Dodge Data and Analytics (Dodge) and from NEEA’s 2014 *Commercial Building Stock Assessment (CBSA)* to estimate market size. Appendix A provides a detailed description of the research methodology.

Cadmus received survey data on four types of commissioning activity:

- Commissioning (Cx)—Commissioning of new buildings during the construction phase
- Retro-commissioning (RCx)—Commissioning of existing buildings that have never been commissioned

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<sup>1</sup> The Northwest is considered the states of Oregon, Washington, Idaho, and Montana.

<sup>2</sup> In 2018, Cadmus worked with NEEA to design a three-year “Incentive Agreement,” under which firms receive an escalating incentive for completing the survey each year in 2018, 2019, and 2020.

- Recommissioning (ReCx)—Commissioning of existing buildings that were commissioned during the construction phase
- Ongoing/continuous commissioning (OCx)—Fine-tuning commissioned buildings repeatedly over time

## Key Takeaways

- 97 commissioning firms were active in the Northwest in 2019,<sup>3</sup> which is 12 more firms than the population in 2018. An estimated 165 certified commissioning professionals represent these firms (a small increase from 163 in 2018), plus 106 uncertified professionals.
- For the Northwest as a whole, market penetration of new building commissioning (Cx) decreased from 75% in 2018 to 64% in 2019. Cx market penetration decreased in Washington, Oregon, and Idaho, while Montana’s Cx market penetration increased from 33% in 2018 to 93% in 2019.
- Market penetration rates for existing building commissioning (RCx, ReCx, and OCx) increased from 0.70% in 2018 to 1.21% in 2019. There were increases in all three types of existing building commissioning.

## Results for New Building Commissioning (Cx)

For the Northwest as a whole, Cx market penetration rates decreased from 75% in 2018 to 64% in 2019, though some individual Northwest states experienced more substantial year-over-year changes. Table 1 summarizes the 2019 findings for Cx as compared to the 2018 findings.

Cx market penetration decreased slightly in Oregon and Washington but decreased sharply in Idaho, from 19% in 2018 to 5% in 2019. Mathematically, this decrease was driven by a 40% increase in Idaho’s new construction floor area, combined with commissioning firms reporting only one-third of the Cx activity as reported in 2018. The data indicate that the Idaho building codes may not be a driving force for Cx, despite Cx being included in the energy code.<sup>4</sup> This is explored further in the Market Insights section.

By contrast, Montana’s Cx market penetration increased significantly from 33% in 2018 to 93% in 2019, as several commissioning firms reported a significant increase in Cx activity. (Montana’s 2019 Cx activity as reported in the survey data actually resulted in a calculated market penetration rate that exceeded 100%. For that reason, Cadmus used the 2017 market penetration rate of 93% and calculated square footage accordingly). This result echoes the large variability in Montana’s Cx market penetration, from 35% in 2016 to 93% in 2017, back to 33% in 2018, then 93% in 2019.

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<sup>3</sup> Of these firms, three are based in California but conduct commissioning projects in the Northwest.

<sup>4</sup> Washington and Idaho adopted the 2015 International Energy Conservation Code, and Montana adopted the 2012 International Energy Conservation Code, requiring mandatory commissioning of mechanical services for newly constructed buildings.

**Table 1. 2019 Estimates for New Building Commissioning**

State	New Construction Floor Area (sq. ft.)	Commissioned Space (sq. ft)	Market Penetration (2019)	Market Penetration (2018)
Idaho	9,969,082	457,357	5%	19%
Montana	3,032,119	2,829,509*	93%*	33%
Oregon	19,841,759	9,861,966	50%	53%
Washington	44,410,612	36,330,884	82%	96%
<b>Total</b>	<b>77,253,572</b>	<b>49,479,716</b>	<b>64%</b>	<b>75%</b>

\*Montana’s 2019 Cx activity reported in the survey data resulted in a calculated market penetration rate that exceeded 100%. For that reason, Cadmus used the 2017 market penetration rate of 93% and calculated square footage accordingly.

Sources: Dodge 2019 and 2020; Cadmus analysis of 2018 and 2019 survey data.

### Results for Existing Building Commissioning (RCx, ReCx, OCx)

For the Northwest as a whole, the combined floor area reported for all types of existing building commissioning activity increased after a four-year trend of decreasing activity. This increase was driven primarily by a 2019 increase in OCx activity in the region. Cadmus reviewed changes reported by specific commissioning service providers in the 2018 study compared to the 2019 study to characterize this growth. Several firms had reported low or no OCx projects in 2018 but reported projects in 2019 in both Washington and Montana. Similarly, there was a relatively large increase in ReCx activity in both Washington and Montana. RCx market penetration also increased in Oregon, Idaho and Montana, with an almost fourfold increase in Montana.

Table 2 summarizes 2019 findings for existing building commissioning activities.

**Table 2. 2019 Estimates for Existing Building Commissioning**

Type	State	Existing Floor Area (sq. ft.)	Commissioned Space (sq. ft)	Market Penetration (2019)	Market Penetration (2018)
RCx	Idaho	309,313,486	1,425,346	0.46%	0.20%
	Montana	253,466,056	2,743,714	1.08%	0.28%
	Oregon	972,126,746	3,687,386	0.38%	0.23%
	Washington	1,723,026,775	10,230,729	0.59%	0.60%
	<b>Total*</b>	<b>3,257,933,063</b>	<b>18,087,174</b>	<b>0.56%</b>	<b>0.42%</b>
ReCx	Idaho	309,313,486	27,714	0.01%	0.02%
	Montana	253,466,056	554,286	0.22%	0.00%
	Oregon	972,126,746	69,286	0.01%	0.08%
	Washington	1,723,026,775	5,565,882	0.32%	0.12%
	<b>Total</b>	<b>3,257,933,063</b>	<b>6,217,168</b>	<b>0.19%</b>	<b>0.09%</b>
OCx	Idaho	309,313,486	185,686	0.06%	0.07%
	Montana	253,466,056	415,714	0.16%	0.09%
	Oregon	972,126,746	2,405,600	0.25%	0.25%
	Washington	1,723,026,775	12,235,857	0.71%	0.18%
	<b>Total</b>	<b>3,257,933,063</b>	<b>15,242,857</b>	<b>0.47%</b>	<b>0.18%</b>
<b>Total (All)*</b>		<b>3,257,933,063</b>	<b>39,547,199</b>	<b>1.21%</b>	<b>0.70%</b>

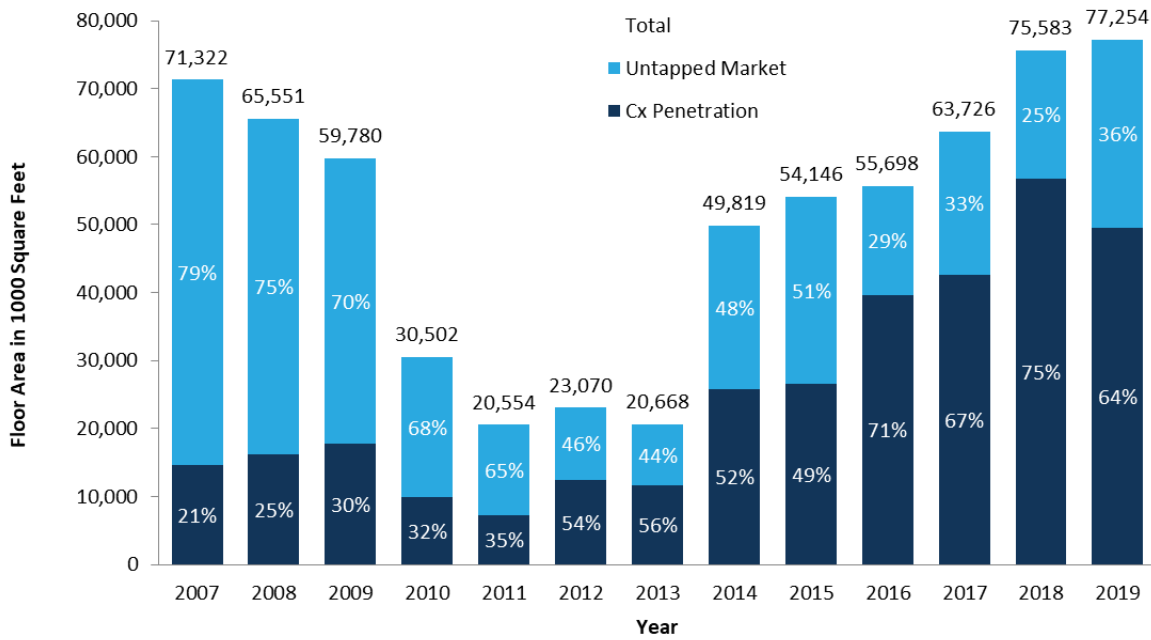
\*Totals may not equal the sum of column due to rounding.

Sources: NEEA 2014 (CBSA); Cadmus analysis of 2018 and 2019 survey data.

## Historical Data and Trends

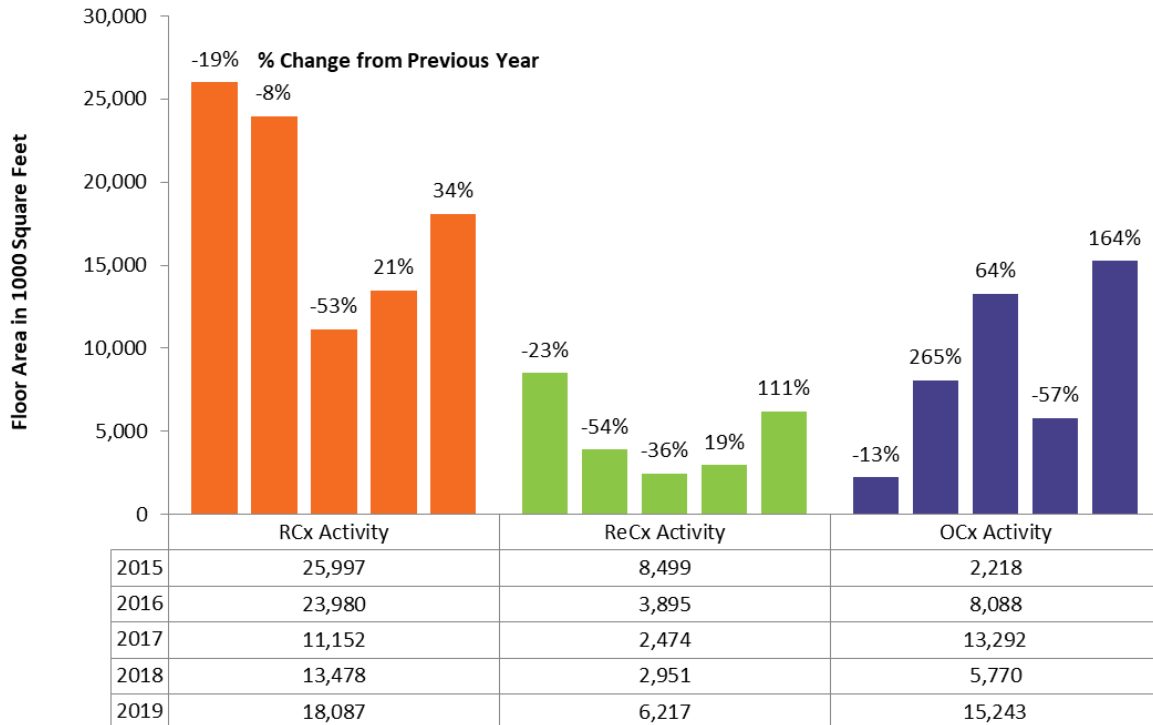
Figure 1. and Figure 2. illustrate historical, region-wide commissioning activity and market penetration for Cx (Figure 1.) and for RCx, ReCx, and OCx (Figure 2.). Appendix C provides historical data on a state-by-state basis.

**Figure 1. Historical Estimates for New Building Commissioning Market Penetration**



Sources: Summit Blue Consulting 2006-2008; Navigant 2010-2012; Cadmus 2014-2019; Cadmus analysis of 2019 survey data.

**Figure 2. Historical Estimates for Existing Building Commissioning Activity**



Sources: Cadmus 2014-2019; Cadmus analysis of 2019 survey data.

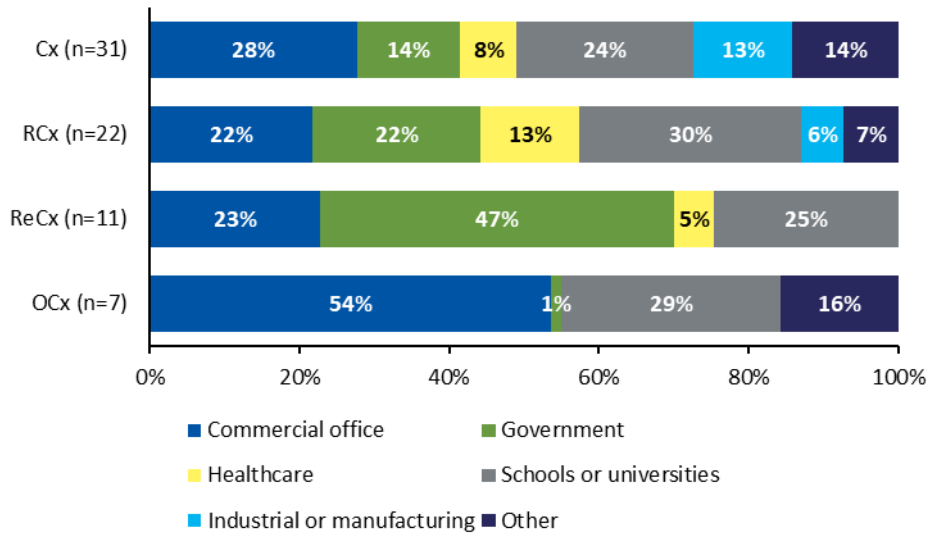


# Market Insights

## Commissioned Building Types

Cadmus asked commissioning firms about the share of commissioned floor area by building type; Figure 3 displays this data for each commissioning type. Two noteworthy findings are that ReCx most commonly occurred in government buildings and OCx most commonly occurred in commercial offices.

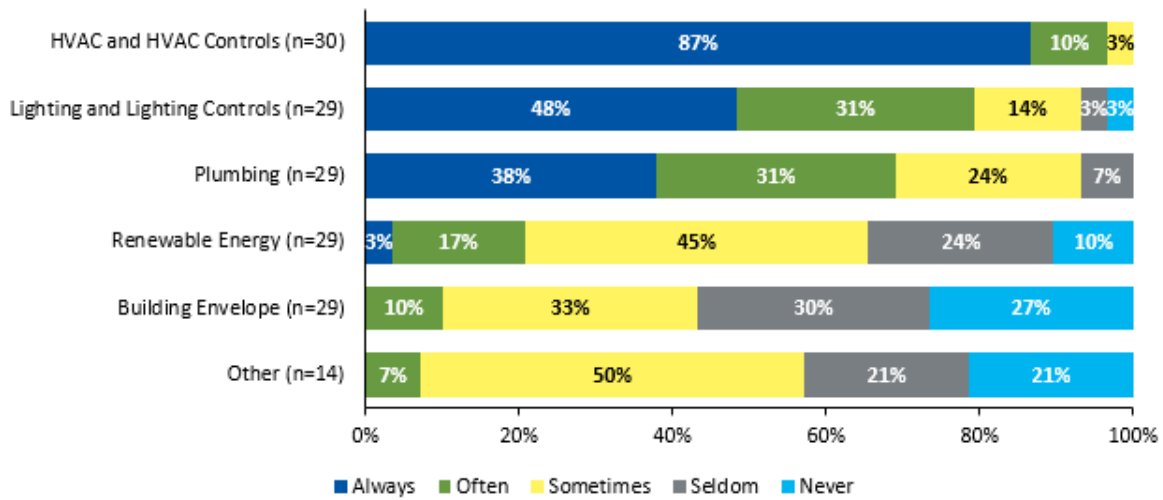
**Figure 3. Distribution of New and Existing Building Commissioning by Building Type**



Source: Cadmus survey questions D4, D9, D12, and D15. “For the new/existing space your firm commissioned in 2019, what was the approximate percentage breakdown of square footage by the building types below?” Percentages may not total to 100% due to rounding. n = the number of firms who do that type of commissioning and therefore responded to the question

Cadmus asked how frequently providers commission certain pieces of equipment and systems during new and existing building commissioning projects. As shown in Figure 4, most firms said that during Cx projects they *always* commission HVAC and HVAC controls (87%; n=30) and almost half said they *always* commission lighting and lighting controls (48%; n=29).

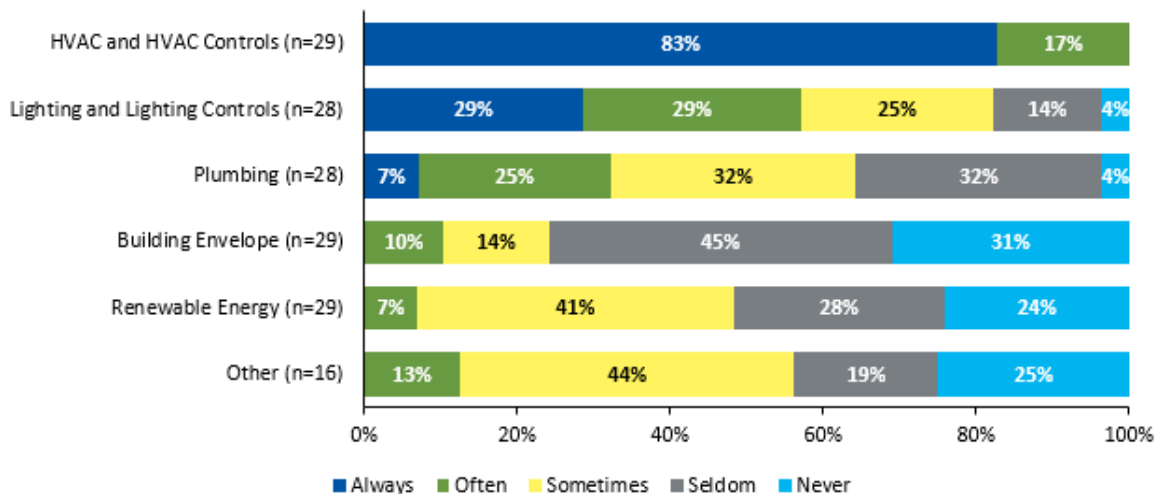
**Figure 4. Frequency of Commissioning by Equipment/System Type During New Building Commissioning (Cx)**



Source: Cadmus survey question D5. “How frequently does your firm commission the following systems in new building commissioning projects?” Percentages may not total to 100% due to rounding.

Compared to Cx projects, slightly fewer firms (though still a majority) said they *always* commission HVAC and HVAC controls during existing building commissioning (RCx, ReCx, and OCx) projects (83%; n=29), and fewer reported that they *always* commission lighting and lighting controls during existing building commissioning projects (29%; n=28). This is consistent with findings from 2018. It was also notable that in both new and existing building commissioning, building envelope was the system least frequently commissioned. For Cx projects, 27% of firms said they *never* commission the building envelope (n=29), and for existing building commissioning projects, 31% reported the same (n=29).

**Figure 5. Frequency of Commissioning by Equipment/System Type in Existing Building Commissioning**



Source: Cadmus survey question D16. “How frequently does your firm commission the following systems in existing building commissioning projects? These projects could include retro-commissioning, recommissioning, or ongoing/continuous commissioning.” Percentages may not total to 100% due to rounding.

## Project Costs

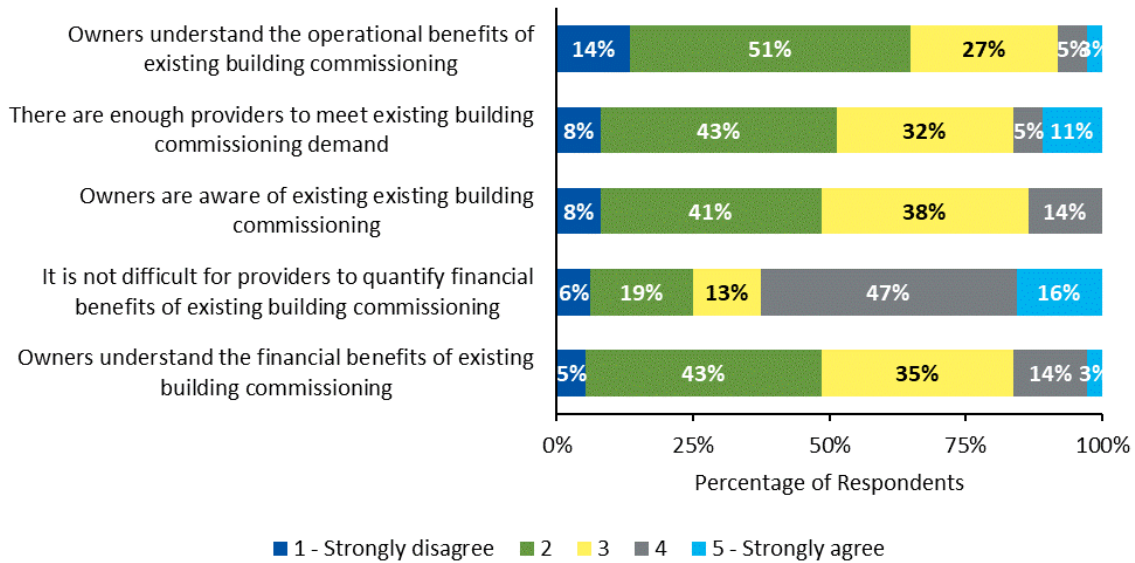
Cadmus asked firms that commission new and existing buildings about their “typical” project cost range. Each respondent supplied a lower-bound and upper-bound cost for typical projects. The average cost per square foot for new buildings was \$1.16 (average lower bound of \$0.55 and average upper bound of \$1.76, n=18). The average cost per square foot for existing buildings was \$0.73 (average lower bound of \$0.36 and average upper bound of \$1.10, n=15). These findings were mostly consistent with findings in 2018, though presented a slight decrease in cost for existing buildings.

## Barriers to Existing Building Commissioning

Cadmus asked respondents several questions to understand what commissioning agents believe the barriers are to commissioning in the Northwest from their perspective. In an open-ended question, we asked respondents to imagine they were the owner of an existing building and from that perspective, to share the main reasons they would not commission their building. The majority of respondents indicated cost (84%, n=32) as the main barrier. Additionally, almost half said lack of knowledge about the benefits of existing building commissioning was a barrier. Other less commonly mentioned barriers included the fact that equipment may still be functioning (13%), lack of time (6%), lack of qualified providers (6%), lack of code requirements for existing building commissioning (6%), and lack of monetary incentives for owners to conduct existing building commissioning (from entities such as utilities) (3%).

Additionally, Cadmus asked respondents to rate their level of agreement with several statements about existing building commissioning. As shown in Figure 6, most respondents did not agree that *building owners understand the operational benefits of existing building commissioning* (65%, n=37), nor with the statement that *there are enough providers to meet existing building commissioning demand* (51%). Conversely, most respondents agreed that *it is not difficult for providers to quantify financial benefits of existing building commissioning* (63%); however, respondents still perceived that building owners have trouble understanding financial benefits.

**Figure 6. Responding Commissioning Agents' Agreement with Statements about Existing Building Commissioning**



Source: Cadmus survey question E4. “Using a scale from 1 to 5 where 1 means *strongly disagree* and 5 means *strongly agree*, please rate whether you agree with the following statements about existing building commissioning.” Percentages may not total to 100% due to rounding.

In an open-ended question, Cadmus then asked respondents to describe what they thought would help the most to increase customer adoption of existing building commissioning in the Northwest. Forty-two percent (n=36) said utility or government-based customer incentives, 33% mentioned the need for customer education about the benefits of existing building commissioning, 28% mentioned requiring existing building commissioning in codes, and 25% said for providers to be better able to quantify the short-term and long-term benefits of existing building commissioning. Two respondents said customer education about the benefits by a third-party, such as NEEA or the Lawrence Berkeley National Laboratory, would be particularly effective.

### Drivers of Varying Effects of New Building Codes

Although Washington, Idaho, and Montana codes all require Cx, Cx market penetration varied substantially across states in both 2018 and 2019. In Washington, Cx market penetration was very high both years. In Idaho, only 5% of new construction was commissioned in 2019 and for the three prior years the rate did not rise above 20%. In Montana, although the Cx market penetration rate was 93% in 2019, the rate has been highly variable; it was 33% in 2018, 93% in 2017, and 35% in 2016. Cadmus asked respondents two questions to gain a better understanding of this variability.

First, to gauge whether firms think that the Cx market in Washington was close to full penetration in 2019, Cadmus asked respondents what percentage of new building floor area they believed was commissioned in Washington in 2019. This was a closed-ended question with four choices: “more than 95%,” “more than 90%,” “more than 85%,” and “85% or less.” Over half the respondents (59%, n=22) said they believed that “more than 85%” of the new building floor area was commissioned. On average, respondents said they believed that about 91% of new building space had been commissioned in 2019,

which aligns with the market penetration rate estimated based on the respondents' reported Cx floor area.

In an open-ended question, Cadmus asked respondents to provide further insight for the difference in Cx in Washington versus Montana or Idaho. Most commonly, respondents attributed the lower and variable Cx market penetrations in Idaho and Montana to lack of code enforcement (44%, n=25) and a lack of code familiarity among owners and architects (40%), as well as a lack of code familiarity among the jurisdictions with authority to enforce the codes (28%). Several firms specifically said that code officials within Montana and Idaho and in eastern Washington may not be familiar enough with the codes to enforce them properly:

"I don't think code officials, owners, or architects know it is required."

"[There is a] lack of understanding by code officials, [and there is] poor application and understanding by designers."

"[Authority Having Jurisdictions<sup>5</sup> are] unfamiliar with the code and don't enforce commissioning."

One firm detailed the differences between having code requirements in place and having the systems and procedures in place to ensure that code is enforced:

"To us, this seems like a simple issue of enforcement. Putting something into code and enforcing it are two hugely different matters; especially when it comes to an esoteric, highly technical QA/QC process like commissioning, which isn't really understood at its most fundamental level by most owners, architects, and code enforcement officials. [...] We also tried to obtain [Washington State Energy Code]-required commissioning checklists for recently completed buildings in Seattle, but nobody we talked to at the building department even knew what they were. Based on this and other more anecdotal evidence, we suspect this kind of thing is common, even in western Washington where there is a cultural commitment to building efficiency. That commitment appears to us to wane as you move east into eastern Washington, Idaho, and Montana. So we're not at all surprised by [this study's] statistic."

## Areas of Opportunity

Cadmus asked respondents to identify areas of opportunities for existing building commissioning across the Northwest. The most commonly identified market segments that potentially hold opportunities for existing building commissioning were within health care (cited by 24% of respondents, n=33), government (24%), education (24%), and commercial buildings (18%).

In addition to identifying market segments, respondents said older buildings (9%) and buildings with a building automation system or capacity for such a system (6%) are also areas of opportunity:

"Older buildings that have never been commissioned where the [operations and maintenance] staff are focusing on putting out fires rather than focusing on energy or life-cycle costs."

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<sup>5</sup> "Authority Having Jurisdiction" means the organization, office or individual responsible for enforcing the requirements of a code or standard.

“It would be beneficial to engage control system contractors to find candidate projects based on age of systems and BAS [building automation system] capabilities. If the contractors have a financial stake in identifying projects that are not new but have a capable BAS, then this will generate opportunities.”

Other responses included the following:

“Forget [Leadership in Energy and Environmental Design– Existing Building [LEED-EB]. [...] Owners, for the most part, don’t understand energy models and M&V because there was too much emphasis on just getting LEED certified...”

“We currently seem to be in a strong new construction cycle: people want to spend capital on new buildings/renovations, [but] when this drops, we will have more of an opportunity to convince people to evaluate current building performance.”

## Discussion and Recommendations

**Large increases in the volume of existing building commissioning in the region was a new and positive trend in 2019, which will hopefully recur in 2020 and beyond.**

The floor area reported for all types of existing building commissioning (RCx, ReCx, and OCx) increased in 2019 compared to 2018. The 2019 data showed a particularly strong uptick in ongoing/continuous commissioning (OCx). Last year, Cadmus received feedback from at least one commissioning provider who was considering ways to lay the groundwork for OCx with new construction clients at the time of new building completion. Retro-commissioning (RCx) market penetration increased in Oregon, Idaho and Montana, with an almost fourfold increase in Montana. In prior years, Cadmus has observed that RCx activity is often inversely related to new building commissioning (Cx). This trend continued in 2019 particularly for Oregon, which saw a growth in the square footage of RCx compared to 2018 while the amount of Cx decreased slightly.

### ***Recommendation:***

- Though the 2019 study did not explore respondents’ strategic areas of focus or how they marketed their services, this may be an interesting objective for the 2020 survey to provide more insight into a growing OCx practice (if the trend remains).

**Variable code enforcement and awareness/knowledge barriers are the likely culprits for variable rates of Cx in eastern regions.**

While Idaho code requires Cx, only 5% of new construction was commissioned in 2019 and for the three years prior, the rate did not rise above 20%. In Montana, although the Cx market penetration rate approached 100% in 2019, the rate had been highly variable; it was 33% in 2018, 93% in 2017, and 35% in 2016. Several more years of low, and/or inconsistent, market penetration rates are likely for Cx in eastern regions as commissioning providers noted that in Idaho and Montana there is a lack of awareness of—and challenges with understanding—the new code requirements at every level across the spectrum of actors involved with construction: building owners, architects and design teams, and enforcement and permitting agencies.

***Recommendation:***

- Additional research into this barrier in 2020 could help determine opportunities for solutions and interventions. Research could include discussing Cx with stakeholders such as the Building Commissioning Association (BCxA), the Idaho Energy Code Collaborative, and state and local energy code officials.

## Appendix A. Methodology

This is the seventh year that Cadmus has conducted this study. Each year, the methods have remained consistent to provide a reliable measure of market change, although NEEA and Cadmus have made refinements based on the study’s findings, NEEA’s priorities, and the best available information.

### Data Collection Methodology

NEEA had four major objectives for the 2019 study:

- Update the total floor area of commissioned space (square footage) by state and by each commissioning type
- Determine the total market size of new and existing commercial buildings
- Calculate market penetration and determine how market penetration has changed over time
- Update the number of certified and uncertified commissioning professionals by state

Table 3 summarizes the methodology and sources used for meeting each of these objectives. The next section describes the methodology for the online survey. In later sections of the appendix, Cadmus discusses the detailed steps taken to develop the 2019 estimates.

**Table 3. Data Collection Methodology**

Objectives	Method	Population*	Target Sample Size	Achieved Sample Size	Data Source for Task
Floor area of commissioned building space	Online survey of professionals	97 firms	35	35 firms	Sample frame constructed from public data from certification bodies* and internet search
Market size (floor area of new and existing buildings)	Secondary sources	n/a	n/a	n/a	Dodge data and 2014 CBSA data provided by NEEA
Number of certified and uncertified commissioning professionals by state	Online survey of professionals	271 professionals	35 respondents	37 respondents	Number of certified professionals from public data per certification bodies* and internet search; number of uncertified professionals obtained from survey

\*Population is based on number of professionals certified with one or more of the following: BCxA, AABC Commissioning Group, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Association of Energy Engineers, and the National Environmental Balancing Bureau.



Cadmus calculated precision for floor area at 80% confidence with  $\pm 24\%$  precision for Cx, and 80% confidence with  $\pm 47\%$  precision for existing building commissioning (RCx, ReCx, and OCx).<sup>6</sup> Despite similar achieved sample sizes in 2018 and 2019, the precision level for existing building commissioning changed significantly from  $\pm 27\%$  in 2018 to  $\pm 47\%$  in 2019. This shows that the level of variability in reported existing building commissioning floor areas has increased in 2019.

## Online Survey

Cadmus used an online survey platform, designed and administered through Qualtrics, to collect square footage for commissioning activities. Appendix E provides the online survey instrument. Cadmus contacted all commissioning professionals from the commissioning firm population, targeting 35 responses.

## Survey Sample

In the 2019 study, Cadmus updated the population of commissioning firms active in the Northwest with new information from internet research. We compiled a list of professionals from several certification bodies (BCxA, AABC Commissioning Group, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Association of Energy Engineers, and the National Environmental Balancing Bureau) and added any certified professionals who were new to the 2018 list. Cadmus removed professionals from the list who, in the 2018 study, had declined to be contacted or whose emails had bounced back. For professionals whose emails bounced back, Cadmus conducted an internet search to inquire whether they had started working for other commissioning firms that are active in the Northwest (and if so, we added their new email addresses to the list).

The list included California-based engineering firms and professionals who may have serviced the Northwest in 2019. Three reported they had and were counted in the final population. Altogether, 37 commissioning professionals completed the survey, representing 35 firms (32 Northwest and three California-based firms).

## Survey Recruitment

In the 2018 study, Cadmus worked with NEEA to design a three-year Incentive Agreement, under which professionals receive an escalating incentive for completing the survey each year. If professionals opted out of the Incentive Agreement, they could still complete the survey and receive a one-time incentive. As a result, 16 firms signed the agreement to participate again in the 2019 and 2020 study.

Throughout the survey fielding period from mid-November of 2019 to mid-January of 2020, Cadmus sent three reminder emails to all commissioning professionals and made at least 25 reminder phone calls. Cadmus also worked with NEEA and the BCxA to create a post for its December 13, 2019, e-

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<sup>6</sup> Cadmus calculated one measurement of confidence and precision for all combined types of existing building commissioning. Sample sizes were too small to provide meaningful precision results for RCx, ReCx, and OCx separately.

newsletter to advertise the study and to invite commissioning professionals to complete the survey (see Appendix D).

Including the 16 Incentive Agreement participants, 35 commissioning firms participated in the 2019 study. Six firms that participated in the 2018 study did not participate again; however, Cadmus recruited seven firms that did not participate in the 2018 study. Table 4 summarizes the number of participating firms by the channel through which they were contacted and the incentive options they chose. Almost one-half of participating firms signed up for the Incentive Agreement in 2018, ensuring these firms will provide data again in the 2020 study.

**Table 4. Participating Firms by Incentive Option and Recruitment Channel**

Recruitment Channel	Incentive Option	
	Three-Year Incentive Agreement	2019 Participation Only
Cadmus Email Invitation	16	18
BCxA Newsletter	0	1
<b>Total</b>	<b>16</b>	<b>19</b>

## Determination of Market Size

NEEA measures market penetration of new and existing building commissioning activity using the total new and existing commercial building floor area by state. New commercial building floor area in square feet serves as the metric for Cx market size, and existing commercial building floor area in square feet serves as the metric for RCx, ReCx, and OCx market size.

NEEA provided Cadmus with new construction floor area from Dodge for 2018 and 2019. Both years were necessary to arrive at the most accurate 2019 market size for Cx because Cadmus lagged the construction start data by nine months to account for the long duration between construction starts and completions. The 2019 new building floor area estimate consisted of 75% of the 2018 new construction starts' floor area, and 25% from 2019. Cadmus also removed the floor area of parking garages from this estimate as these structures typically do not undergo commissioning.

To determine the 2019 existing commercial building floor area in each state, Cadmus used NEEA's CBSA building stock floor area estimates from 2014 and added 2015, 2016, 2017, and 2018 new construction floor area.<sup>7</sup> Appendix C shows new and existing building stock by state and by year.

## Floor Area of Demolitions

NEEA's cost-effectiveness model requires estimates of demolished building floor area. In the 2018 study, Cadmus applied the 2013 study's established demolition rate of 0.63% to 2018's existing building floor area for each state to calculate the demolished building floor area. For the 2019 study, we conducted additional secondary data research and updated each state's demolition rate based on the commercial

<sup>7</sup> Lagged by nine months.

building square footage forecast in the Northwest Power and Conservation Council’s *Seventh Northwest Power Plan* (2016). Table 5 reports the square footage of demolished building floor area for 2019.

**Table 5. 2019 Demolished Square Footage**

State	2019 Existing Floor Area (sq. ft.)	Demolition Rate	Demolished Floor Area (sq. ft.)
Idaho	309,313,486	0.44%	1,357,724
Montana	253,466,056	0.45%	1,140,836
Oregon	972,126,746	0.46%	4,487,809
Washington	1,723,026,775	0.41%	7,087,873

Source: Council (2016); Cadmus analysis.

## Market Penetration

Cadmus determined commissioning market penetration by collecting commissioning firms’ estimates of floor area (in square feet) commissioned in 2019, by state and commissioning type.

Cadmus’ market penetration methodology involved the following steps:

1. Collect data on commissioned floor area from professionals through the online survey.
2. Estimate the population of commissioning firms by state and commissioning type.
3. Adjust for commissioning in manufacturing and industrial facilities.
4. Extrapolate the sample data collected to the firm population to arrive at total commissioned floor area.
5. Calculate market penetration by state and commissioning type.

Table 6 contains the final estimated population of firms by state and commissioning type. In this case, “service population” means the number of firms that Cadmus estimated serviced customers in that state for each specific commissioning type. The study used these population estimates as a multiplier to generate total floor area for the Alliance Cost-Effectiveness model.

**Table 6. Total Estimated Population of Commissioning Firms by State and Commissioning Type**

State	Cx Service Population	RCx Service Population	ReCx Service Population	OCx Service Population
Idaho	14	8	3	3
Montana	11	6	6	3
Oregon	30	14	3	3
Washington	55	42	28	14

Source: Cadmus analysis of 2019 survey data.

## Adjustments

NEEA’s commissioning initiative focused on the commercial building market. However, the survey asked respondents to provide data on building commissioning, which may include industrial and manufacturing (I&M) buildings. To measure respondents’ inclusion of I&M commissioning, Cadmus included survey questions to inform the square footage of commissioned floor area from I&M buildings

for each of the four commissioning types, then adjusted the final commercial square footage to remove floor area for these buildings, as presented in this report.<sup>8</sup> I&M buildings comprised 10% of reported Cx square footage, 45% of reported RCx square footage, and none of reported ReCx or OCx square footage.<sup>9</sup>

## Extrapolation of Sample Data to Population

To extrapolate sample square footage to the population of firms in each state and commissioning type, Cadmus applied the following formula:

$$NCxSqFt_{s,t} = \frac{\sum_{f=1}^n CxSqFt_{s,t}}{n_{s,t}} \times N_{s,t}$$

Where

- s = State (ID, MT, OR, or WA);
- t = Commissioning type (Cx, RCx, ReCx, or OCx);
- f = Commissioning firm;
- $N_{s,t}$  = Number of firms in the population in state (s) and commissioning type (t) (from Table 6);
- $n_{s,t}$  = Number of firms in the sample in state (s) and commissioning type (t) (Cadmus analysis of 2018 survey data);
- $CxSqFt_{s,t}$  = Adjusted commissioning square feet reported by firm (f) for state (s) and commissioning type (t) (Cadmus analysis of 2018 survey data); and
- $NCxSqFt_{s,t}$  = Total commissioning square feet for state (s) and commissioning type (t) (in Table 1 and Table 2).

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<sup>8</sup> NEEA also captures savings from I&M commissioning but uses a different savings rate.

<sup>9</sup> See questions **Error! Reference source not found.**, **Error! Reference source not found.**, **Error! Reference source not found.**, and **Error! Reference source not found.** in Appendix E.

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## Appendix C. Historical Data

**Table 7. New Building Commissioning 2013–2019 Market Size, Activity, and Penetration Estimates**

State	Year	New Building Market Size (sq. ft.)	Cx Activity (sq. ft.)	Market Penetration
<b>Idaho</b>	<b>2019</b>	<b>9,969,082</b>	<b>457,357</b>	<b>5%</b>
Idaho	2018	7,093,869	1,355,241	19%
Idaho	2017	8,101,275	1,620,375	20%
Idaho	2016	8,654,525	1,241,321	14%
Idaho	2015	5,626,275	1,971,336	35%
Idaho	2014	3,756,200	856,308	23%
Idaho	2013	2,659,925	376,000	14%
<b>Montana</b>	<b>2019</b>	<b>3,032,119</b>	<b>2,829,509</b>	<b>93%</b>
Montana	2018	2,401,198	787,315	33%
Montana	2017	2,801,875	2,614,650	93%
Montana	2016	2,935,250	1,038,165	35%
Montana	2015	2,556,625	768,214	30%
Montana	2014	2,060,825	794,779	39%
Montana	2013	1,401,725	499,021	36%
<b>Oregon</b>	<b>2019</b>	<b>19,841,759</b>	<b>9,861,966</b>	<b>50%</b>
Oregon	2018	20,047,811	10,697,247	53%
Oregon	2017	15,927,975	5,576,794	35%
Oregon	2016	13,003,750	9,740,592	75%
Oregon	2015	12,600,125	9,421,714	75%
Oregon	2014	13,959,850	7,199,634	52%
Oregon	2013	5,842,325	3,192,334	55%
<b>Washington</b>	<b>2019</b>	<b>44,410,612</b>	<b>36,330,884</b>	<b>82%</b>
Washington	2018	46,040,446	43,988,029	96%
Washington	2017	36,895,250	32,748,574	89%
Washington	2016	31,103,975	27,608,184	89%
Washington	2015	33,363,025	14,344,043	43%
Washington	2014	30,041,975	16,950,747	56%
Washington	2013	10,763,625	7,562,522	70%
<b>Total</b>	<b>2019</b>	<b>77,253,572</b>	<b>49,479,716</b>	<b>64%</b>
Total	2018	75,583,324	56,827,831	75%
Total	2017	63,726,375	42,560,393	67%
Total	2016	55,697,500	39,628,261	71%
Total	2015	54,146,050	26,505,308	49%
Total	2014	49,818,850	25,801,468	52%
Total	2013	20,667,600	11,629,876	56%

Sources: Dodge; Cadmus 2014-2019; Cadmus analysis of 2019 data.

**Table 8. Retro-Commissioning 2013–2019 Market Size, Activity, and Penetration Estimates**

State	Year	Existing Building Market Size (sq. ft.)	RCx Activity (sq. ft.)	Market Penetration
<b>Idaho</b>	<b>2019</b>	<b>309,313,486</b>	<b>1,425,346</b>	<b>0.46%</b>
Idaho	2018	302,222,597	612,459	0.20%
Idaho	2017	294,267,364	21,250	0.01%
Idaho	2016	285,616,121	111,268	0.04%
Idaho	2015	279,993,579	449,365	0.16%
Idaho	2014	277,520,204	1,310,676	0.47%
Idaho	2013	251,819,745	231,000	0.09%
<b>Montana</b>	<b>2019</b>	<b>253,466,056</b>	<b>2,743,714</b>	<b>1.08%</b>
Montana	2018	251,065,572	699,176	0.28%
Montana	2017	248,264,039	1,300,500	0.52%
Montana	2016	245,330,092	620,702	0.25%
Montana	2015	242,774,686	1,922,118	0.79%
Montana	2014	241,278,586	2,895,373	1.20%
Montana	2013	73,404,096	1,256,700	1.71%
<b>Oregon</b>	<b>2019</b>	<b>972,126,746</b>	<b>3,687,386</b>	<b>0.38%</b>
Oregon	2018	952,086,039	2,174,322	0.23%
Oregon	2017	936,163,951	5,299,538	0.57%
Oregon	2016	923,165,449	15,537,577	1.68%
Oregon	2015	910,569,540	14,787,244	1.62%
Oregon	2014	902,390,465	8,041,145	0.89%
Oregon	2013	700,587,203	5,490,747	0.78%
<b>Washington</b>	<b>2019</b>	<b>1,723,026,775</b>	<b>10,230,729</b>	<b>0.59%</b>
Washington	2018	1,677,004,284	9,992,108	0.60%
Washington	2017	1,640,126,291	4,531,116	0.28%
Washington	2016	1,609,038,937	7,710,523	0.48%
Washington	2015	1,575,691,205	8,838,009	0.56%
Washington	2014	1,558,742,105	19,810,255	1.27%
Washington	2013	1,175,723,736	12,494,182	1.06%
<b>Total*</b>	<b>2019</b>	<b>3,257,933,063</b>	<b>18,087,174</b>	<b>0.56%</b>
Total	2018	3,182,378,491	13,478,066	0.42%
Total	2017	3,118,821,645	11,152,404	0.36%
Total	2016	3,063,150,599	23,980,068	0.78%
Total	2015	3,009,029,010	25,996,736	0.86%
Total	2014	2,979,931,360	32,057,449	1.08%
Total	2013	2,201,534,780	19,472,629	0.88%

\*Totals may not equal the sum of column due to rounding.

Sources: Dodge; NEEA 2014 (CBSA); Cadmus 2014-2019; Cadmus analysis of 2019 data.



**Table 9. Recommissioning 2013–2019 Market Size, Activity, and Penetration Estimates**

State	Year	Existing Building Market Size (sq. ft.)	ReCx Activity (sq. ft.)	Market Penetration
<b>Idaho</b>	<b>2019</b>	<b>309,313,486</b>	<b>27,714</b>	<b>0.01%</b>
Idaho	2018	302,222,597	74,118	0.02%
Idaho	2017	294,267,364	-	0.00%
Idaho	2016	285,616,121	276,159	0.10%
Idaho	2015	279,993,579	0	0.00%
Idaho	2014	277,520,204	523,243	0.19%
Idaho	2013	251,819,745	-	0.00%
<b>Montana</b>	<b>2019</b>	<b>253,466,056</b>	<b>554,286</b>	<b>0.22%</b>
Montana	2018	251,065,572	-	0.00%
Montana	2017	248,264,039	-	0.00%
Montana	2016	245,330,092	21,429	0.01%
Montana	2015	242,774,686	313,820	0.13%
Montana	2014	241,278,586	350,071	0.15%
Montana	2013	73,404,096	-	0.00%
<b>Oregon</b>	<b>2019</b>	<b>972,126,746</b>	<b>69,286</b>	<b>0.01%</b>
Oregon	2018	952,086,039	787,871	0.08%
Oregon	2017	936,163,951	1,609,900	0.17%
Oregon	2016	923,165,449	1,934,324	0.21%
Oregon	2015	910,569,540	6,025,351	0.66%
Oregon	2014	902,390,465	3,897,020	0.43%
Oregon	2013	700,587,203	1,046,318	0.15%
<b>Washington</b>	<b>2019</b>	<b>1,723,026,775</b>	<b>5,565,882</b>	<b>0.32%</b>
Washington	2018	1,677,004,284	2,088,961	0.12%
Washington	2017	1,640,126,291	864,167	0.05%
Washington	2016	1,609,038,937	1,663,518	0.10%
Washington	2015	1,575,691,205	2,160,289	0.14%
Washington	2014	1,558,742,105	6,314,294	0.41%
Washington	2013	1,175,723,736	3,825,000	0.33%
<b>Total</b>	<b>2019</b>	<b>3,257,933,063</b>	<b>6,217,168</b>	<b>0.19%</b>
Total	2018	3,182,378,491	2,950,950	0.09%
Total	2017	3,118,821,645	2,474,067	0.08%
Total	2016	3,063,150,599	3,895,430	0.13%
Total	2015	3,009,029,010	8,499,461	0.28%
Total	2014	2,979,931,360	11,084,628	0.37%
Total	2013	2,201,534,780	4,871,318	0.22%

Sources: Dodge; NEEA 2014 (CBSA); Cadmus 2014-2019; Cadmus analysis of 2019 data.

**Table 10. Ongoing/Continuous Commissioning 2013–2019 Market Size, Activity, and Penetration Estimates**

State	Year	Existing Building Market Size (sq. ft.)	OCx Activity (sq. ft.)	Market Penetration
<b>Idaho</b>	<b>2019</b>	<b>309,313,486</b>	<b>185,686</b>	<b>0.06%</b>
Idaho	2018	302,222,597	221,426	0.07%
Idaho	2017	294,267,364	-	0.00%
Idaho	2016	285,616,121	246,377	0.09%
Idaho	2015	279,993,579	10,714	0.00%
Idaho	2014	277,520,204	246,947	0.09%
Idaho	2013	251,819,745	-	0.00%
<b>Montana</b>	<b>2019</b>	<b>253,466,056</b>	<b>415,714</b>	<b>0.16%</b>
Montana	2018	251,065,572	225,132	0.09%
Montana	2017	248,264,039	-	0.00%
Montana	2016	245,330,092	30,612	0.01%
Montana	2015	242,774,686	321,429	0.13%
Montana	2014	241,278,586	86,171	0.04%
Montana	2013	73,404,096	-	0.00%
<b>Oregon</b>	<b>2019</b>	<b>972,126,746</b>	<b>2,405,600</b>	<b>0.25%</b>
Oregon	2018	952,086,039	2,332,976	0.25%
Oregon	2017	936,163,951	6,853,125	0.73%
Oregon	2016	923,165,449	5,909,100	0.64%
Oregon	2015	910,569,540	1,114,286	0.12%
Oregon	2014	902,390,465	1,766,511	0.20%
Oregon	2013	700,587,203	1,806,000	0.26%
<b>Washington</b>	<b>2019</b>	<b>1,723,026,775</b>	<b>12,235,857</b>	<b>0.71%</b>
Washington	2018	1,677,004,284	2,990,647	0.18%
Washington	2017	1,640,126,291	6,438,750	0.39%
Washington	2016	1,609,038,937	1,901,991	0.12%
Washington	2015	1,575,691,205	771,429	0.05%
Washington	2014	1,558,742,105	458,271	0.03%
Washington	2013	1,175,723,736	2,345,000	0.20%
<b>Total</b>	<b>2019</b>	<b>3,257,933,063</b>	<b>15,242,857</b>	<b>0.47%</b>
Total	2018	3,182,378,491	5,770,182	0.18%
Total	2017	3,118,821,645	13,291,875	0.43%
Total	2016	3,063,150,599	8,088,080	0.26%
Total	2015	3,009,029,010	2,217,857	0.07%
Total	2014	2,979,931,360	2,557,901	0.09%
Total	2013	2,201,534,780	4,151,000	0.19%

Sources: Dodge; NEEA 2014 (CBSA); Cadmus 2014-2019; Cadmus analysis of 2019 data.

## Appendix D. Survey Invitation

### *Cadmus Email Invitation*

To: [EMAIL ADDRESS]

From: NEEA and Cadmus

Subject: Annual Paid Survey Opportunity - NEEA Commissioning Study

Dear [FIRST NAME]:

Greetings! The non-profit Northwest Energy Efficiency Alliance (NEEA) is conducting its annual study on new and existing building commissioning in the Northwest. According to our research, your firm provides commissioning services in our region and so we'd like to invite you to participate in this paid research opportunity. If you had participated in this study in the past, thank you for your continued support!

This survey will take you about 20 minutes and will ask you to share your firm's square footage of whole-building, energy-focused commissioning projects completed in 2019 in Washington, Oregon, Idaho and Montana, and a few other questions. As always, individual results remain anonymous, but firms participating in the research can indicate in the survey if they wish to list their firm name as a contributor in the report.

If your firm participates this year, we are offering a **\$150** Visa gift card as a thank you for completing the survey.

**When you are ready to complete the survey, follow this link to the survey:** [SURVEY LINK]

**Or copy and paste this URL into your internet browser:** [SURVEY LINK]

Your responses are saved automatically. You can return to the survey at any time by clicking on the survey link provided above. Please access the survey from the same device and complete the survey by **December 31st, 2019.**

If you have any questions about this research, please feel free to contact me or Jennifer Stout, the project manager for this study at NEEA. She may be reached at 503-516-7370 or [jstout@neea.org](mailto:jstout@neea.org).

Sincerely,  
Kaitlyn Teppert

Cadmus  
720 SW Washington St  
Portland, OR 97205  
303-389-2530

## *BCxA Newsletter Invitation*

Available online at: <https://www.bcxa.org/blog/2019/12/12/be-part-of-neeas-paid-nw-cx-survey-your-response-150-visa-gift-card/>

## Appendix E. Survey Instrument

### A. Survey Start Screen



[DISPLAY NEEA LOGO]

- A0. In 2019, did your firm provide commissioning services in the Northwest (Washington, Oregon, Idaho, or Montana)? [FORCED RESPONSE]
1. Yes [continue]
  2. No [terminate]
  3. Don't know [terminate]

[Termination message: "Only commissioning providers who have worked in the Northwest in 2019 are eligible for this study. Thank you for your interest. To learn more about NEEA, please visit [www.neea.org](http://www.neea.org)"]

[SURVEY CONTINUES IF A0=1]

- A1. Did you (or your firm) sign the three-year participation Agreement with NEEA last year (2018)?
1. Yes
  2. No
  3. Don't know

[IF 26 NOT YES]

Welcome! The Northwest Energy Efficiency Alliance (NEEA) is conducting its annual study on new building and existing building commissioning markets. Your responses are very important to us and we will keep them confidential. Complete the survey by **December 31, 2019** to receive a **\$150 Visa gift card**. The survey will take you about 20 minutes.

This survey saves your responses automatically and responses will be submitted when you complete the survey. You can return to the survey at any time by clicking on the survey link provided to you in the email. Please access the survey from the same device.

**More about this study:** This survey will ask you to share your firm's square footage of whole-building, energy-focused commissioning projects completed in 2019 in Washington, Oregon, Idaho and Montana, and a few other questions. As always, individual results remain anonymous. The purpose of the research is to help NEEA understand more about the building commissioning industry and market trends.

[IF 26=YES]

Welcome! The Northwest Energy Efficiency Alliance (NEEA) is conducting its annual study on new building and existing building commissioning markets. Thank you for signing the three-year participation Agreement with NEEA last year. Your participation in this year’s study marks the second year of the three-year participation Agreement. Your responses are very important to us and we will keep them confidential. Complete the survey by **December 31, 2019** to receive a **\$300 Visa gift card**.

The survey will take you about 20 minutes. This survey saves your responses automatically and responses will be submitted when you complete the survey. You can return to the survey at any time by clicking on the survey link provided to you in the email. Please access the survey from the same device.

**More about this study:** This survey will ask you to share your firm’s square footage of whole-building, energy-focused commissioning projects completed in 2019 in Washington, Oregon, Idaho and Montana, and a few other questions. As always, individual results remain anonymous. The purpose of the research is to help NEEA understand more about the building commissioning industry and market trends.

[DISPLAY BEGIN SURVEY BUTTON]

## B. Introduction

B1. Name:   
Firm Name:   
Job Title:   
Phone Number:   
[FOR BCxA NEWSLETTER INVITATIONS] Email Address:

- B2. From which of the following do you hold a current commissioning certification? (Select all that apply)
1. ACG (AABC Commissioning Group)
  2. AEE (Associations of Energy Engineers)
  3. ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers)
  4. BCxA (Building Commissioning Association)
  5. NEBB (National Environmental Balancing Bureau)
  6. TABB (Testing, Adjusting and Balancing Bureau)
  7. UWM (University of Wisconsin-Madison)
  8. Other, please specify
  9. None
  98. Don't know

## C. About Your Firm

For this study, the term “commissioning” is defined as **whole-building energy-focused commissioning** (as opposed to commissioning focusing only on selected systems such as lighting or water.)

In this section, we will ask you about the types of **whole-building energy-focused commissioning** your firm provides, as well as about other services.

[DISPLAY COMMISSIONING DEFINITION GRAPHIC WITH THE FOLLOWING DEFINITIONS]

**Definition of Commissioning Types**

- **New building commissioning** (Cx) is the process of commissioning new buildings during the construction phase.
- **Retro-commissioning** (RCx) is the commissioning of existing buildings that have not previously been commissioned.
- **Re-commissioning** (ReCx) is the commissioning of existing buildings that have previously been commissioned.
- **Ongoing/continuous commissioning** (OCx), sometimes referred to as continuous commissioning, is the process of monitoring and fine-tuning commissioned buildings repeatedly over time.

C1. What types of commissioning services does your firm provide? For the purposes of this study, please note the definitions of the various commissioning types above. (Select all that apply)

1. New building commissioning
2. Retro-commissioning
3. Re-commissioning
4. Ongoing/continuous commissioning
5. Other, please specify
98. Don't know

C2. Which best describes your firm?

1. My firm specializes in commissioning and that is the main service we offer.
2. My firm provides commissioning as one of many services.
98. Don't know

C3. How many people does your firm employ who work a significant amount of time on commissioning projects? Only count employees who spend at least 25% of their time on commissioning projects.

C4. Of this group, how many people hold individual professional commissioning certifications? Use your best guess.

- C5. Does your firm hold any firm-level commissioning certifications?
1. Yes
  2. No
  98. Don't know

[ASK IF 29=1]

- C6. Which **firm-level** commissioning certifications does your firm hold? (Select all that apply)
1. BCxA's Certified Commissioning Firm
  2. AEE's Certified Building Commissioning Firm
  3. NEBB's Building Systems Commissioning Firm
  4. Other, please specify
  5. Don't know

## D. *Project Square Footage and Characteristics*

In this section, we will ask you to enter square footage data for **whole-building energy-focused** commissioning projects your firm completed in 2019 for the Northwest states of Washington, Oregon, Idaho, and Montana. We are seeking data by state and by commissioning type. If you do not have square footage data available now, please collect the information at your convenience and come back to this survey. Clicking on the survey link provided to you in the email will resume this survey.

[ASK IF 28=1]

- D1. Please enter the total square footage of **new building commissioning\*** projects your firm completed in 2019 for each state. Use whole numbers. Enter "0" if you did not complete projects in that state.

*\*New building commissioning is the process of commissioning new buildings during the construction phase.*

<input type="text"/>	Washington
<input type="text"/>	Oregon
<input type="text"/>	Idaho
<input type="text"/>	Montana

[ASK IF 28Error! Reference source not found.=1]

- D2. If any of the square footage you just entered for **new building commissioning** are estimates, please use the drop down menu(s) to indicate how accurate you think your estimates are. [DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 0-100%, in 5% increments, plus DK] [Note: If respondent enters "zero" in one of the states above, the state will not show here.]



Washington	<input type="text"/>
Oregon	<input type="text"/>
Idaho	<input type="text"/>
Montana	<input type="text"/>

[ASK IF 28=1]

D3. About what percentage of the **new building commissioning** projects were major **renovations**?

Washington	<input type="text"/>
Oregon	<input type="text"/>
Idaho	<input type="text"/>
Montana	<input type="text"/>

[ASK IF 28=1]

D4. For the **new building** space your firm commissioned in 2019, what was the approximate percentage breakdown in square footage by the building types below? (For industrial or manufacturing facilities, please only consider new **building space**, not **equipment**.) [MANUAL % INPUT IN ORDER TO MAINTAIN VALIDATION; ADDITIONAL VALIDATION CODING TO ENSURE IT ADDS UP TO 100%]

Commercial office	<input type="text"/>
Government	<input type="text"/>
Healthcare	<input type="text"/>
Schools or universities	<input type="text"/>
Industrial or manufacturing	<input type="text"/>
Other	<input type="text"/>

[ASK IF 28=1]

D5. How frequently does your firm commission the following systems in **new building commissioning** projects? [ONLY ONE RESPONSE PER ROW; NOT FORCED]

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	Never (1)	Seldom (2)	Sometimes (3)	Often (4)	Always (5)	Don't know (98)
HVAC and HVAC controls						
Lighting and lighting controls						
Plumbing						
Building envelope						
Renewable Energy						
Other						

[ASK IF 28=1]

D6. What is the typical project cost range (\$/sq. ft.) for your firm’s **new building commissioning** projects? Please leave blank if you don’t know. [ALLOW NUMERIC ENTRY, PLUS DK; NOT FORCED]

From \$  /sq. ft.  
To \$  /sq. ft.

[ASK IF 28=2]

D7. Please enter the total square footage of **retro-commissioning\*** projects your firm completed in 2019 for each state. Use whole numbers. Enter “0” if you did not complete projects in that state.  
*\*Retro-commissioning is the commissioning of existing buildings that have not previously been commissioned.*

Washington  
 Oregon  
 Idaho  
 Montana

[ASK IF Error! Reference source not found.=2]

D8. If any of the square footage you just entered for **retro-commissioning** are estimates, please use the dropdown menu(s) to indicate how accurate you think your estimates are. [DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 0-100%, in 5% increments, plus DK] [Note: If respondent enters “zero” in one of the states above, it will not show here.]

Washington

Oregon

Idaho

Montana

[ASK IF 28=2]

D9. For the existing building space your firm **retro-commissioned** in 2019, what was the approximate percentage breakdown in square footage by the building types below? (For industrial or manufacturing facilities, please only consider **building space**, not **equipment**.) **[MANUAL % INPUT IN ORDER TO MAINTAIN VALIDATION; ADDITIONAL CODING TO ENSURE IT ADDS UP TO 100%]**

Commercial office	<input type="text"/>
Government	<input type="text"/>
Healthcare	<input type="text"/>
Schools or universities	<input type="text"/>
Industrial or manufacturing	<input type="text"/>
Other	<input type="text"/>

**[ASK IF 28=3]**

D10. Please enter the total square footage for **re-commissioning\*** projects your firm completed in 2019 for each state. Use whole numbers. Enter "0" if you did not complete projects in that state. *\*Re-commissioning is the commissioning of existing buildings that have previously been commissioned.*

<input type="text"/>	Washington
<input type="text"/>	Oregon
<input type="text"/>	Idaho
<input type="text"/>	Montana

**[ASK IF 28=3]**

D11. If any of the square footage you just entered for **re-commissioning** are estimates, please use the dropdown menu(s) to indicate how accurate you think your estimates are. **[DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 0-100%, in 5% increments, plus DK]** [Note: If respondent enters "zero" in one of the states above, it will not show here.]

Washington	<input type="text"/>
Oregon	<input type="text"/>
Idaho	<input type="text"/>
Montana	<input type="text"/>

**[ASK IF 28=3]**

D12. For the existing building space your firm **re-commissioned** in 2019, what was the approximate percentage breakdown in square footage by the building types below? (For industrial or manufacturing facilities, please only consider **building space**, not **equipment**.) **[MANUAL % INPUT IN ORDER TO MAINTAIN VALIDATION; ADDITIONAL CODING TO ENSURE IT ADDS UP TO 100%]**

Commercial office	<input type="text"/>
Government	<input type="text"/>
Healthcare	<input type="text"/>
Schools or universities	<input type="text"/>

Industrial or manufacturing

Other

[ASK IF 28=4]

D13. Please enter the total square footage for **ongoing/continuous commissioning\*** projects your firm completed in 2019 for each state. Use whole numbers. Enter “0” if you did not complete projects in that state.

*\*Ongoing commissioning, sometimes referred to as continuous commissioning, is the process of monitoring and fine-tuning commissioned buildings repeatedly over time.*

Washington

Oregon

Idaho

Montana

[ASK IF 28=4]

D14. If any of the square footage you just entered for **ongoing/continuous commissioning** are estimates, please use the dropdown menu(s) to indicate how accurate you think your estimates are. [DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 0-100%, in 5% increments, plus DK] [Note: If respondent enters “zero” in one of the states above, it will not show here.]

Washington

Oregon

Idaho

Montana

[ASK IF 28=4]

D15. For the existing building space your firm conducted **ongoing/continuous commissioning** in 2019, what was the approximate percentage breakdown in square footage by the building types below? (For industrial or manufacturing facilities, please only consider **building space**, not **equipment**.) [MANUAL % INPUT IN ORDER TO MAINTAIN VALIDATION; ADDITIONAL CODING TO ENSURE IT ADDS UP TO 100%]

Commercial office

Government

Healthcare

Schools or universities

Industrial or manufacturing

Other

[ASK IF 28=2, 3, OR 4]

D16. How frequently does your firm commission the following systems in **existing building commissioning** projects? These projects could include retro-commissioning, re-commissioning, or ongoing/continuous commissioning. **[ONLY ONE RESPONSE PER ROW; NOT FORCED]**

	Never	Seldom	Sometimes	Often	Always	Don't know
HVAC and HVAC controls						
Lighting and lighting controls						
Plumbing						
Building envelope						
Renewable Energy						
Other						

**[ASK IF 28=2, 3, OR 4]**

D17. What is typically the project cost range (\$/sq. ft.) for your firm's **existing building commissioning** projects? These projects could include retro-commissioning, re-commissioning, or ongoing/continuous commissioning. Please leave blank if you don't know. **[ALLOW NUMERIC ENTRY, PLUS DK; NOT FORCED]**

From \$  /sq. ft. to \$  /sq. ft.

From \$  /sq. ft. to \$  /sq. ft.

## E. Market Trends and Opportunities

E1. **[ASK IF 29: WASHINGTON > 0; OR 29:WASHINGTON > 0; OR 29: WASHINGTON > 0; OR 29: WASHINGTON > 0]** Based on your experience and observations, what percentage of all the **new building space** would you say was commissioned in **Washington** in 2019?

1. More than 95% of new building space was commissioned
2. More than 90% of new building space was commissioned
3. More than 85% of new building space was commissioned
4. 85% or less of new building space was commissioned
98. I don't know

E2. The building codes in Washington, Idaho, and Montana all require **new building commissioning**. However, over the past two years, this study has indicated that in Washington the percentage of new building space commissioned is very high, while in Montana and Idaho the percentages are much lower.

If you or your firm have experience working across these three Northwest states, why do you think the percentages of new building space commissioned are different among them even though all three require commissioning? What have you observed or heard about that might explain this?

**[OPEN END; NOT FORCED]**

- E3. Imagine you are an owner of an **existing building**. From that perspective, how would you answer this question, “What are the main reasons building owners don’t commission their buildings?”  
[OPEN END; NOT FORCED]
- E4. Using a scale from 1 to 5 where 1 means “strongly disagree” and 5 means “strongly agree,” please rate whether you agree with the following statements about **existing building commissioning**.  
[RANDOMIZE ORDER] [DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 1-5, plus DK]
- A. Building owners in the Northwest are aware of existing building commissioning
  - B. Building owners in the Northwest understand the financial benefits of existing building commissioning
  - C. Building owners in the Northwest understand the operational benefits of existing building commissioning
  - D. There are enough qualified commissioning providers to meet Northwest demand for existing building commissioning
  - E. It is difficult for commissioning providers to quantify the financial benefits of existing building commissioning for customers
- E5. What do you think would most help to increase customer adoption of **existing building commissioning** in the Northwest? [OPEN END; NOT FORCED]
- E6. Generally speaking, where do you see opportunities for **existing building commissioning** in the Northwest? This could be opportunities that you see in certain market segments, among certain customers, for certain building systems, or commissioning types (i.e., ongoing/continuous commissioning, etc.). [OPEN END; NOT FORCED]

## *F. Thank You!*

- A1. Thank you so much for participating in the survey. The data you have provided will be aggregated with data from other firms and reported anonymously in the study report. Does your firm wish to have its name published as a contributor to this study? The report is available to the public and posted on NEEA’s website. [FORCED RESPONSE]
- 1. Yes
  - 2. No
- A2. Please provide your mailing address to receive your Visa gift card. [FORCED RESPONSE]

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Name	<input type="text"/>
Street Address	<input type="text"/>
City	<input type="text"/>
State	<input type="text"/>
Zip Code	<input type="text"/>

[IF 26 NOT YES]

A3. Are you interested in being contacted for future annual research on this topic?

1. Yes
2. No

[END OF SURVEY SCRIPT] Your responses have been submitted. Thank you for participating. Your gift card will be mailed out in a few weeks. Please be on the lookout for a business-size envelope from CADMUS. To learn more about NEEA, please visit [www.neea.org](http://www.neea.org)