June 12, 2019

REPORT # E19-383

Building Commissioning - 2018 Long-Term Monitoring and Tracking Report

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Acknowledgements

Cadmus would like to thank the commissioning providers that provided data for this study. The following providers gave permission to be listed by name:

- Affiliated Engineers
- AIRTEST Co., Inc.
- Blue Sky Consulting Services
- CBRE Heery
- Elkhorn Commissioning Group
- Energy 350
- Engineering Economics Inc.
- Farnsworth Group Inc.
- Innovative Energy Solutions
- Interface Engineering
- Keithly Barber Associates
- Morrison-Maierle
- Musgrove Engineering
- Neudorfer Engineers
- RWDI
- Sazan Environmental Services
- SEEDIdaho P.C.
- SmartWatt Energy, Inc.
- Sweek Consulting Engineers
- System WorCx
- Systems West Engineers
- TestComm, LLC
- US Army Corps of Engineers
- Virtual Building Browser, Inc.
- Welsh Commissioning Group, Inc.

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Introduction

The Northwest Energy Efficiency Alliance's (NEEA's) 2018 Long-Term Monitoring and Tracking (LTMT) study of new and existing commercial building commissioning in the Northwest had four objectives:

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

This year's study conducted by Cadmus meets these objectives and also provides findings on drivers of year-to-year changes, types of buildings and systems being commissioned, barriers and project costs, and areas of opportunity in the Northwest commissioning market. The report contains 11 pages of 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

Cadmus updated the population of commissioning firms based on internet research and determined there were 84 active firms in the Northwest in 2018. Cadmus emailed an online survey to the full population and received data from 35 individual commissioning professionals representing 34 firms active in the Northwest. The number of firms participating in the study increased by 70% from 20 in 2017 due to this year's redesign of the participant incentive structure and increased follow-up reminders. Cadmus also analyzed data from Dodge Data and Analytics (Dodge) and 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
- Recommissioning (ReCx)—Commissioning of existing buildings that were commissioned during the construction phase
- Ongoing commissioning (OCx)—Fine-tuning commissioned buildings repeatedly over time

[1] Oregon, Washington, Idaho, Montana.

Key Takeaways

- Similar to the population of commissioning firms in the previous year, 84 commissioning firms were active in the Northwest in 2018.[2] An estimated 163 certified commissioning professionals represent these firms, plus an estimated 79 uncertified professionals. The estimated population of certified professionals increased by 37% compared to 2017.
- For the Northwest as a whole, market penetration of new building commissioning (Cx) increased from 67% in 2017 to 75% in 2018. Washington continued to observe a very high Cx market penetration rate (96%), and in Oregon Cx market penetration increased from 35% to 53%.
- Market penetration rates for existing building commissioning decreased from 0.86% in 2017 to 0.70% in 2018, although the year-to-year changes varied by the type of existing building commissioning. Due to increased RCx activity in Washington and Idaho, RCx market penetration increased for the region as a whole compared to the previous year, a reverse from three prior years of decreases. However, OCx market penetration for the region as a whole decreased by more than 50% due to decreasing activity reported in Washington and Oregon; this decrease was a reverse from two prior years of increases. Moreover, respondents reported that many significant barriers still remain for existing building commissioning in the Northwest, including poor awareness and understanding of benefits, upfront costs, time constraints, and code minimums not capturing the full value of existing building commissioning.
- Although NEEA no longer has an active commissioning initiative, it may want to consider ways to support regional awareness-building of the benefits offered by all types of new and existing building commissioning through support of the Building Commissioning Association (BCA) and other industry efforts.

Results for New Building Commissioning (Cx)

For the Northwest as a whole, Cx market penetration rates increased from 67% in 2017 to 75% in 2018, though some individual Northwest states experienced more substantial year-to-year changes. Table 1 summarizes the 2018 findings for Cx and compares them to the 2017 findings.

Similar to results from recent years, Washington had a very high Cx market penetration rate compared to the other three states. Moreover, Cx market penetration in Oregon increased this year from 35% to 53%. By contrast, Cx market penetration in Montana decreased sharply from 93% in 2017 to 36% in 2018, returning to 2015 and 2016 levels. The Montana result was predominantly attributed to a large player in the market reporting much less commissioned floor area compared to 2017 and another large player in 2017 not participating in the 2018 survey. High, stable Cx penetration in Washington may be linked to statewide building code requirements, though statewide building code requirements in

[2] Of these firms, five are based in California but conduct commissioning projects in the Northwest.

Montana and Idaho have not resulted in similar market penetration levels, and as noted, Montana Cx rates dropped substantially.[3]

Table 1. 2018 LTMT Estimates for New Building Commissioning

State	New Construction Floor Area (sq. ft.)	Commissioned Space (sq. ft)*	Market Penetration (2018)	Market Penetration (2017)
Idaho	7,093,869	1,355,241	19%	20%
Montana	2,401,198	787,315	33%	93%
Oregon	20,047,811	10,697,247	53%	35%
Washington	46,040,446	43,988,029	96%	89%
Total	**75,583,324**	**56,827,831**	**75%**	**67%**

*Reflects adjusted value based on self-reported accuracy estimates.

Sources: Dodge 2018 and 2019; Cadmus analysis of 2017 and 2018 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 decreased for the fourth year in a row. This decrease can be attributed primarily to a decrease in OCx activity in the region in 2018. Cadmus found that firms reporting OCx activity in Washington and Oregon during 2017 reported minimal activity in 2018. On the other hand, RCx activity increased in the Northwest in 2018 compared to the previous year, a reverse from three prior years of decreases. Main drivers of increased RCx activity included more firms reporting RCx activity in Washington, and an increase in firms' average reported RCx project size. Similarly, three Idaho-based firms significantly increased their RCx activities in 2018. Table 2 summarizes 2018 findings for existing building commissioning activities.

[3] Washington adopted the 2015 International Energy Conservation Code (IECC), and both Montana and Idaho adopted the 2012 IECC, requiring mandatory commissioning of mechanical services for newly constructed buildings.

Table 2. 2018 LTMT Estimates for Existing Building Commissioning

Type	State	Existing Floor Area (sq. ft.)	Commissioned Space (sq. ft)*	Market Penetration (2018)	Market Penetration (2017)
Retro-commissioning	Idaho	302,222,597	612,459	0.20%	0.01%
	Montana	251,065,572	699,176	0.28%	0.52%
	Oregon	952,086,039	2,174,322	0.23%	0.57%
	Washington	1,677,004,284	9,992,108	0.60%	0.28%
	Total	**3,182,378,491**	**13,478,066**	**0.42%**	**0.36%**
Recommissioning	Idaho	302,222,597	74,118	0.02%	0.00%
	Montana	251,065,572	-	0.00%	0.00%
	Oregon	952,086,039	787,871	0.08%	0.17%
	Washington	1,677,004,284	2,088,961	0.12%	0.05%
	Total	**3,182,378,491**	**2,950,950**	**0.09%**	**0.08%**
Ongoing commissioning	Idaho	302,222,597	221,426	0.07%	0.00%
	Montana	251,065,572	225,132	0.09%	0.00%
	Oregon	952,086,039	2,332,976	0.25%	0.73%
	Washington	1,677,004,284	2,990,647	0.18%	0.39%
	Total	**3,182,378,491**	**5,770,182**	**0.18%**	**0.43%**
	Total (All)**	**3,182,378,491**	**22,199,198**	**0.70%**	**0.86%**

*Reflects adjusted value based on self-reported accuracy estimates.

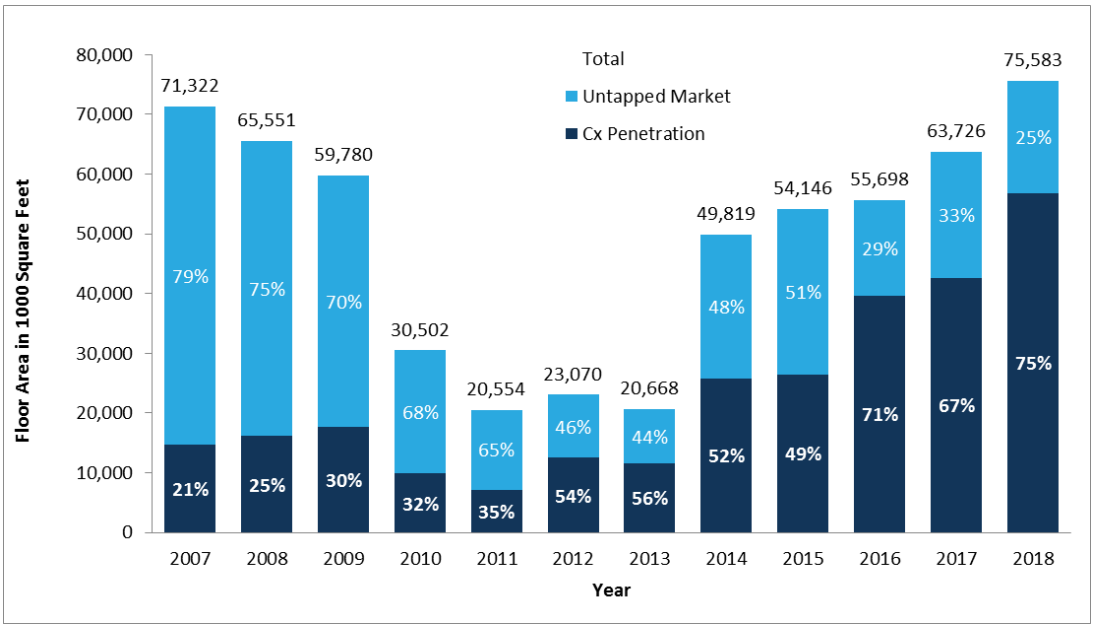
**Totals may not equal the sum of column due to rounding.

Sources: NEEA 2014 (CBSA); Cadmus analysis of 2017 and 2018 survey data.

Historical Data and Trends

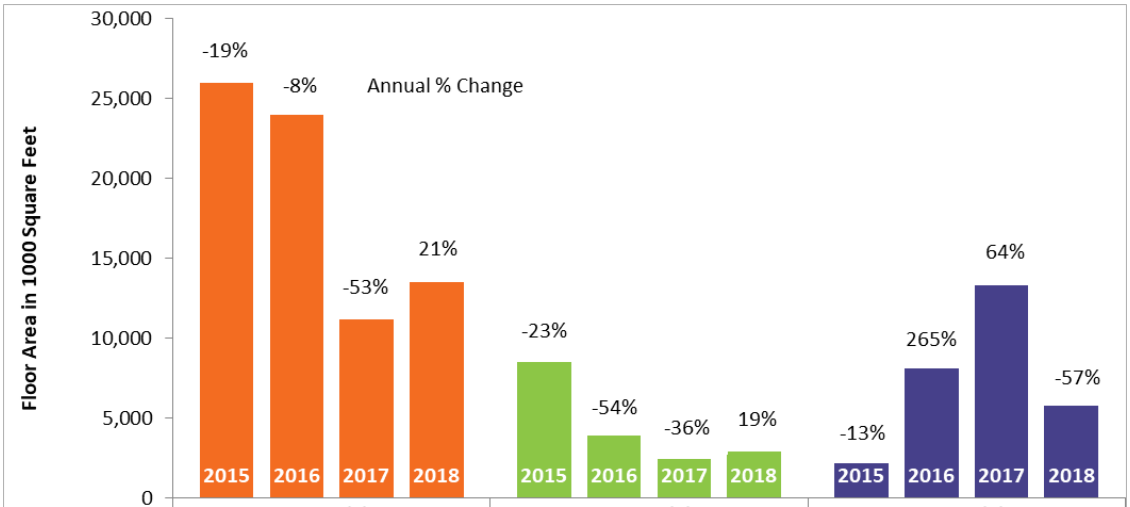
Figure 1 and Figure 2 illustrate historical, region-wide commissioning activity and market penetration for Cx, RCx, ReCx, and OCx, respectively. Appendix C provides historical data on a state-by-state basis.

Figure 1. New Construction: Historical Estimates for Market Size and Cx Penetration



Sources: Summit Blue Consulting 2006-2008; Navigant 2010-2012; Cadmus 2014-2018; Cadmus analysis of 2018 survey data.

Figure 2. Historical Estimates for Existing Building Commissioning Activity



	RCx Activity	ReCx Activity	OCx Activity
2015	25,997	8,499	2,218
2016	23,980	3,895	8,088
2017	11,152	2,474	13,292
2018	13,478	2,951	5,770

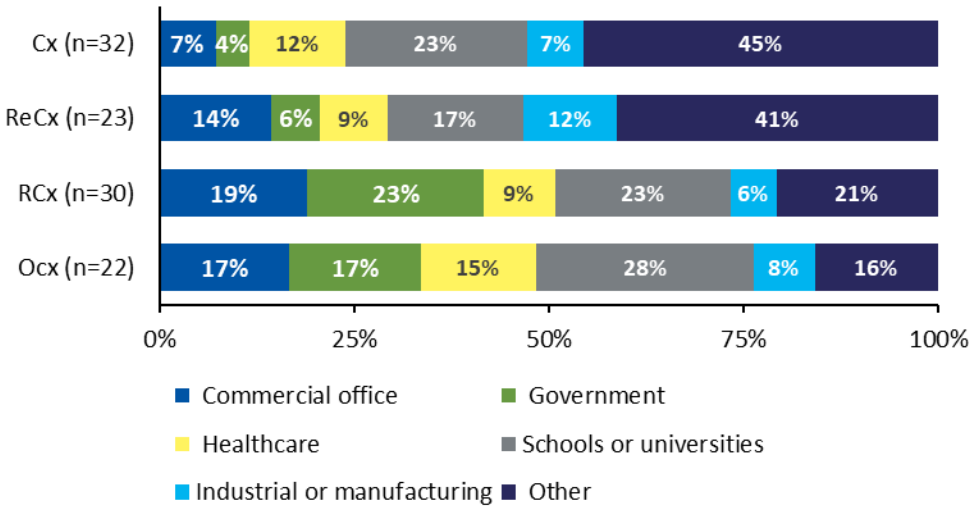
Sources: Cadmus 2014–2018; Cadmus analysis of 2018 survey data.

Market Insights

Commissioned Building Types

Cadmus asked commissioning firms about the share of commissioned space by building type. For each commissioning type, Figure 3 displays the share of commissioned floor space by building type, as reported by the firms. One noteworthy finding was that Cx and RCx projects were most commonly performed in schools and universities.

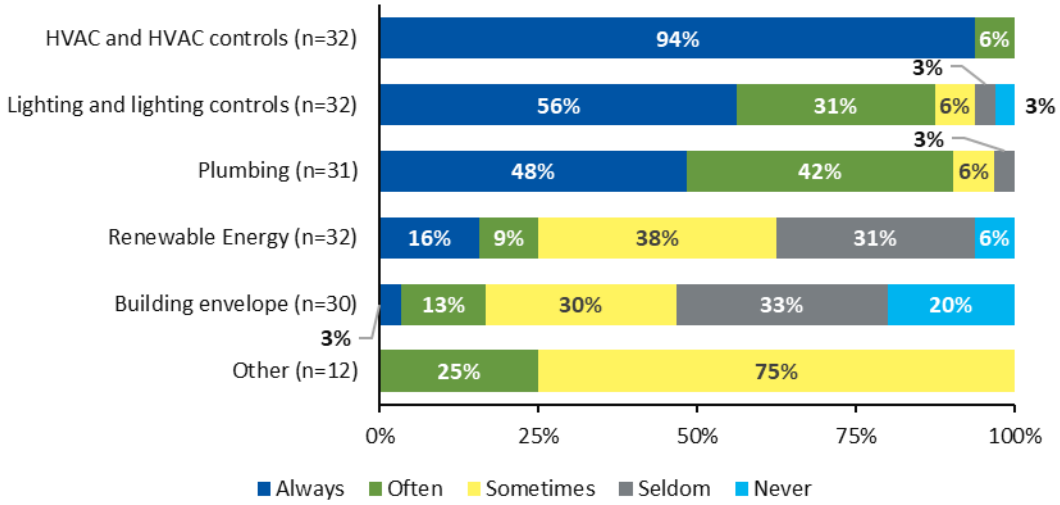
Figure 3. Distribution of New and Existing Commercial Building Commissioning by Building Type



Source: Cadmus survey questions D4, D9, D12, and D15. "For the new/existing space your firm commissioned in 2018, what was the approximate percentage breakdown of square footage by the building types below?" Percentages may not total to 100% due to rounding.

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 new building Cx projects they *always* commission HVAC and HVAC controls (94%; n=32), and a majority said they *always* commission lighting controls (56%; n=32).

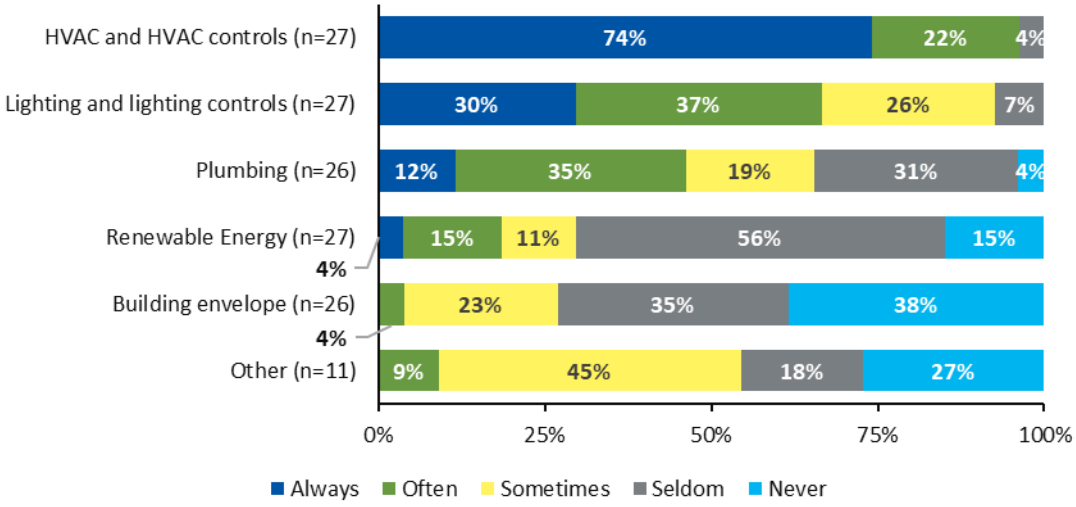
Figure 4. Frequency of Commissioning by Equipment/System Type During New Building Commissioning



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.

As shown in Figure 5, during existing building projects (RCx, ReCx, and OCx) somewhat fewer firms (though still a majority) said they *always* commission HVAC and HVAC controls (74%; n=27), and fewer reported always commissioning lighting controls during these projects (30%; n=27). Twenty percent of firms said they *never* commission the building envelope during a new building commissioning project (n=30), and 38% reported the same for existing building commissioning (n=26).

Figure 5. Frequency of Commissioning by Equipment/System Type in Existing Building Commissioning (RCx, ReCx, and OCx)



Source: Cadmus survey questions 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." Percentages may not total to 100% due to rounding.

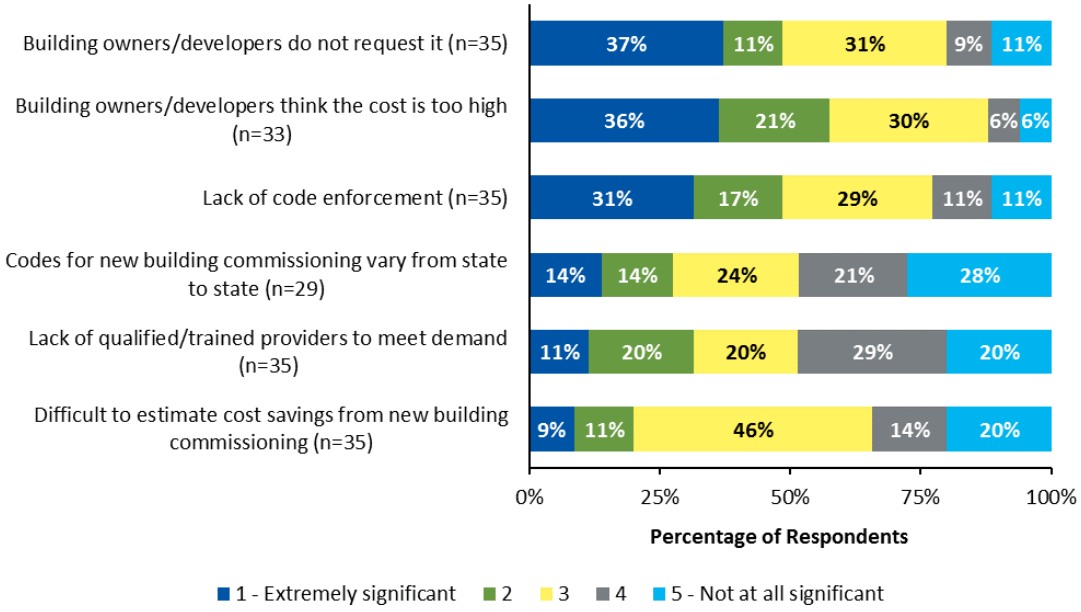
Project Costs

Cadmus asked firms commissioning new and existing buildings about their typical project cost range. Each respondent supplied a lower bound and upper bound cost for typical projects. Cadmus calculated the average of reported lower bounds and the average of reported higher bounds per square foot, which ranged from $0.65 to $1.79 for a new building (n=23) and $0.51 to $1.18 for an existing building (n=18).

Barriers to Commissioning

Cadmus asked respondents to rate the significance of several barriers to new building commissioning. Firms said building owners' or developers' lack of requests for Cx posed an *extremely significant* (37%) or *significant* (11%) barrier (n=35), while the fact that Cx codes vary from state to state did not pose a significant barrier for 48% of firms (n=29). Figure 6 presents these results in detail. Other Cx barriers that respondents mentioned on their own included a lack of requirements to perform Cx and a lack of clients' understanding of the value.

Figure 6. Barriers to New Building Commissioning

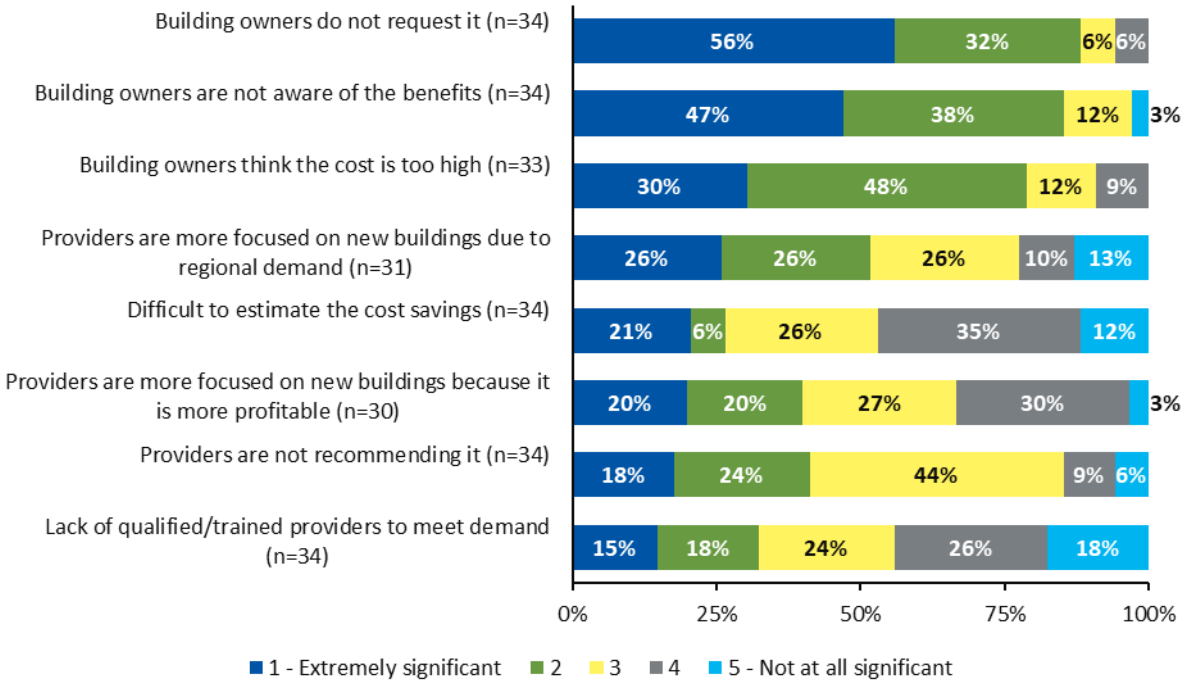


Source: Cadmus survey question E1. "Using a scale from 1 to 5 where 1 means extremely significant and 5 means not at all significant, please rate the level of significance of the following barriers to new building commissioning." Percentages may not total to 100% due to rounding.

For existing building commissioning, 88% of respondents reported that the lack of requests from building owners posed an *extremely significant* or *significant* barrier to existing building commissioning, and 79% of respondents rated cost as a *significant* or *extremely significant* barrier. (Respondents also rated these two barriers as significant barriers to new building commissioning.) Additionally, 85% of respondents rated the lack of awareness regarding benefits as a *significant* or *extremely significant* barrier to existing building commissioning. Respondents also mentioned on their own that other barriers

for existing building commissioning included time constraints and code minimums not capturing full value of existing building commissioning.

Figure 7. Barriers to Existing Building Commissioning



Source: Cadmus survey question E6. "Using a scale from 1 to 5 where 1 means extremely significant and 5 means not at all significant, please rate the level of significance of the following barriers to existing building commissioning in the Northwest." Percentages may not total to 100% due to rounding.

Areas of Opportunity

Respondents said the new construction market's growth presented a major opportunity for Cx in all Northwest states. For example, one respondent said the rapid growth of mixed use and multifamily sectors will present new Cx opportunities. Other responses included the following:

- "I believe the biggest advantages of commissioning are not regionally specific. The biggest advantage is making sure that all systems are performing as designed, and that no systems are fighting each other."
- "Given the large amount of commercial new construction in Seattle for companies like Amazon and by developers such as Kilroy, one opportunity would be partnering agreements between code authorities and these entities to identify barriers and challenges to commissioning their buildings so existing requirements can be refined (City of Seattle Energy Code)…."

The 2017 LTMT study reported that Oregon experienced a large decrease in Cx market penetration in 2017 compared to 2016, after experiencing an increase in most years from 2012 to 2016. To further understand this result, Cadmus asked respondents if they observed the Cx market changing in Oregon, specifically, over the past two years. Contrary to the decrease in reported floor area commissioned from 2016 to 2017, no respondents reported observing a decrease in new building commissioning activity in

Oregon during the examined time period. One-half of respondents said they believed that the total floor area commissioned increased, and the other one-half said it remained the same (n=17).

Regarding areas of opportunities in existing building Cx, respondents named several sectors that have potential for existing building commissioning: school/universities, healthcare facilities, groceries, breweries, warehouses, and chain stores. One respondent said setting up OCx with new construction clients would help expand this market in recently developed buildings.

Discussion and Recommendations

- **Drivers of decreasing OCx activity:** For the Northwest as a whole, the combined floor area reported for all types of existing building commissioning activity decreased for the fourth year in a row. This year's decrease, in comparison with last year, mostly was driven by lower OCx activity. Cadmus examined the survey data for OCx activity and found some firms reporting OCx projects in Washington or Oregon in 2017 reported no or minimal OCx project work in those states during 2018. Generally, survey respondents reported several significant barriers to existing building commissioning, including a lack of understanding among building owners about existing building commissioning and the value it can offer, upfront costs, time constraints, and code minimums not capturing full value of existing building commissioning. Nevertheless, one respondent said they were considering setting up OCx with new construction clients as an opportunity to expand the commissioning market in recently developed buildings. Cadmus recommends NEEA consider ways to support regional awareness-building regarding the benefits of OCx and other existing building commissioning through support of BCA or other industry efforts.
- **Drivers of varying RCx activity levels across states:** RCx activity increased in the Northwest as a whole in 2018 compared to 2017, a reverse from three prior years of decreases. Increased RCx activity arose from more firms reporting RCx activity in Washington and the higher average RCx floor area reported by these firms. Washington's increase in RCx activity will likely continue due to the new Seattle Building Tune-Ups policy; this requires large buildings (floor area of more than 100,000 square feet) to conduct RCx by the end of 2019 and smaller buildings (floor area of 50,000 square feet to 100,000 square feet) to conduct RCx by the end of 2021.[4] However, one survey respondent cautioned that the Seattle Building Tune-Ups policy does not require in-depth analysis, encourages low bids, and may divert budgets from Seattle property owners that might otherwise have gone to more extensive RCx. Idaho's RCx activity also increased in 2018, as three Idaho-based firms reported significantly increased RCx activity during the year. RCx activity in Oregon, however, decreased, continuing a trend from 2017, while Cx activity in Oregon increased in 2018. This inverse relationship between Cx and RCx in Oregon may result from commissioning professionals prioritizing Cx over RCx. Three survey respondents reported

[4] Seattle Office of Sustainability and Environment. "Seattle Building Tune-Ups." Accessed March 29, 2019: http://www.seattle.gov/environment/climate-change/buildings-and-energy/building-tune-ups

receiving more Cx work during new building market booms and then falling back to existing building commissioning when new construction slows down.

Appendix A. Methodology

This is the sixth 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 2018 LTMT 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 detailed steps taken to develop the 2018 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	84 firms	n/a	34 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 provided by NEEA and 2014 CBSA data
Number of certified and uncertified commissioning professionals by state	Online survey of professionals	242 professionals	35 respondents	35 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: BCA, 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 ±27% precision for new building commissioning, and 80% confidence with ±26% precision for existing building commissioning.[5] The precision levels for new and existing building commissioning improved compared to levels in the previous year (±39% and ±54%). The improved precision levels primarily resulted from the increase in the achieved sample size, from 20 firms in 2017 to 34 firms in 2018.

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 2017 LTMT study, Cadmus updated the population of commissioning firms active in the Northwest with new information from internet research. For the 2018 study, Cadmus made minor updates to previous year's list of certified commissioning professionals by excluding professionals who declined to be contacted or whose emails bounced back in the 2017 LTMT study. For professionals whose emails bounced back, Cadmus conducted an internet search to inquire whether they had started working for other commissioning firms active in the Northwest. If so, Cadmus added their new email addresses to the list.

The list included California-based engineering firms and professionals to investigate whether they serviced the Northwest in 2018. Five reported they had, so Cadmus counted them in the final population. Altogether, 35 commissioning professionals completed the survey, representing 34 firms (29 Northwest and five California-based firms).

Survey Recruitment

To increase participation in the study and to collect data from a consistent pool of commissioning firms, Cadmus worked with NEEA to design a three-year "Incentive Agreement," under which professionals receive an escalating incentive for completing the survey each year. NEEA created the Incentive Agreement template, which Cadmus emailed to the list of commissioning professionals along with a link to the online survey. If professionals opted out of the Incentive Agreement, they could still complete the survey and receive a one-time incentive.

Throughout the survey fielding period from mid-November of 2018 to mid-January of 2019, Cadmus sent three reminder emails to all commissioning professionals and made at least 40 reminder phone calls. Cadmus also worked with NEEA and the BCA to create a newsletter post for its December 14, 2018,

[5] 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.

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

Due to this year's multipronged recruitment approach, the number of participating commissioning firms increased from 20 in the previous LTMT study to 34. Five firms that participated in the previous LTMT study did not participate again; however, Cadmus recruited seven firms who were new to the 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, ensuring these firms will provide data again in the next two years.

Table 4. Participating Firms by Incentive Option and Recruitment Channel

Recruitment Channel	Incentive Option	
	Three-Year Incentive Agreement	2018 Participation Only
Cadmus Email Invitation	16	15
BCA Newsletter	0	3
Total	**16**	**18**

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 2017 and 2018. Both years were necessary to arrive at the most accurate 2018 market size for new building commissioning because Cadmus lagged the construction start data by nine months to account for the long duration between construction starts and completions. For this year's study, the 2018 new building floor area estimate consisted of 75% of the 2017 new construction starts' floor area, and 25% from 2018. Cadmus also removed the floor area of parking garages from this estimate as these structures typically do not undergo commissioning.

To determine the 2018 existing commercial building floor area in each state, Cadmus used NEEA's CBSA building stock floor area estimates from 2014 and added 2015, 2016, and 2017 new construction floor area.[6] Appendix C shows new and existing building stock by state and by year.

Floor Area of Demolitions

For the Alliance Cost-Effectiveness (ACE) Model, NEEA requires estimates of demolished building space. To calculate the floor area of demolished building space, Cadmus applied the 2013 LTMT study's established demolition rate of 0.63% to 2018's existing building floor area for each state.

[6] Lagged by nine months.

Market Penetration

Cadmus determined commissioning market penetration by collecting commissioning firms' estimates of floor area (in square feet) commissioned in 2018, 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 5 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 end users in that state* for each specific commissioning type. The study used these population estimates as a multiplier to generate total floor area for the ACE model.

Table 5. 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	15	12	2	5
Montana	7	10	-	5
Oregon	30	22	7	7
Washington	49	44	20	12

Source: Cadmus analysis of 2018 survey data.

Adjustments

Cadmus employed two adjustments to respondent-reported commissioning floor area before extrapolating results to the population: application of respondent-reported accuracy estimates, and removal of commissioned floor area in industrial and manufacturing (I&M) buildings.

Accuracy adjustment: The Washington 2018 Cx activity reported in the survey data resulted in a calculated market penetration rate that exceeded 100%. Consequently, Cadmus applied the respondent-reported accuracy estimates to adjust the floor area for Cx and to adjust all of the other commissioning types and states for which respondents provided data. For example, if a respondent reported completing 600,000 square feet of Cx in Washington and reported this value as 85% accurate, Cadmus adjusted the value to 510,000 square feet.[7] The aggregated result showed that Washington's Cx market penetration changed from exceeding 100% to 96%. These adjusted values did not reverse any major

[7] If a respondent provided a footage floor area value, but did not provide an accuracy estimate, Cadmus adjusted the square footage value down by 10% (i.e., assuming an accuracy estimate of 90%).

trends for other commissioning types and states, and fell within the calculated lower and upper error bounds at 80% confidence.

Industrial & Manufacturing adjustment: NEEA's commissioning initiative focused on the commercial building market. Although the survey examined commercial building commissioning, respondents may have counted I&M buildings in their reported commissioned square footage. To measure respondents' inclusion of I&M commissioning , Cadmus included survey questions to inform the square footage of commissioned floor space from I&M buildings for each of the four commissioning types, and adjusted the final square footage to remove floor area for these buildings, as presented in this report.[8] I&M buildings comprised 14% of Cx square footage, 25% of RCx square footage, 20% of ReCx square footage, and 3% of OCx square footage.[9]

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:

Equation 1. Extrapolation

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

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 5);

$n_{s,t}$ = 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).

[8] NEEA also captures savings from I&M Commissioning, but it uses a different savings rate.

[9] Questions D4, D9, D12, D15 in Appendix E.

Appendix B. References

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Appendix C. Historical Data

Table 6. Cx 2012–2018 Market Size, Activity, and Penetration Estimates

State	Year	New Building Market Size (sq. ft.)	Cx Activity (sq. ft.)	Market Penetration
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%
Idaho	2012	3,348,850	385,755	12%
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%
Montana	2012	995,300	576,183	58%
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%
Oregon	2012	6,498,525	2,918,564	45%
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%
Washington	2012	12,227,350	8,617,914	70%
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%
Total	2012	23,070,025	12,498,416	54%

Sources: Dodge; Cadmus 2014-2018; Cadmus analysis of 2018 data.

Table 7. RCx 2012–2018 Market Size, Activity, and Penetration Estimates

State	Year	Existing Building Market Size (sq. ft.)	RCx Activity (sq. ft.)	Market Penetration
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%
Idaho	2012	250,628,640	513,333	0.20%
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%
Montana	2012	73,726,888	621,000	0.84%
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%
Oregon	2012	698,772,815	9,682,095	1.39%
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%
Washington	2012	1,168,381,594	7,606,938	0.65%
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%
Total	2012	2,191,509,936	18,423,367	0.84%

Sources: Dodge; NEEA 2014 (CBSA); Cadmus 2014-2018; Cadmus analysis of 2018 data.

Table 8. ReCx 2012–2018 Market Size, Activity, and Penetration Estimates

State	Year	Existing Building Market Size (sq. ft.)	ReCx Activity (sq. ft.)	Market Penetration
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%
Idaho	2012	250,628,640	4,400	0.00%
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%
Montana	2012	73,726,888	37,500	0.05%
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%
Oregon	2012	698,772,815	717,972	0.10%
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%
Washington	2012	1,168,381,594	2,050,000	0.18%
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%
Total	2012	2,191,509,936	2,809,872	0.13%

Sources: Dodge; NEEA 2014 (CBSA); Cadmus 2014-2018; Cadmus analysis of 2018 data.

Table 9. OCx 2012–2018 Market Size, Activity, and Penetration Estimates

State	Year	Existing Building Market Size (sq. ft.)	OCx Activity (sq. ft.)	Market Penetration
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%
Idaho	2012	250,628,640	-	0.00%
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%
Montana	2012	73,726,888	-	0.00%
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%
Oregon	2012	698,772,815	1,806,000	0.26%
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%
Washington	2012	1,168,381,594	2,171,400	0.19%
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%
Total	2012	2,191,509,936	3,977,400	0.18%

Sources: Dodge; NEEA 2014 (CBSA); Cadmus 2014-2018; Cadmus analysis of 2018 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 building 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 2018 in Washington, Oregon, Idaho and Montana, and a few other questions. As always, individual results remain anonymous, but firms participating in the research could indicate in the survey if they wish to publish their company name as a contributor to the report.

This year, NEEA has two incentive offers for participation:

- **Option 1:** In exchange for completing the study's online survey for three consecutive years, your firm would receive an incentive totaling **$900** over three years: **$200** for the first year (2018), **$300** for the second year (2019), and **$400** for the third year (2020). Please download the Incentive Agreement here and **return the signed agreement by November 30, 2018**.
- **Option 2:** If your firm prefers to participate on a year-to-year basis rather than committing to the three-year agreement, we still value your participation and would offer a $150 Visa gift card for completing this year (2018)'s survey.

Please respond to this email as soon as possible to let us know whether you intend to participate, and which incentive offer works best for you. Should you have any questions about the incentive offers or 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.

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 survey by **December 31st, 2018.**

Sincerely,
Kaitlyn Teppert

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

BCA Newsletter Invitation

Available online at: https://www.bcxa.org/blog/2018/12/13/be-part-of-neeas-paid-nw-commissioning-market-study/

Appendix E. Survey Instrument

A. Survey Start Screen

[DISPLAY NEEA LOGO]

A0. In 2018, did your firm provide commissioning services in the Northwest (Washington, Oregon, Idaho, or Montana)?

1. Yes [continue]
2. No [terminate]
3. Don't know [terminate]

[Termination message: "Only commissioning providers who have worked in the Northwest in 2018 are eligible for this study. Thank you for your interest. To learn more about NEEA, please visit www.neea.org"]

[SURVEY CONTINUES IF A0=1]

A1. [FOR CADMUS EMAIL INVITATIONS] Did you (or your firm) sign the three-year participation Agreement with NEEA (it was sent to you in the email with the survey link), or are you opting to participate year-to-year? Either is fine.

4. I signed/will sign the three-year participation Agreement
5. I'm opting to participate year-to-year
6. Don't know

[IF A1 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, 2018** 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 2018 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 A1 = 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, 2018** to receive a **$200 Visa gift card**. Thank you for signing up to participate in the study for three consecutive years; we will email you a link to the survey in 2019, and again in 2020.

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 2018 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.

[FOR BCA NEWSLETTER INVITATIONS]

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, 2018** 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 2018 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 BCA 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. BCA (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 commission focusing exclusively 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 C5=1]

C6. Which **firm-level** commissioning certifications does your firm hold? (Select all that apply)

1. BCA's Certified Commissioning Firm
2. AEE's Certified Building Commissioning Firm
3. NEBB's Building Systems Commissioning Firm
4. Other, please specify ☐
98. 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 2018 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 C=1]

D1. Please enter the total square footage of **new building commissioning*** projects your firm completed in 2018 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.*

☐	Washington
☐	Oregon
☐	Idaho
☐	Montana

[ASK IF C=1]

D2. If any of the square footage you just entered for **new building commissioning** was estimated, help us understand how much variance there may be from the actual square feet. Please estimate how accurate the value that you provided is. [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 C=1]

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

Washington	☐
Oregon	☐
Idaho	☐
Montana	☐

[ASK IF C=1]

D4. For the **new building** space your firm commissioned in 2018, 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	☐
Government	☐
Healthcare	☐
Schools or universities	☐
Industrial or manufacturing	☐
Other	☐

[ASK IF C=1]

D5. How frequently does your firm commission the following systems in **new building commissioning** projects? [ONLY ONE RESPONSE PER ROW]

	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 C=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]

From $ [ ] /sq. ft.
To $ [ ] /sq. ft.

[ASK IF C=2]

D7. Please enter the total square footage of **retro-commissioning*** projects your firm completed in 2018 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 C=2]

D8. If any of the square footage you just entered for **retro-commissioning** was estimated, help us understand how much variance there may be from the actual square feet. Please estimate how accurate the value that you provided is. [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 C=2]

D9. For the existing building space your firm **retro-commissioned** in 2018, 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 C=3]

D10. Please enter the total square footage for **re-commissioning*** projects your firm completed in 2018 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.*

- ☐ Washington
- ☐ Oregon
- ☐ Idaho
- ☐ Montana

[ASK IF C=3]

D11. If any of the square footage you just entered for **re-commissioning** was estimated, help us understand how much variance there may be from the actual square feet. Please estimate how accurate the value that you provided is. [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 C=3]

D12. For the existing building space your firm **re-commissioned** in 2018, 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 C=4]

D13. Please enter the total square footage for **ongoing/continuous commissioning*** projects your firm completed in 2018 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 C=4]

D14. If any of the square footage you just entered for **ongoing/continuous commissioning** was estimated, help us understand how much variance there may be from the actual square feet. Please estimate how accurate the value that you provided is. [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 C=4]

D15. For the existing building space your firm conducted **ongoing/continuous commissioning** in 2018, 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 C=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]

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

[ASK IF C=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]

From $ [ ] /sq. ft. to $ [ ] /sq. ft.

E. Market Barriers and Opportunities

E1. Using a scale from 1 to 5 where 1 means "extremely significant" and 5 means "not at all significant," please rate the level of significance of the following barriers to **new building commissioning**. [RANDOMIZE ORDER] [DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 1-5, plus DK]

A. Building owners/developers do not request it
B. Building owners/developers think the cost is too high
C. It is difficult to estimate cost savings from new building commissioning
D. The codes for new building commissioning vary from state to state in the Northwest
E. In states where new building commissioning is part of code, there is a lack of code enforcement
F. There is a lack of qualified/trained providers to meet demand

E2. Are there any other barriers – major or minor – to **new building commissioning** in the Northwest? Please provide details, including – if relevant – what state the barrier applies to. [OPEN END; NOT FORCED]

[ASK IF INPUT FOR OR > 0 IN D, D7, D10 OR D13]

E3. In your observation of the market in Oregon compared to other Northwest states, did the total **new building commissioning** square footage in **Oregon** increase, decrease, or remain the same in the past two years?

1. Increase

2. Decrease
3. Remain the same
98. Don't know

[ASK IF E3 = 2]

E4. Are there any reasons – major or minor – for the decrease in **new building commissioning** in Oregon? If so, please describe. [OPEN END; NOT FORCED]

E5. Generally speaking, what do you think are the **opportunities** for **new building commissioning** in the Northwest? This could be opportunities that you see in certain market segments, among certain customers, or something else. [OPEN END; NOT FORCED]

E6. Using a scale from 1 to 5 where 1 means "extremely significant" and 5 means "not at all significant," please rate the level of significance of the following barriers to **existing building commissioning** in the Northwest. [RANDOMIZE ORDER] [DROP DOWN SELECTION MENU WITH RESPONSE CHOICES: 1-5, plus DK]

A. Building owners simply do not request existing building commissioning
B. Building owners think the cost of existing building commissioning is too high
C. Building owners are not aware of the benefits
D. It is difficult to estimate the cost savings from existing building commissioning
E. Providers are not recommending it
F. Providers are more focused on new buildings due to regional demand
G. Providers are more focused on new buildings because it is more profitable
H. There is a lack of qualified/trained providers to meet demand

E7. Are there any other barriers – major or minor – to **existing building commissioning** in the Northwest? This could be barriers that you see in certain states or for certain commissioning types (i.e., retro-commissioning, etc.). [OPEN END; NOT FORCED]

E8. 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!

F1. 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

[IF A1 NOT YES]

F2. Please provide your mailing address to receive the $150 Visa gift card. [ADD FOR BCA NEWSLETTER INVITATIONS "Opportunities exist to engage in a longer-term agreement with NEEA for enhanced incentive levels for your firm. Please email Kaitlyn.Teppert@cadmusgroup.com to inquire."] [FORCED RESPONSE]

Name	
Street Address	
City	
State	
Zip Code	

[IF A1 = NOT YES]

F3. 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