The Value of Commissioning: Market and Building Data Surveys

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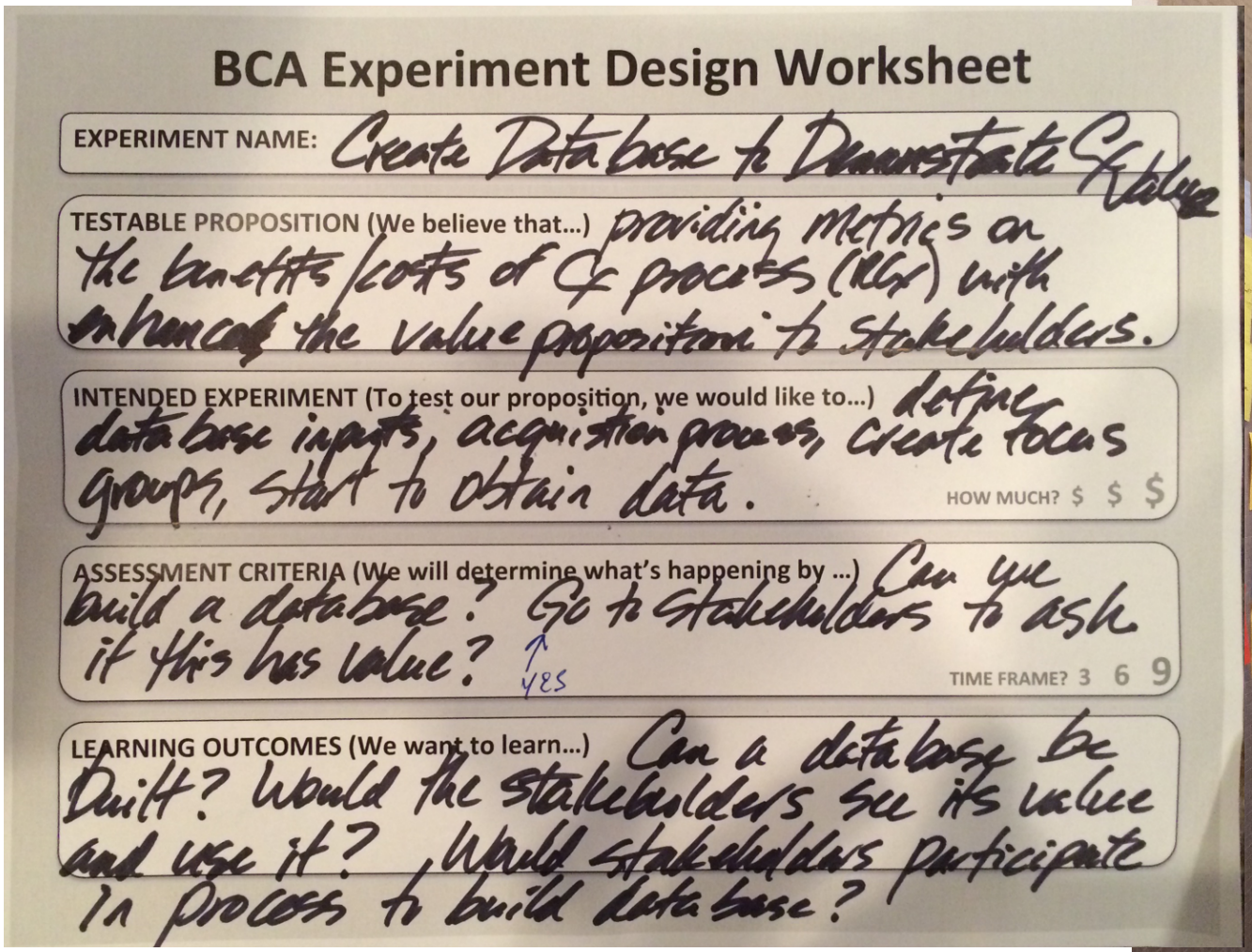
Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

2016 BCxA Leadership Conference



BCA Experiment Design Worksheet

EXPERIMENT NAME: Create Database to Demonstrate $ Value

TESTABLE PROPOSITION (We believe that...) providing metrics on the benefits/costs of C& process (ROI) will enhance the value proposition to stakeholders.

INTENDED EXPERIMENT (To test our proposition, we would like to...) define database inputs, acquisition process, create focus groups, start to obtain data. HOW MUCH? $ $ $

ASSESSMENT CRITERIA (We will determine what's happening by ...) Can we build a database? Go to Stakeholders to ask if this has value? ↑ YES TIME FRAME? 3 6 9

LEARNING OUTCOMES (We want to learn...) Can a database be built? Would the stakeholders see its value and use it? Would stakeholders participate in process to build database?

2009 LBNL Study – Cost Effectiveness of Commercial Building Commissioning

Building Commissioning:

A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions

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Report Prepared for:
California Energy Commission
Public Interest Energy Research (PIER)

July 21, 2009

Learning Objectives

1. Present the results of a joint BCxA/LBNL study that provides updated metrics on the value of commissioning.
2. Provide data that can be used by commissioning stakeholders to promote the industry.
3. Understand market opportunities to improve the commissioning industry.
4. Strengthen your membership and advocate for the BCxA.

Value of Commissioning Database - Goals

- Refresh the LBNL 2009 survey
  - Maintain consistency in the dataset
  - Reflect changes to the industry due to maturity
  - Define effects of changes to Cx approach (such as Ongoing Cx)
  - Include economics for Cx of additional systems
  - Expand database for different building types, markets
- Establish new baseline for Cx metrics
- Identify appropriate level of data to gather
- Create an iterative process for data gathering
- Engage membership to provide feedback on project level and market level trends

Value of Commissioning Study

Data Survey

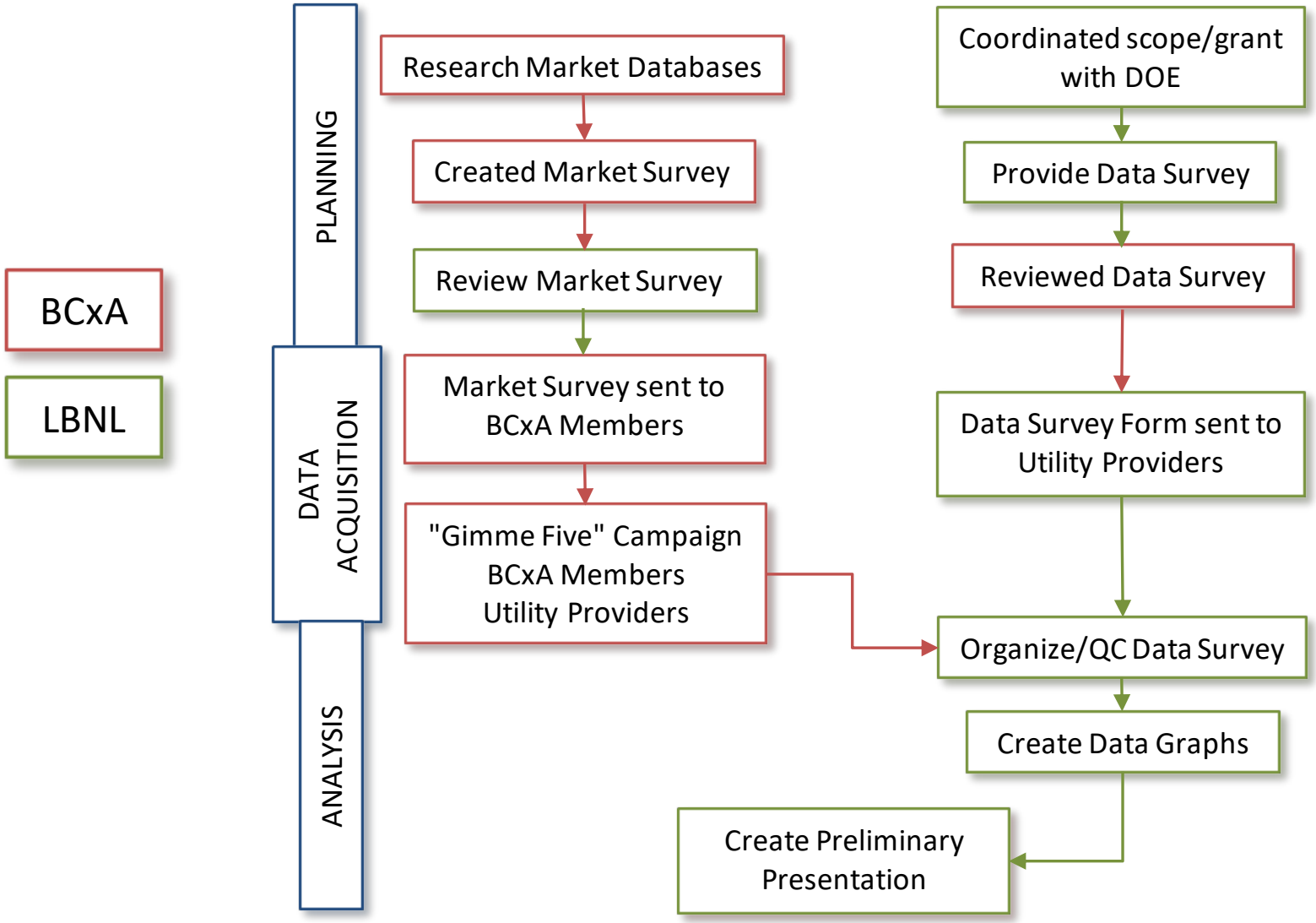
(NCCx, EBCx, OCx)

- Project Specific Description
- Reason for Cx
- Deficiencies & Measures
- Cx Cost Data
- Scope of Cx
- Baseline Energy Use & Savings
- Non-Energy Impacts

Market Survey

- Company information
- Certification
- NCCx Market Factors
- NCCx SOW Tasks
- EBCx Market Factors
- EBCx Economics
- EBCx SOW Tasks
- OCx Economics
- OCx SOW Tasks

BCxA / LBNL Roles



Data Survey Statistics

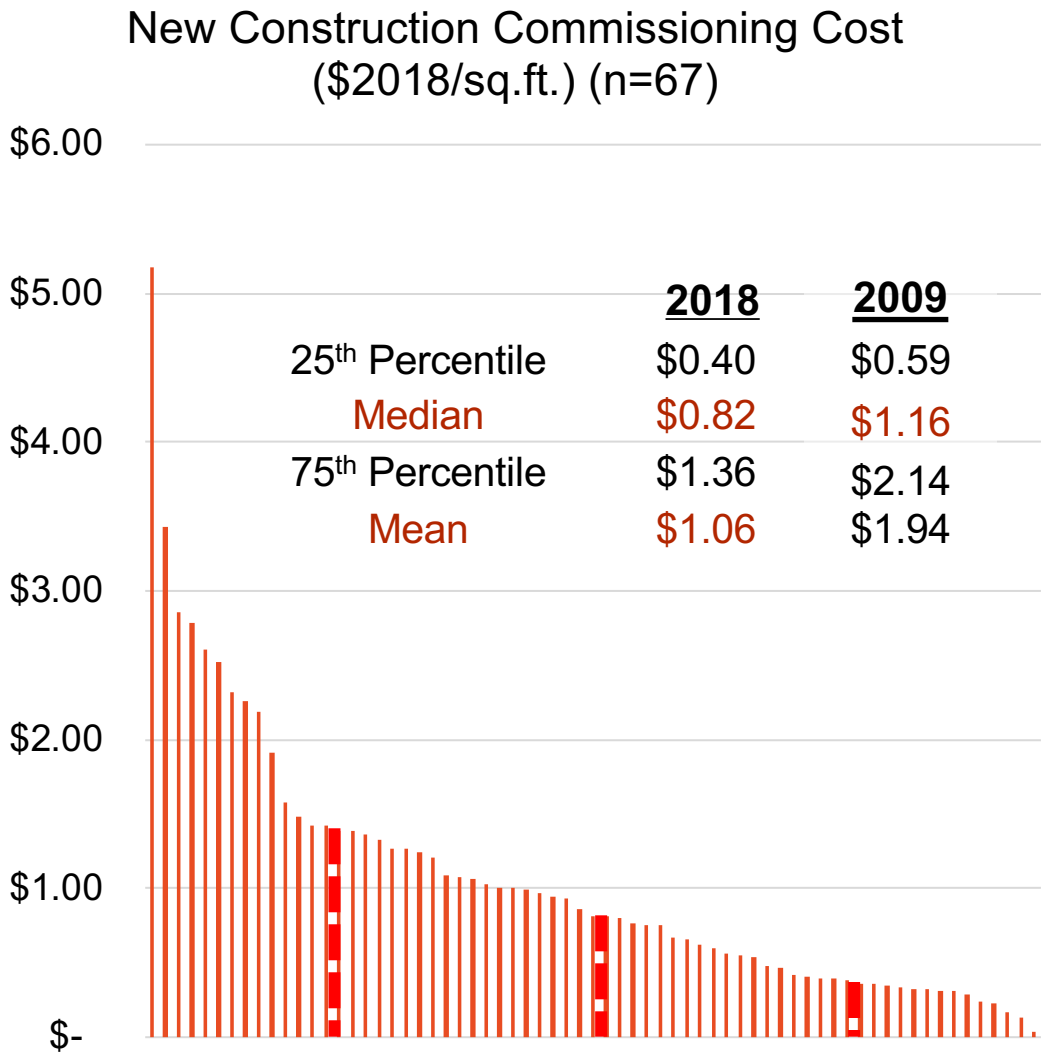
New Construction Cx	2009 Study	2018 Study
# of Buildings	82	101
# of Projects (w/cost data)	74	67
Floor Area (SF)	8,813,925	22,217,059
Construction Cost	$2.2B	$10.1B
# of States Represented	10	18

Existing Building Cx	2009 Study	2018 Study
# of Buildings (total)	562	738
# of Projects (w/energy savings data)	300	604
Floor Area (SF)	90,410,884	274,159,847
# of States Represented	21	18

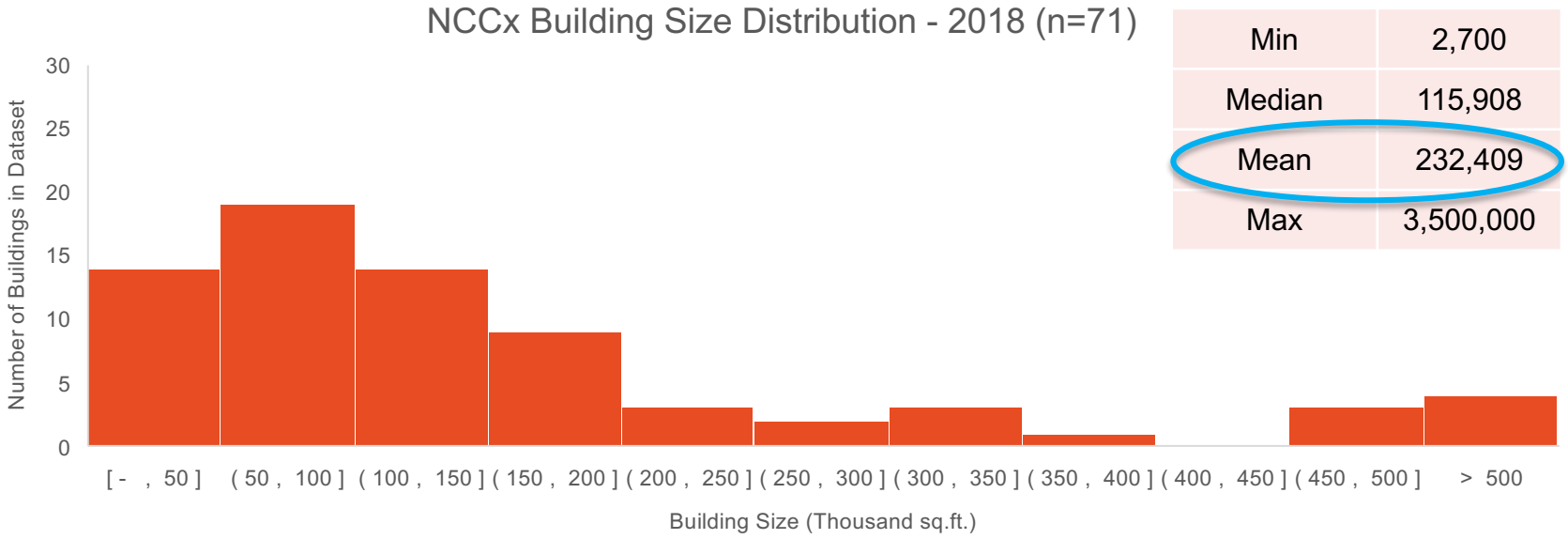
Discussion Topics

- Building data: Preliminary narratives regarding Cx Value metrics
  1. **NCCx – Commoditization Concerns**
  2. **NCCx – Market Demand Factors**
  3. **EBCx – Savings and ROI**
- Review Data Survey Results
  - What's Changed?
  - Check Calibration
  - Market Drivers & Issues

#1–NCCx Cost per Square Foot

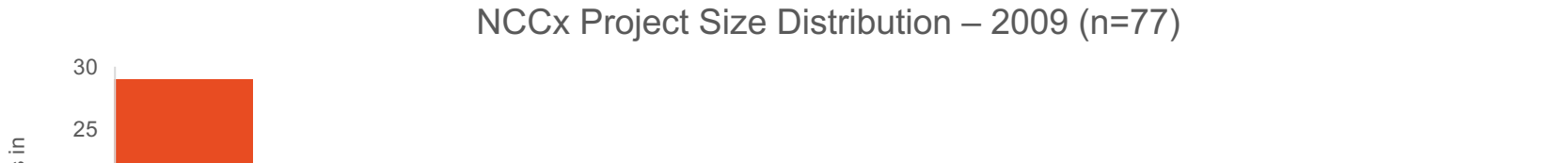


#1–Building Size Distribution: NCCx

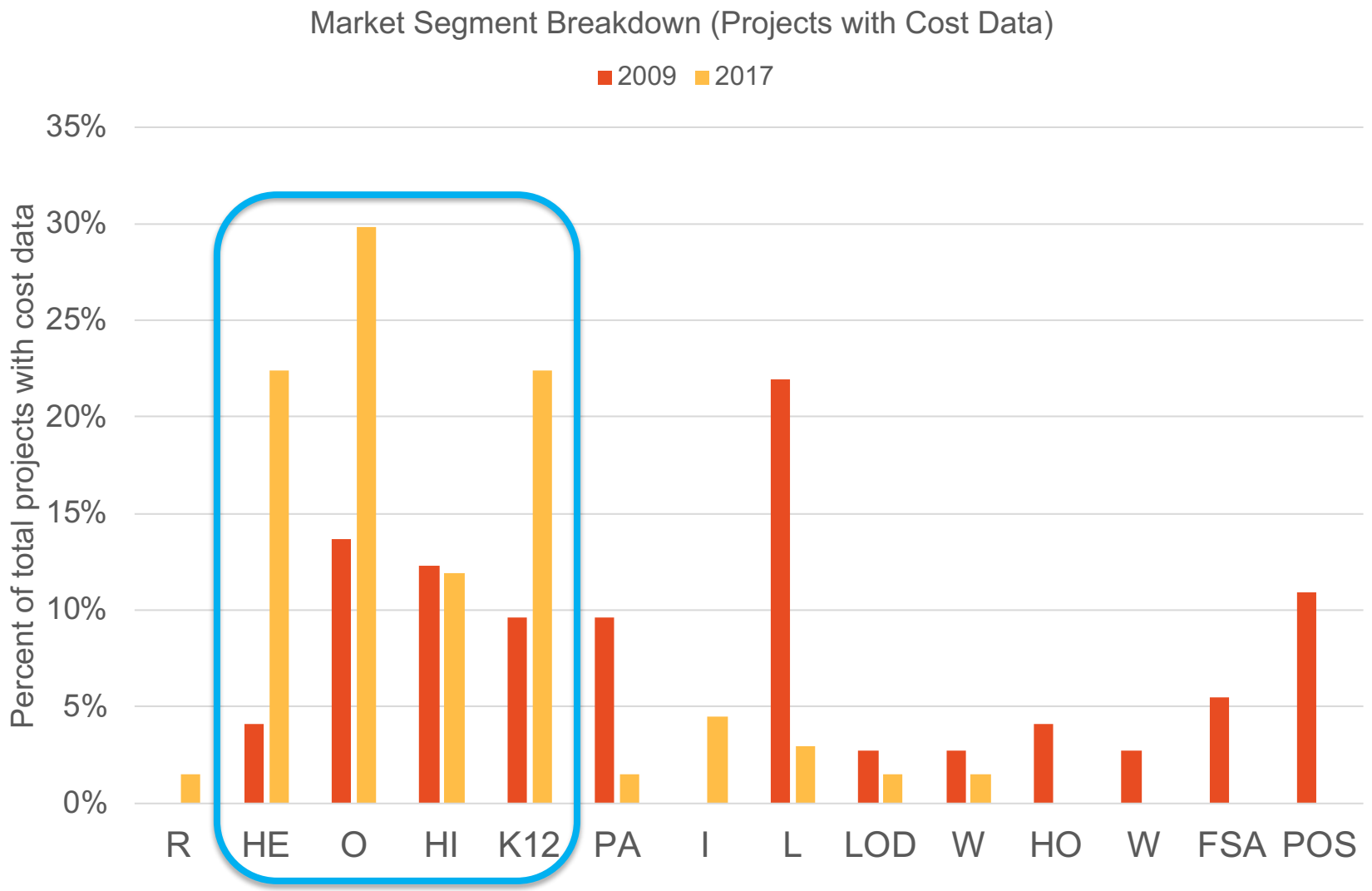


Min	2,700
Median	115,908
Mean	232,409
Max	3,500,000

Min	1,227
Median	69,500
Mean	114,467
Max	685,000



#1–NCCx Cost by Building Type



#1–NCCx Cost by Building Type

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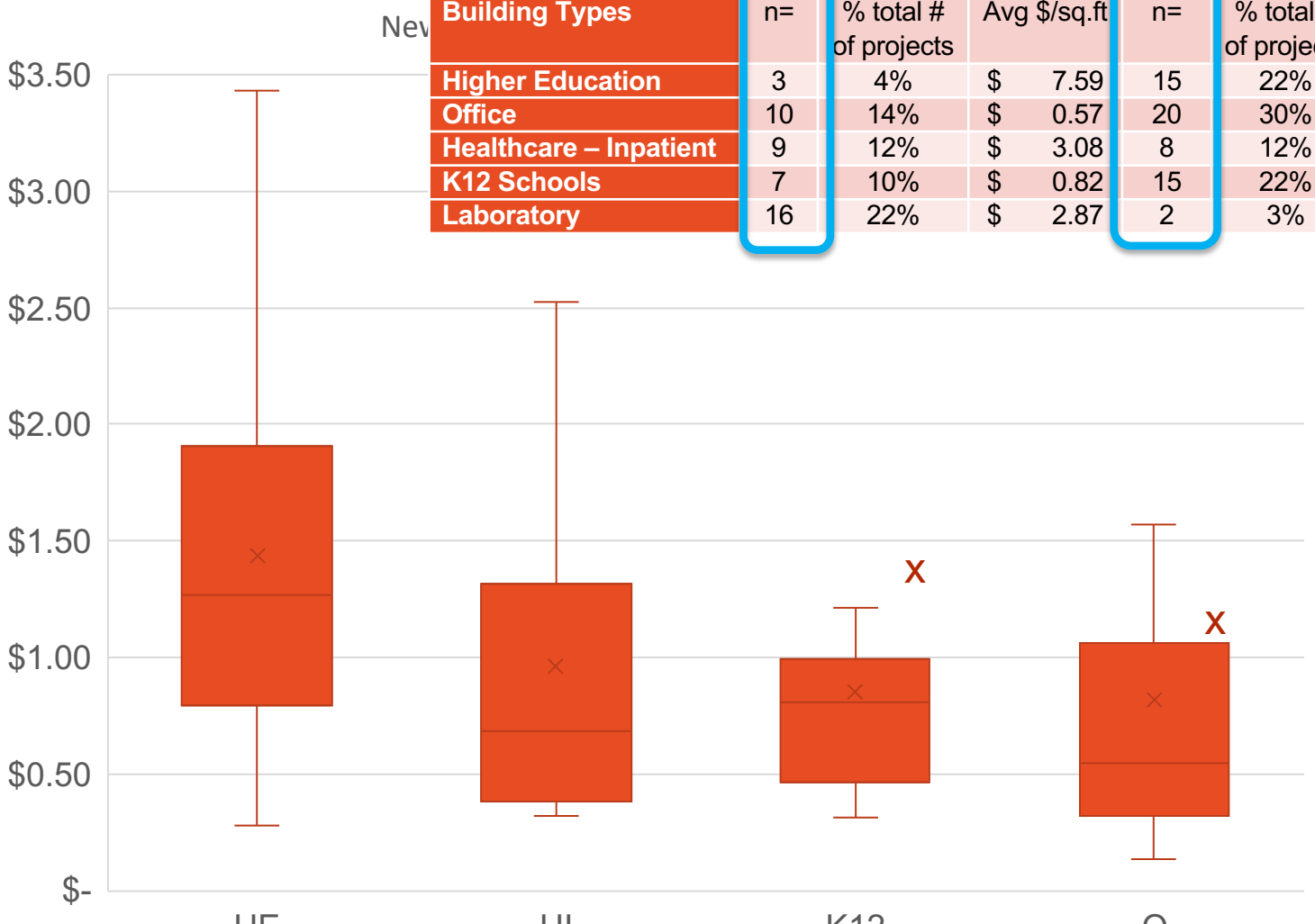
Building Types	2009 n=	2009 % total # of projects	2009 Avg $/sq.ft	2018 n=	2018 % total # of projects	2018 Avg $/sq.ft
Higher Education	3	4%	$ 7.59	15	22%	$ 1.44
Office	10	14%	$ 0.57	20	30%	$ 0.82
Healthcare – Inpatient	9	12%	$ 3.08	8	12%	$ 0.96
K12 Schools	7	10%	$ 0.82	15	22%	$ 0.85
Laboratory	16	22%	$ 2.87	2	3%	$ 0.79



#1–NCCx Cost by Building Type

	2009			2018		
Building Types	n=	% total # of projects	Avg $/sq.ft	n=	% total # of projects	Avg $/sq.ft
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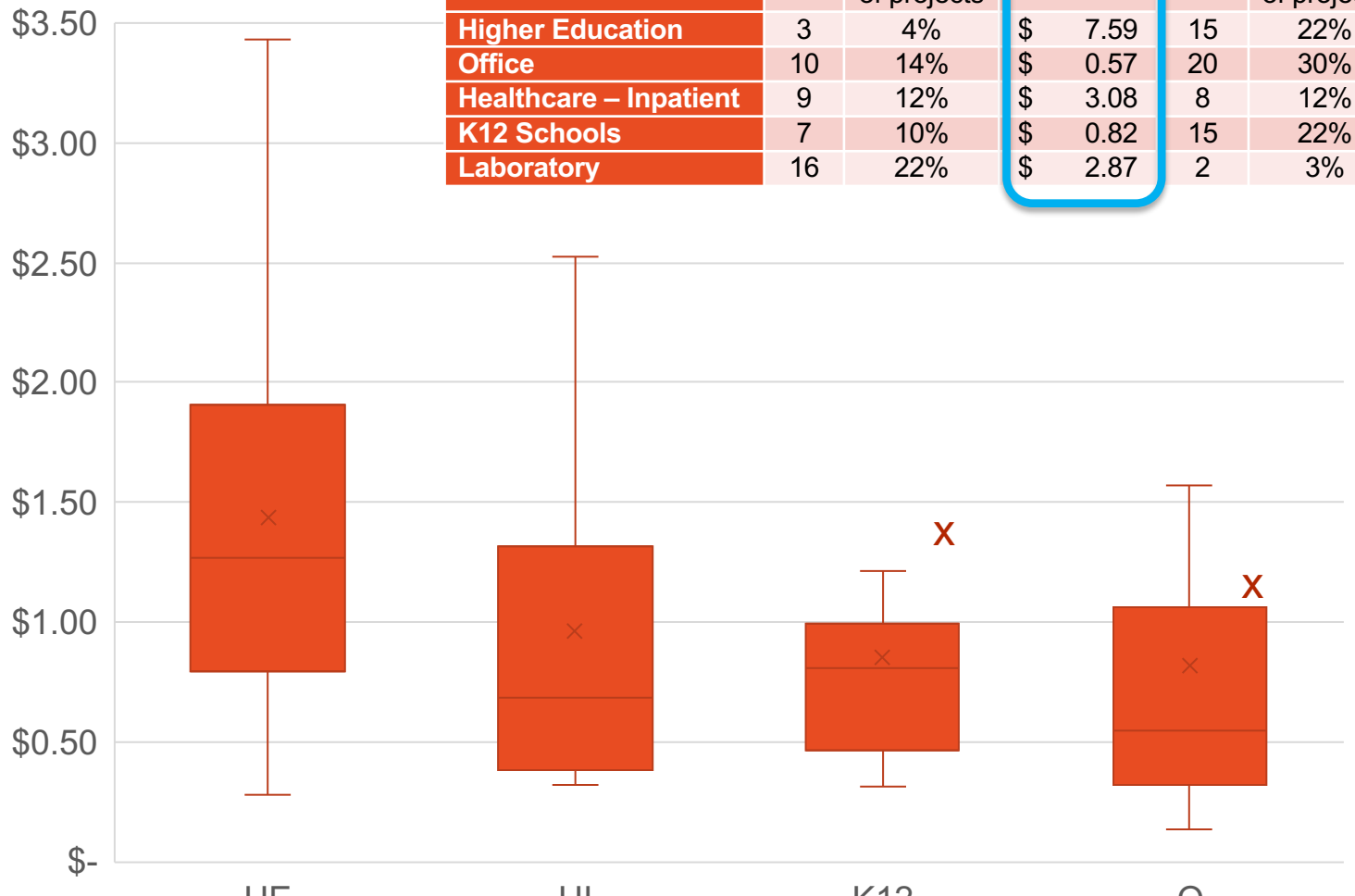
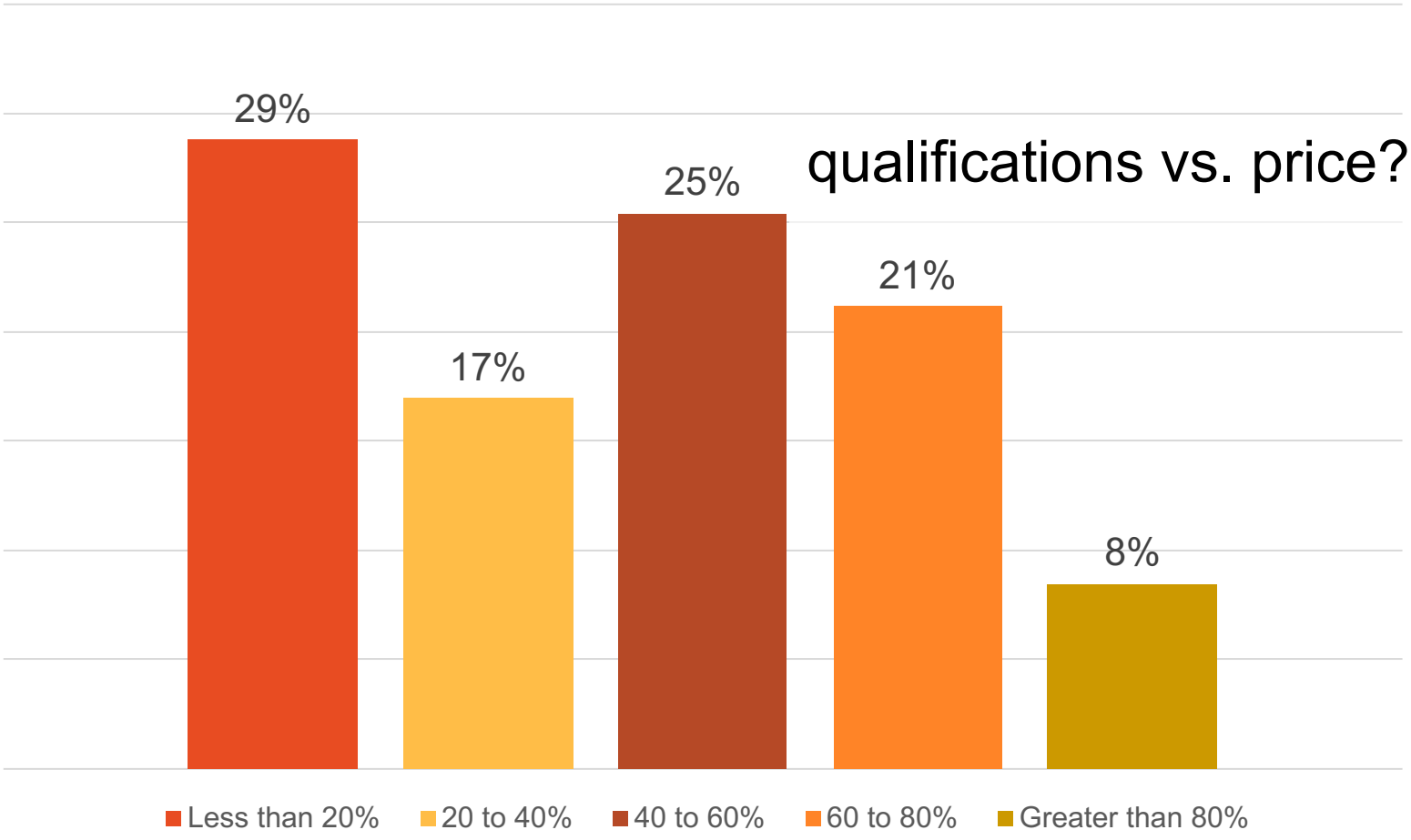
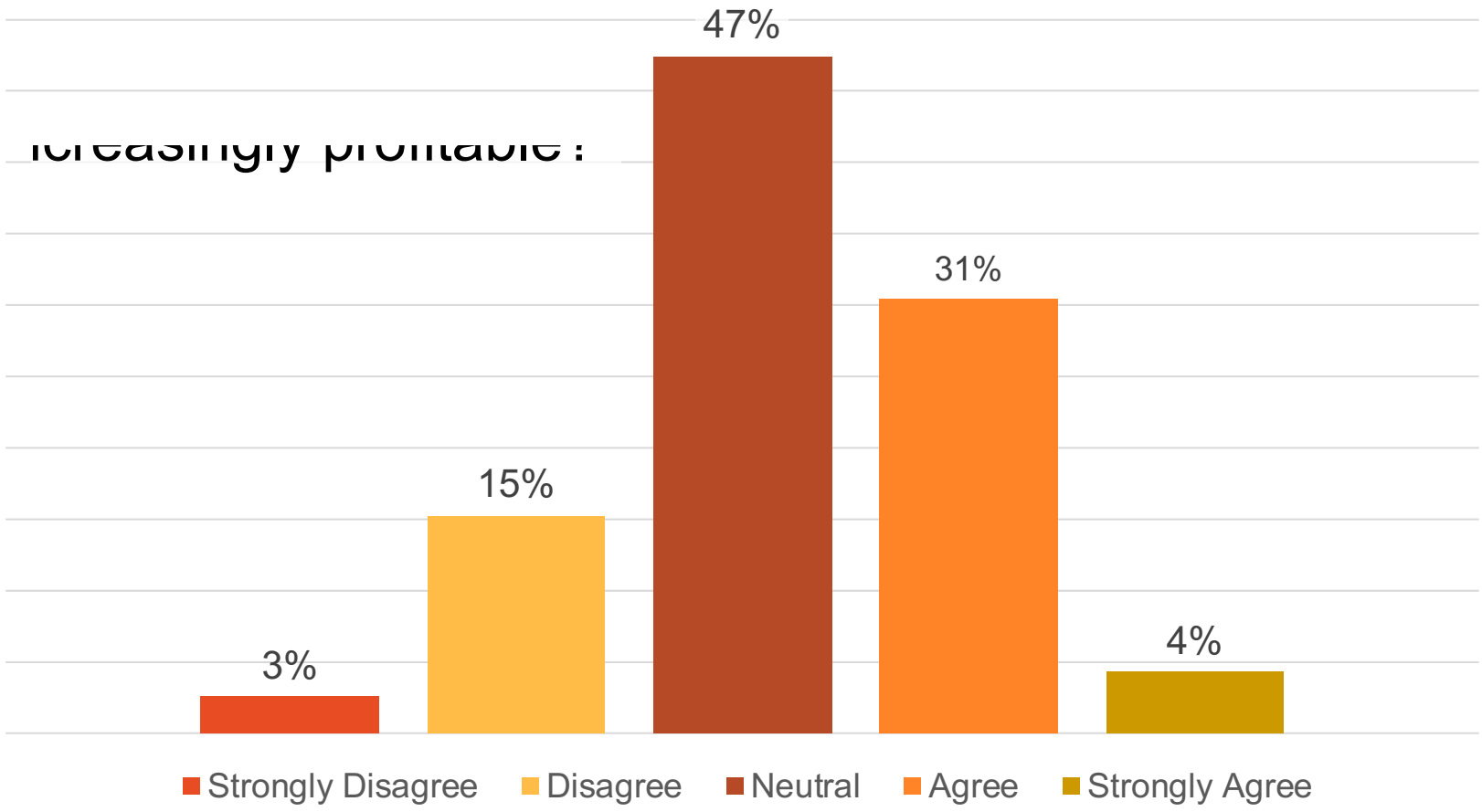


#1–NCCx Cost: Qualifications vs. Price Based Selections



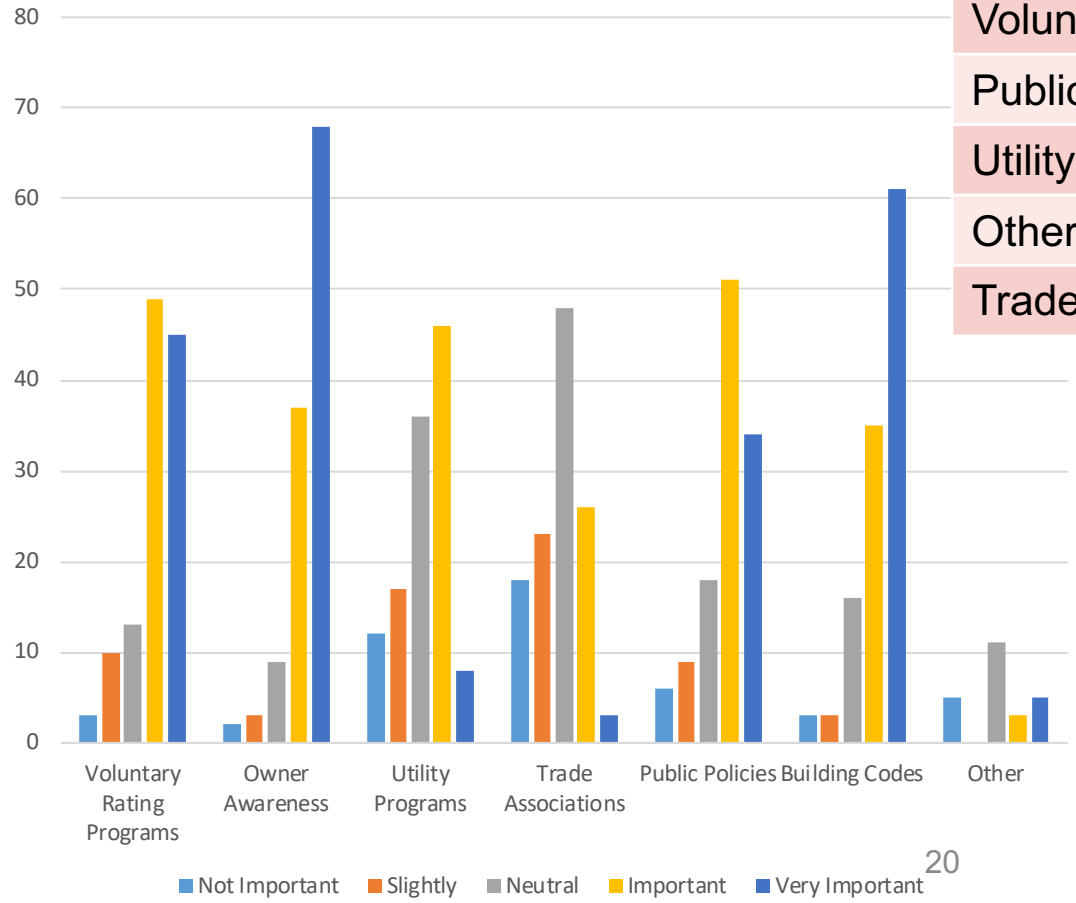
#1–NCCx Cost: Cx is increasingly profitable?



#1–NCCx Commoditization Concerns

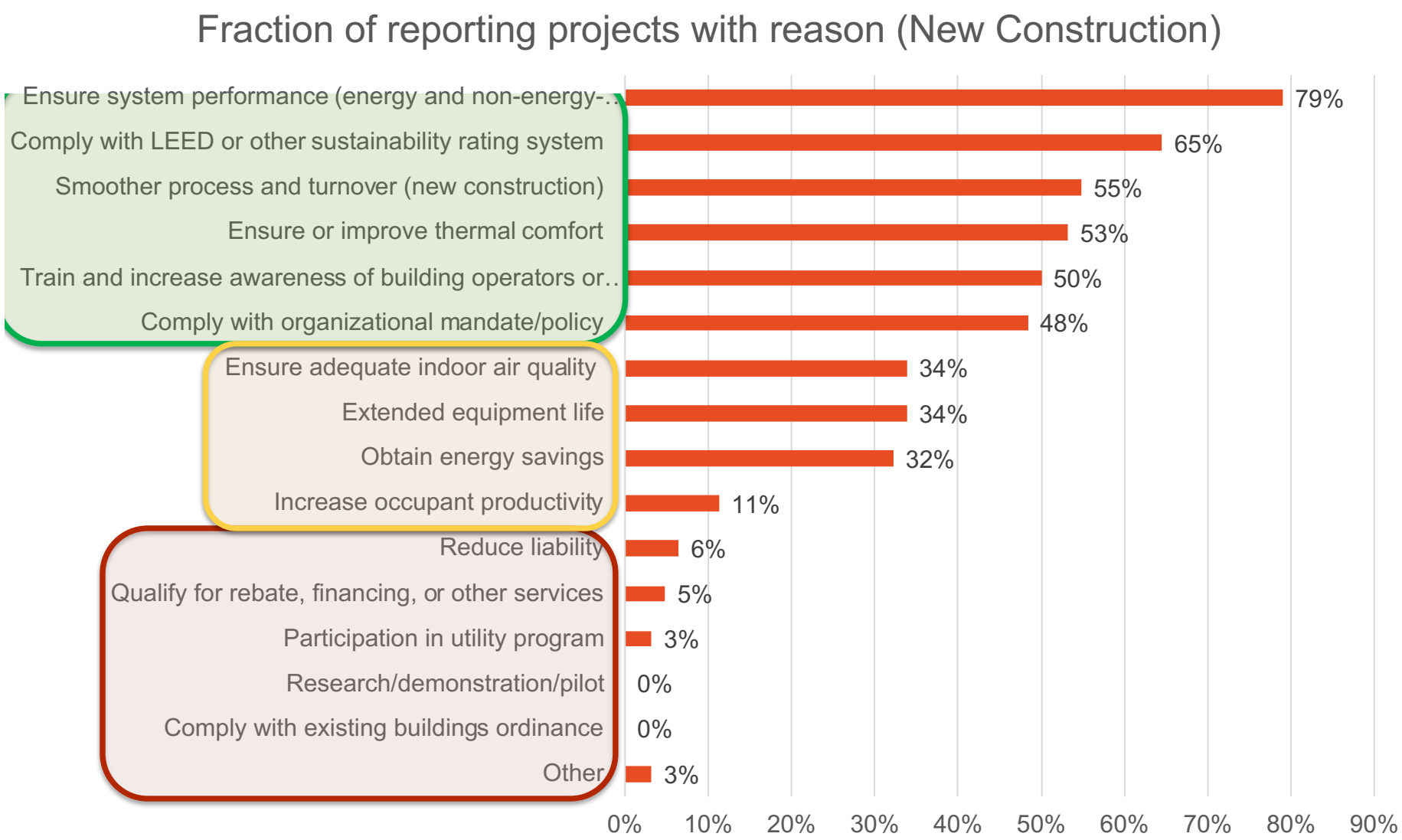
1. Overall **NCCx costs/SF** are lower, but…..
2. 2018 data field contains 2X more **SF per building**
3. **Building type** mix is different. Less data for Public Assembly, Laboratories, and Public Safety (higher $/SF in 2009).
4. NCCx fee ranges for higher education and healthcare are less volatile than 2009. NCCx fee ranges for office and schools are more stable (and increasing).
5. Over 40% of NCCx work is selected based on **qualifications vs. price**
6. Cx firms are reporting stable/increased **project profitability**
7. ***Be very careful to qualify NCCx costs using other metrics than just overall $/SF***
8. ***Use a range to report NCCx costs***

#2 – Reasons for Executing NCCx



Factors that Drive Cx?	(Out of 5.0)
Owner Awareness	3.82
Building Codes	3.74
Voluntary Rating Programs	3.65
Public Policies	3.54
Utility Programs	3.11
Other	2.92
Trade Associations	2.75

#2 – Reasons for Implementing NCCx



#2 – Reasons for Implementing NCCx

Reasons that Increased (2009 to 2018)

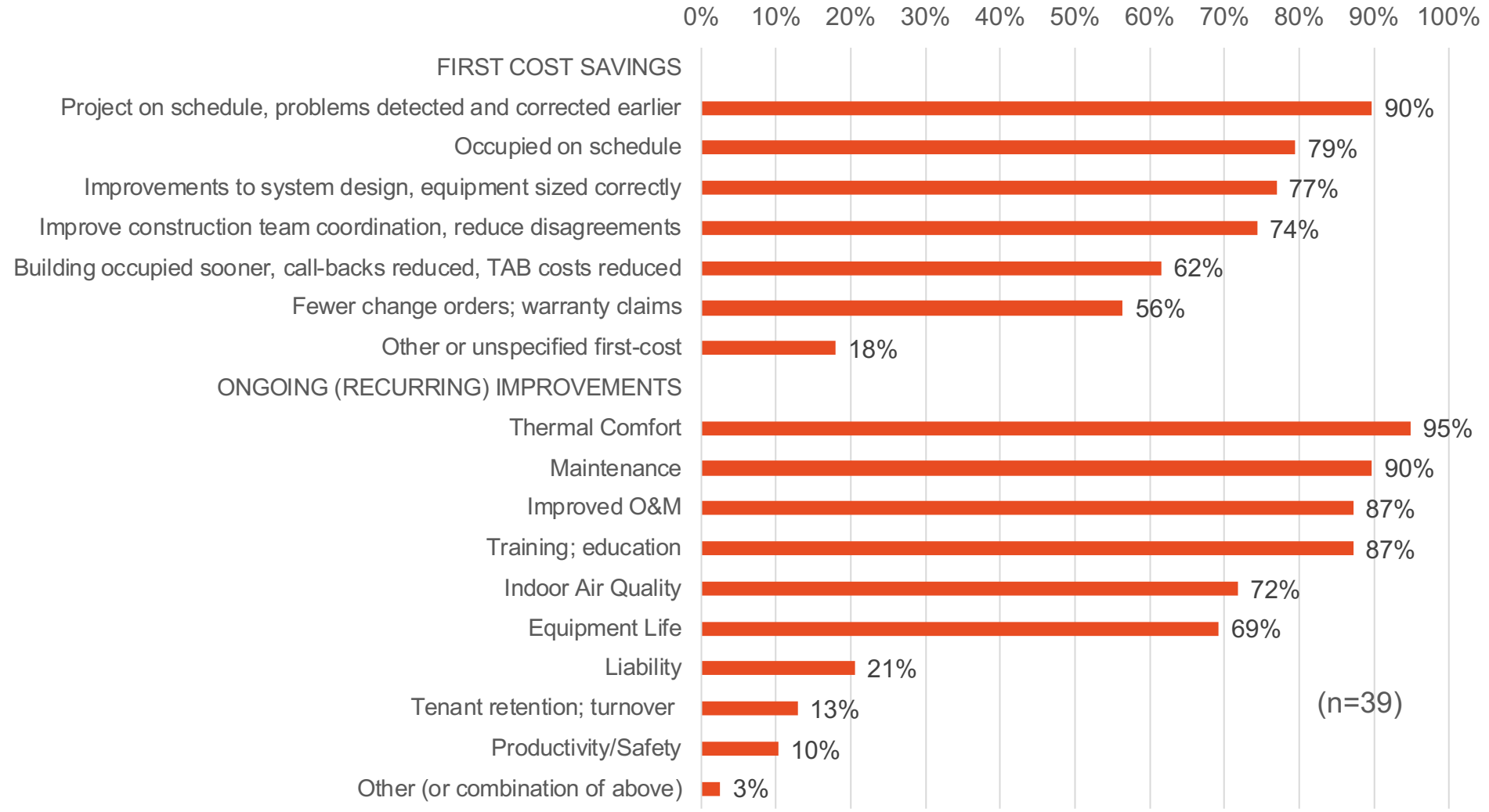
Fraction of reasons to embark on NCCx	2009	2018	Difference
Comply with LEED or other sustainability rating system	15%	65%	**50%**
Comply with organizational mandate/policy	0%	48%	**48%**
Smoother process and turnover (new construction)	26%	55%	**29%**

#2 – Reasons for Implementing NCCx

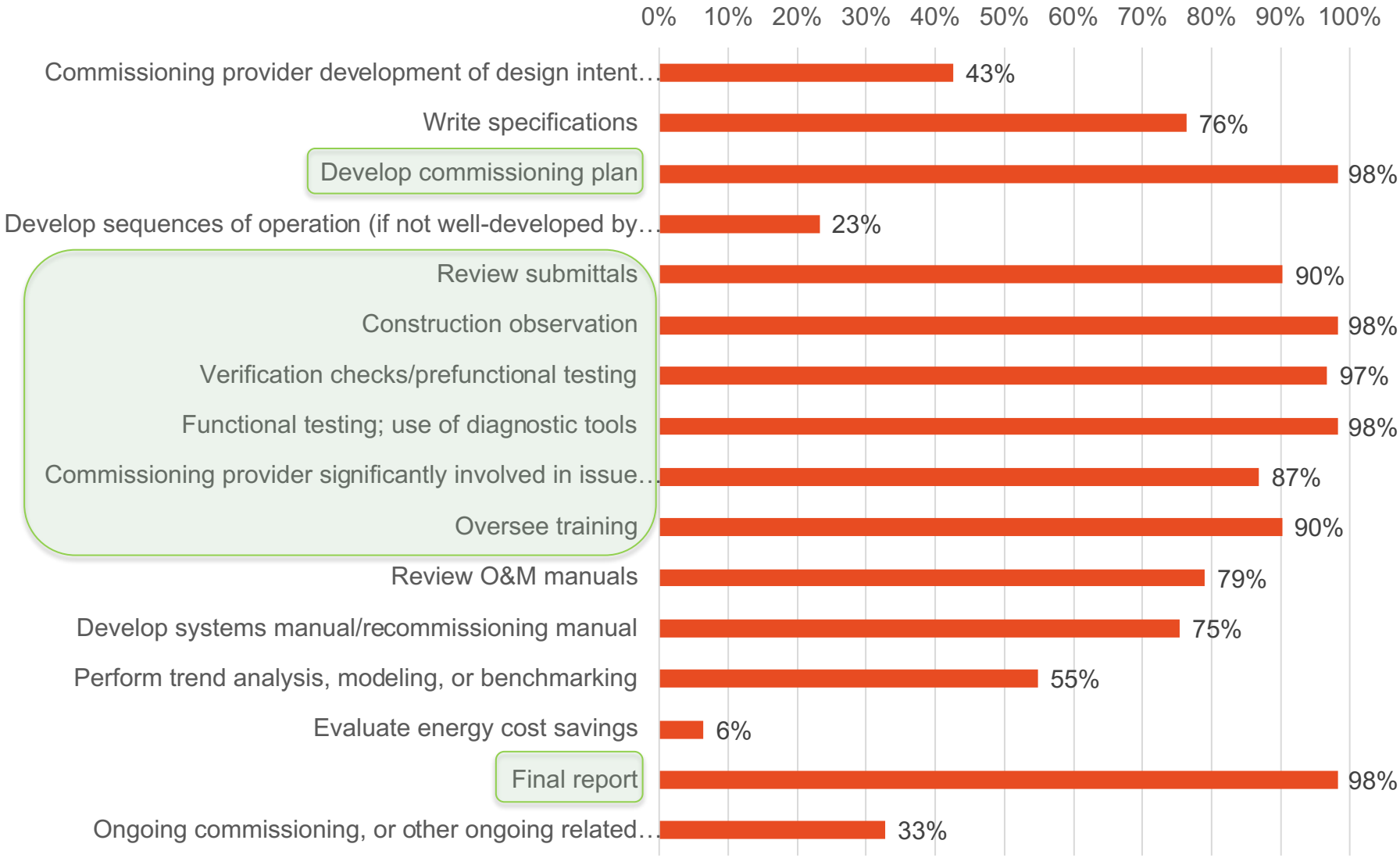
Reasons that Decreased (2009 to 2018)

Fraction of reasons to embark on NCCx	2009	2018	Difference
Ensure adequate **indoor air quality**	75%	34%	**-41%**
Participation in utility program	42%	3%	**-39%**
Obtain **energy savings**	65%	32%	**-33%**
Ensure or improve **thermal comfort**	72%	53%	**-19%**
Train and increase awareness of building operators or occupants	61%	50%	**-11%**

#2 – NCCx: Projects Reporting Non-Energy Benefits



Activities included in New Construction Commissioning Scope (n=62)



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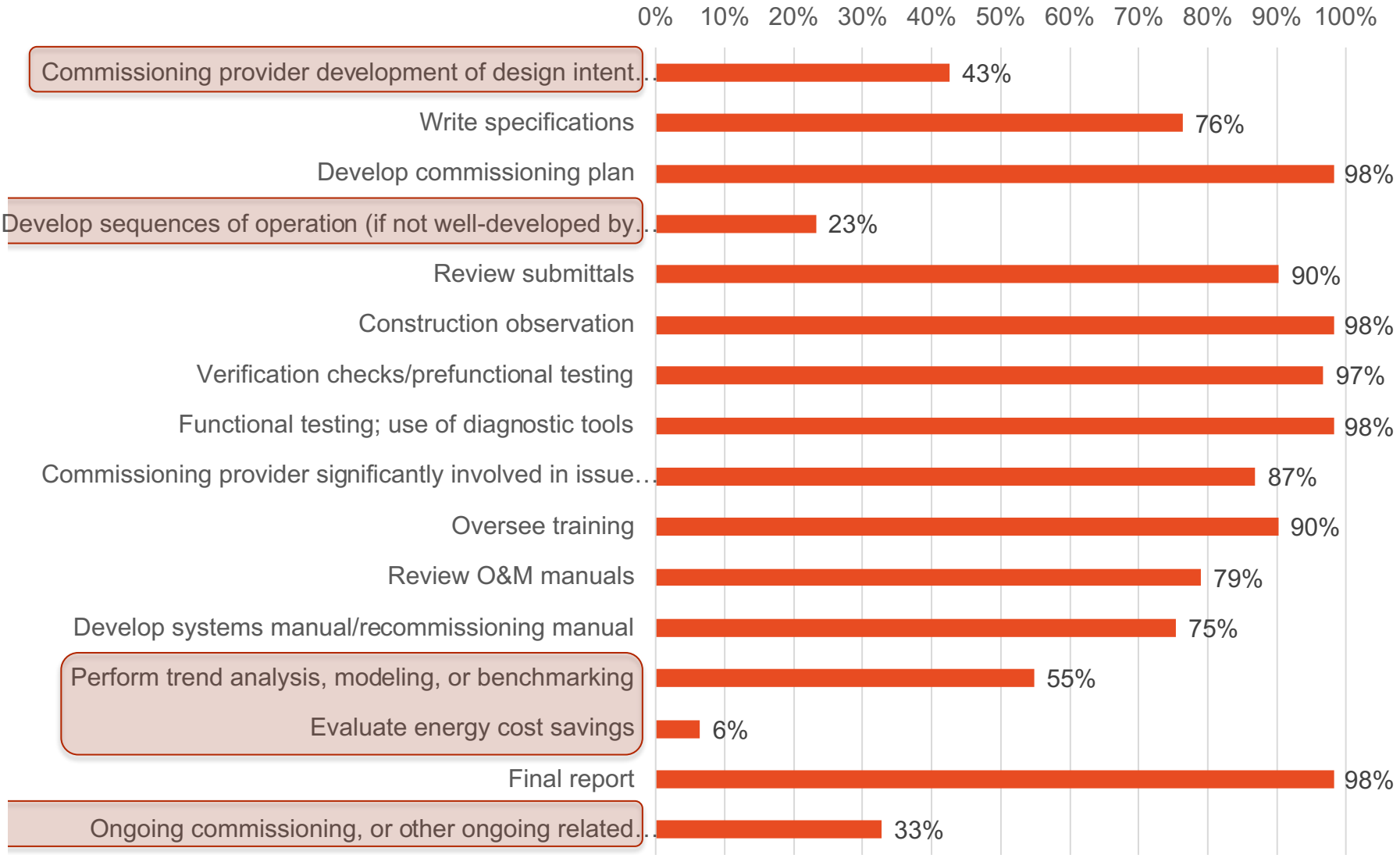
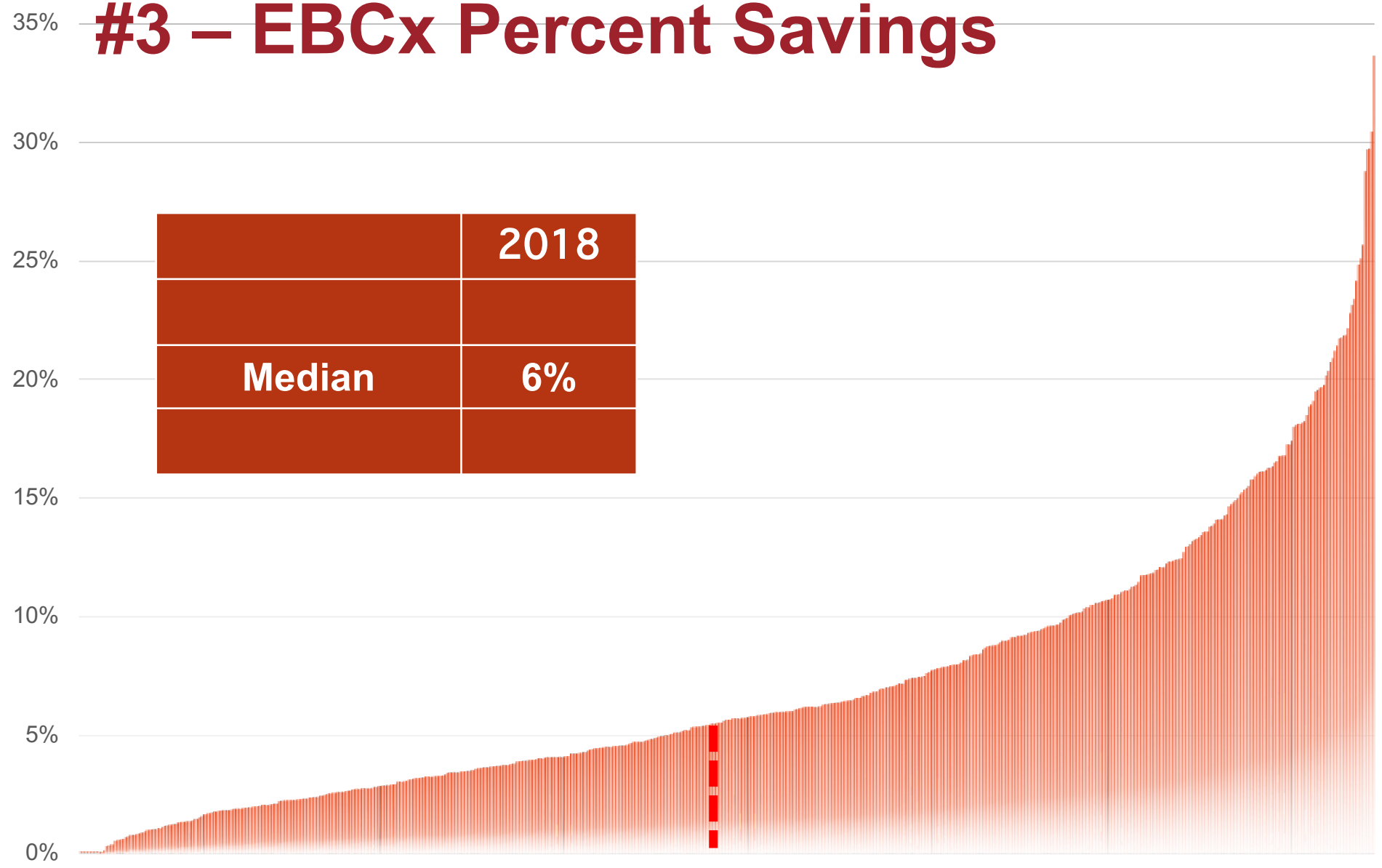


#2–NCCx Market Factors

1. Owner awareness – highest driving factor
2. NCCx demand driven by regulation and codes
3. Several non-energy benefits obtained thru NCCx
    a) Schedule improvement
    b) Smooth turnover
    c) Training
4. Building performance metrics (energy, IAQ) has lost some emphasis
5. Core Cx scope of work is performed on each project
6. Opportunity to improve frequency of scope items:
    a) OPR/Design Intent document
    b) Controls sequence development
    c) Energy cost calculations
    d) Post-occupancy tasks

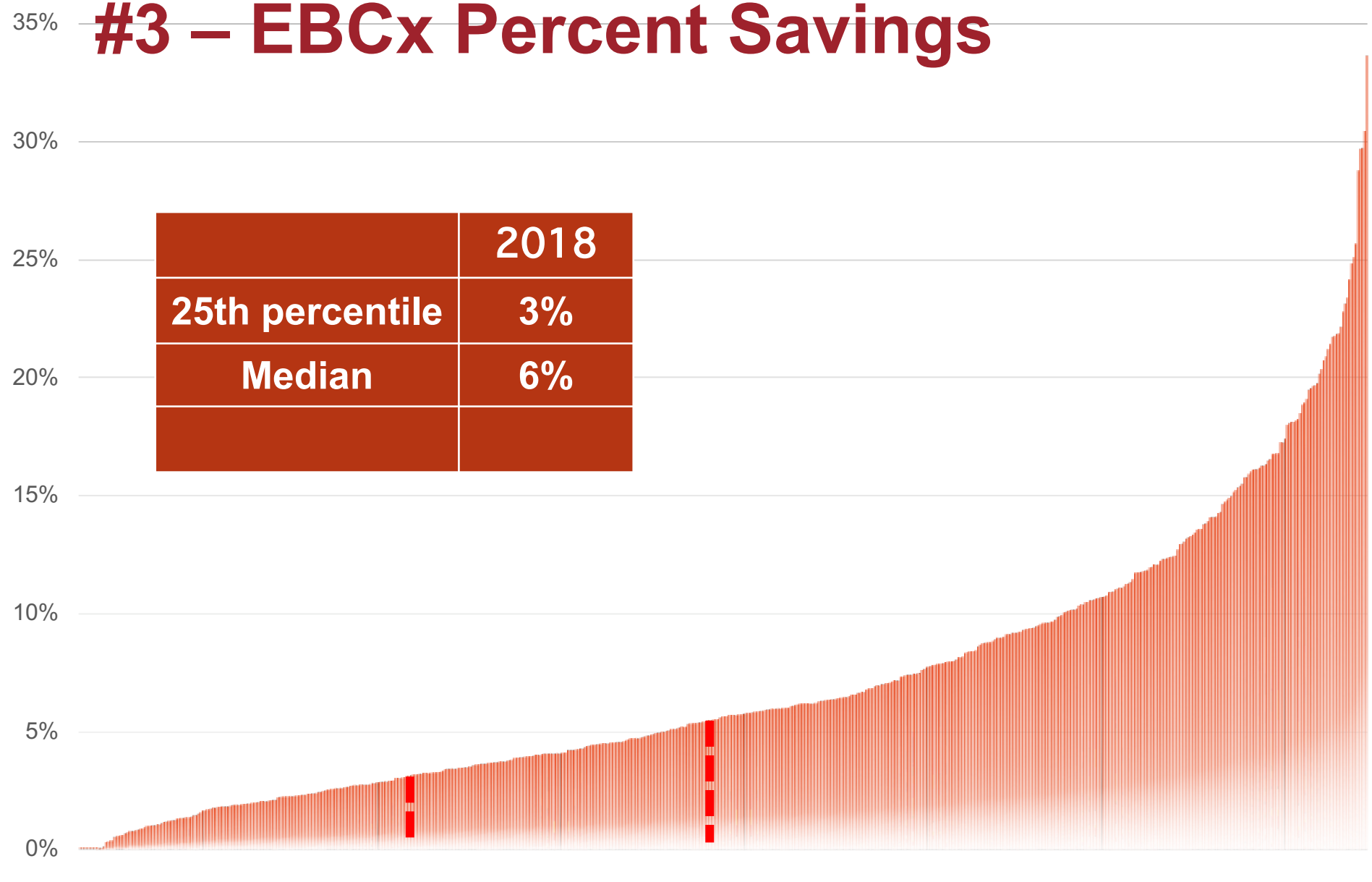
EBCx Percent Savings

#3 – EBCx Percent Savings



	2018
Median	6%

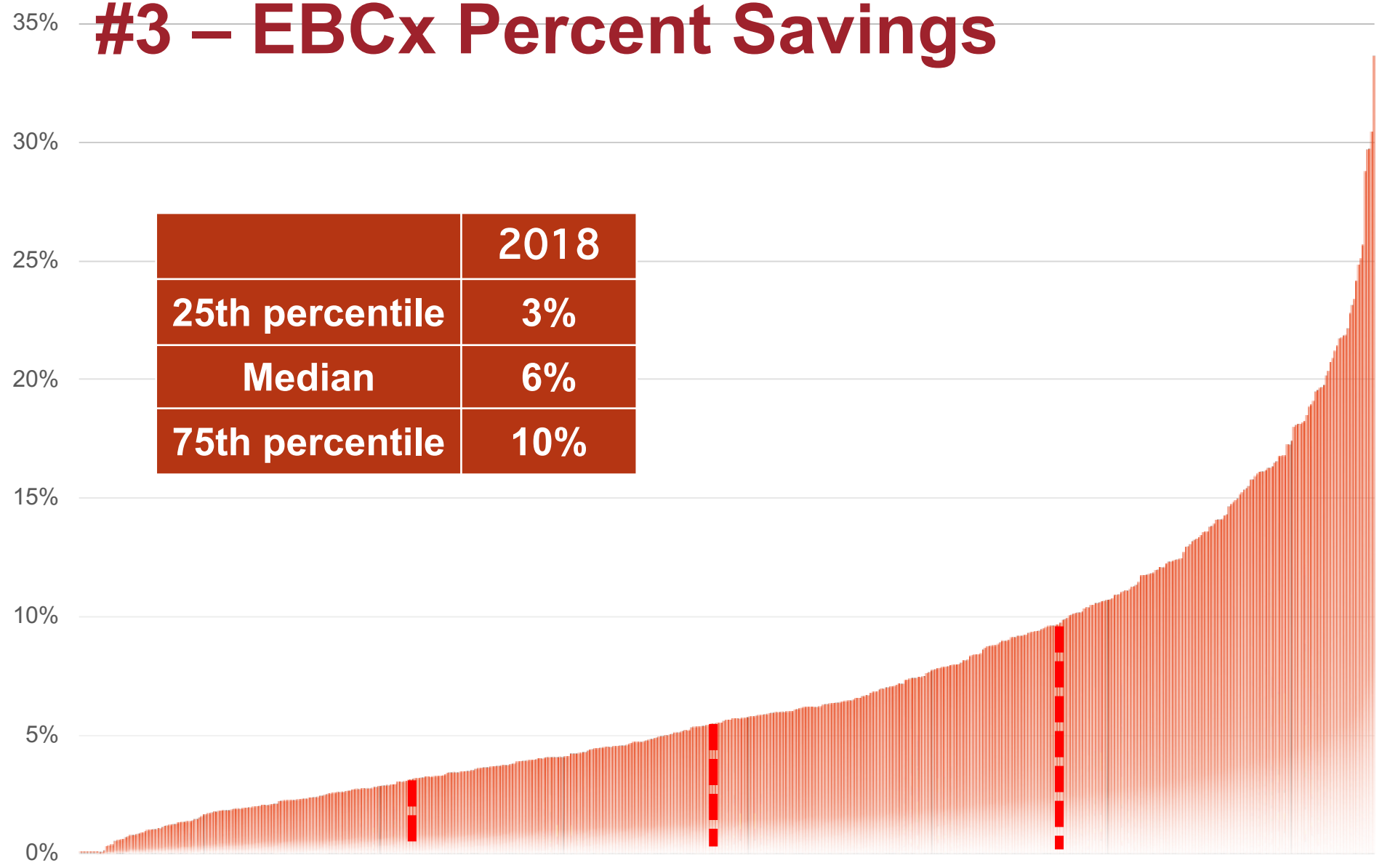
#3 – EBCx Percent Savings



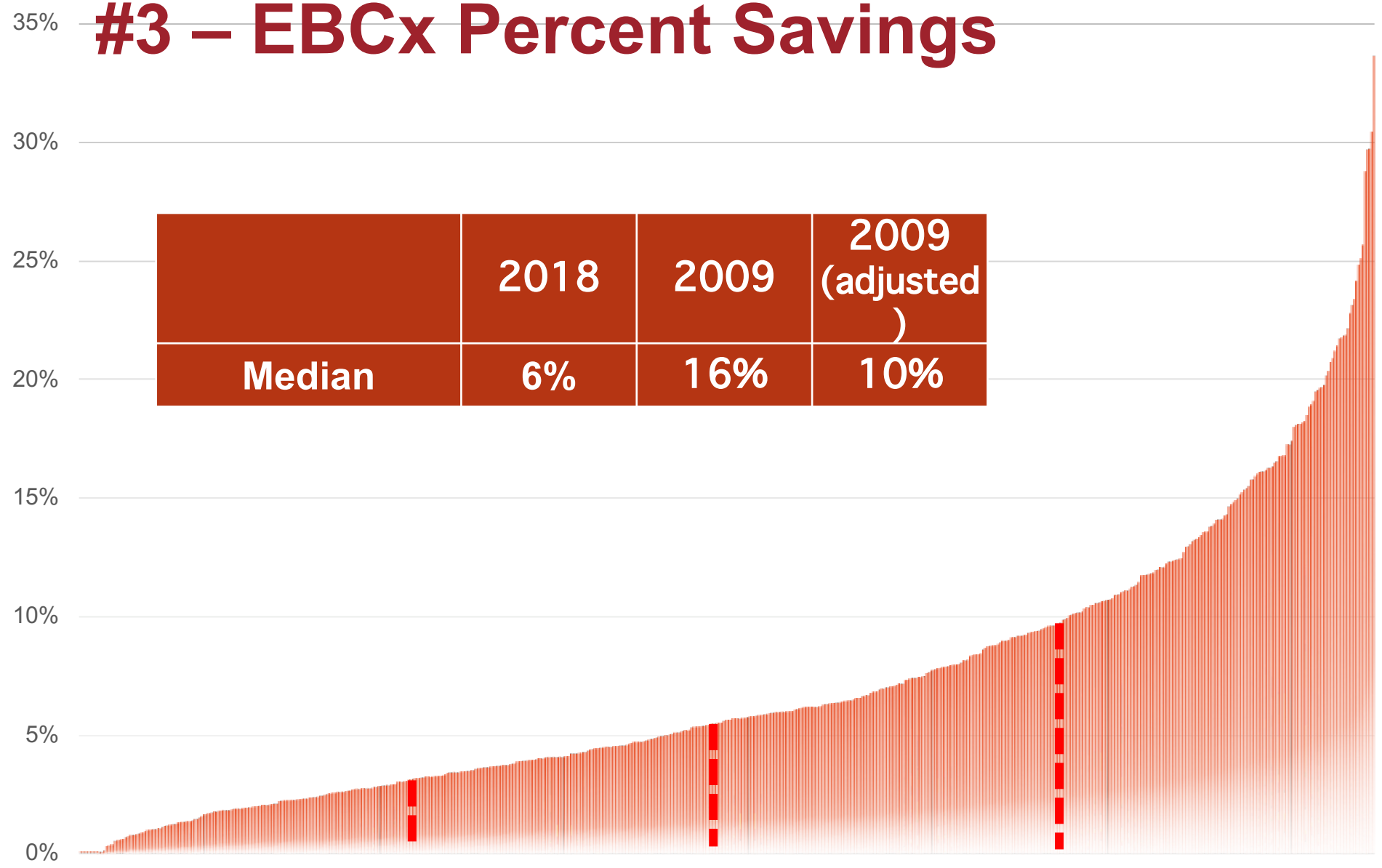
	2018
25th percentile	3%
Median	6%

#3 – EBCx Percent Savings

	2018
25th percentile	3%
Median	6%
75th percentile	10%

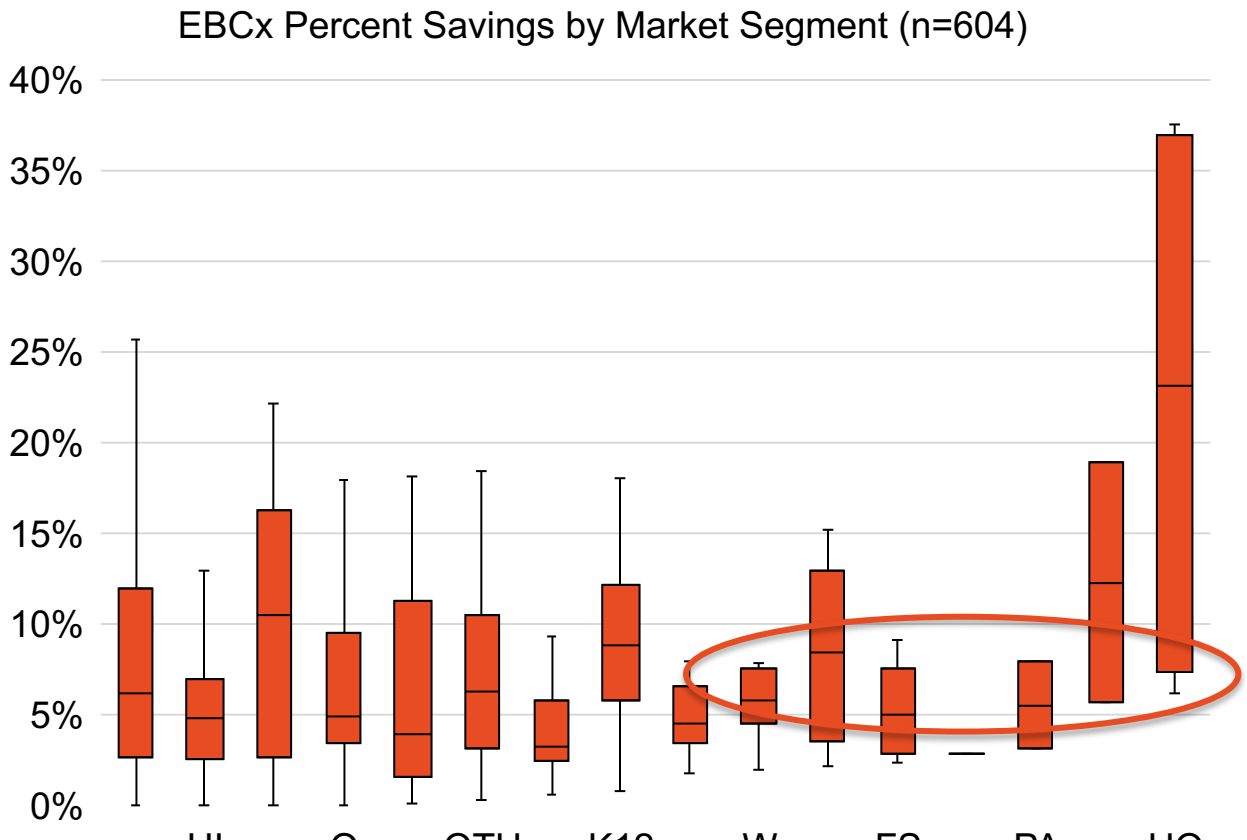


#3 – EBCx Percent Savings



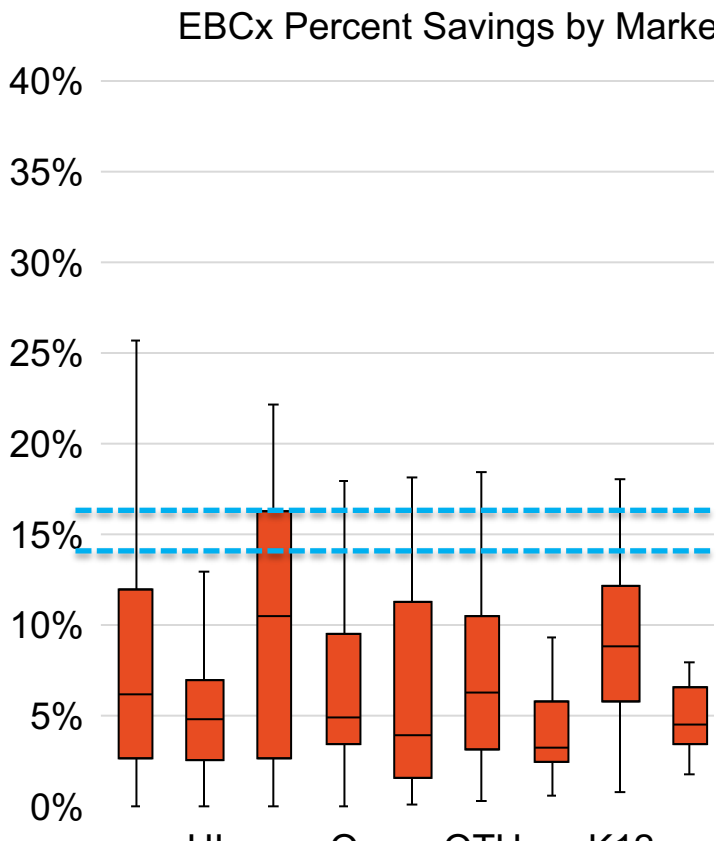
	2018	2009	2009 (adjusted)
Median	6%	16%	10%

#3 – EBCx Savings by Market Segment



HE	Higher Ed.	112
HI	Hospital (Inpatient)	115
R	Retail	30
O	Office	194
I	Industrial	10
OTH	Other	42
DC	Data Center	15
K12	K-12 School	42
LOD	Lodging	17
W	Warehouse	6
RW	Religious Worship	6
FS	Food Service	6
L	Lab	1
PA	Public Assembly	2
POS	Public Order & Safety	2
HO	Hospital (Outpatient)	4
		604

#3 – EBCx Savings by Market Segment



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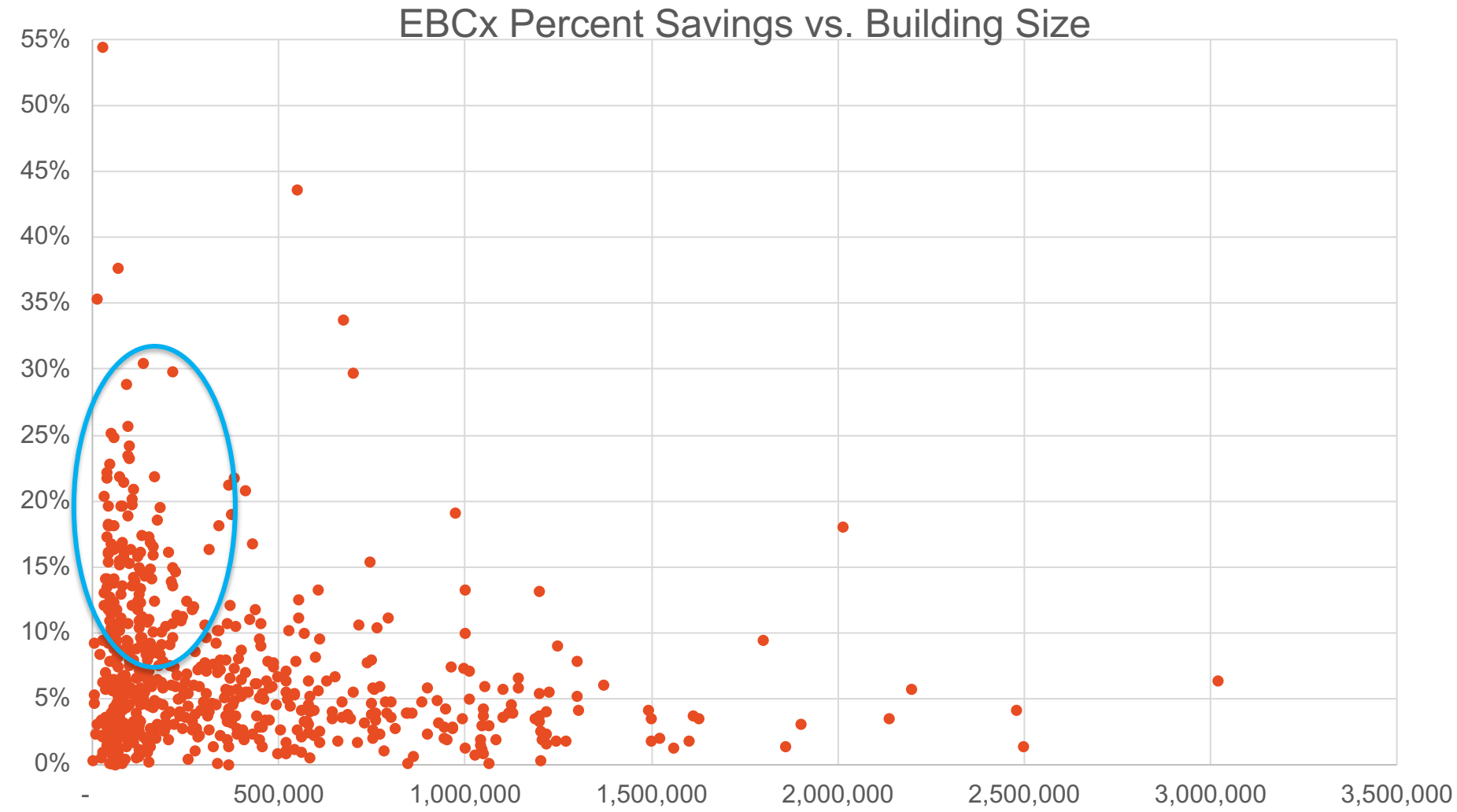
#3 – EBCx Percent Savings – Building Size



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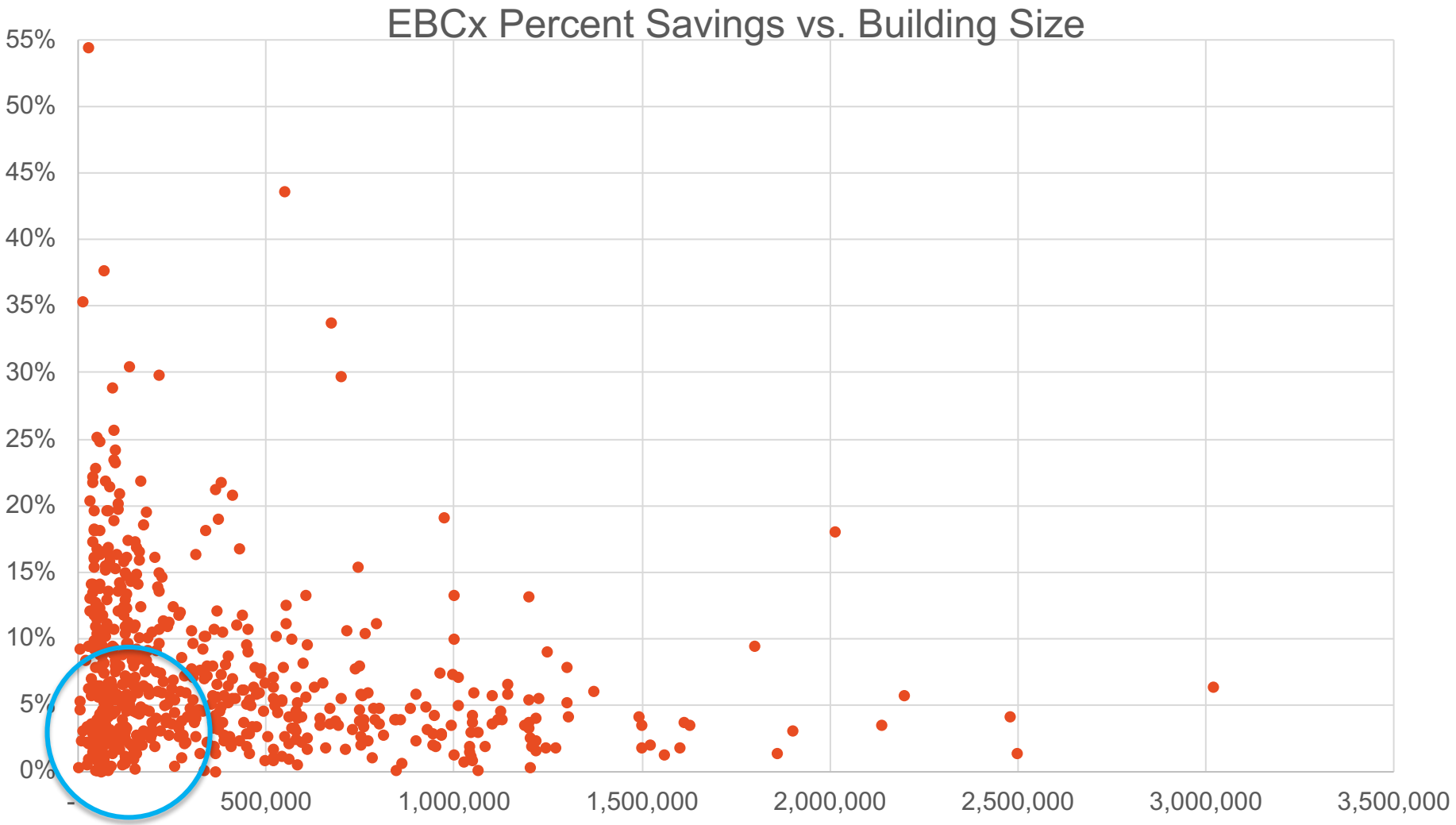
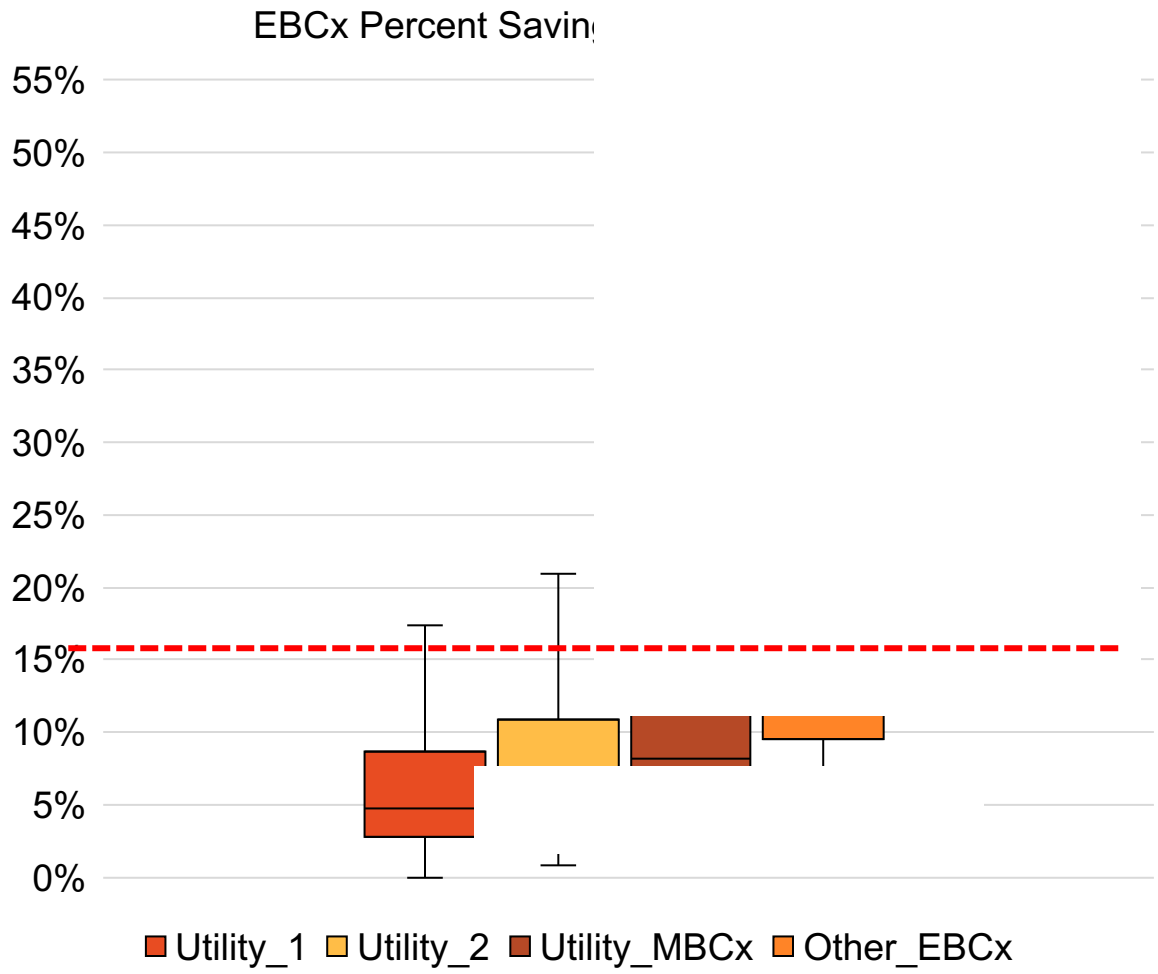


#3 – EBCx Percent Savings by Project Type



	Median	n
Utility_1	5%	411
Utility_2	7%	156

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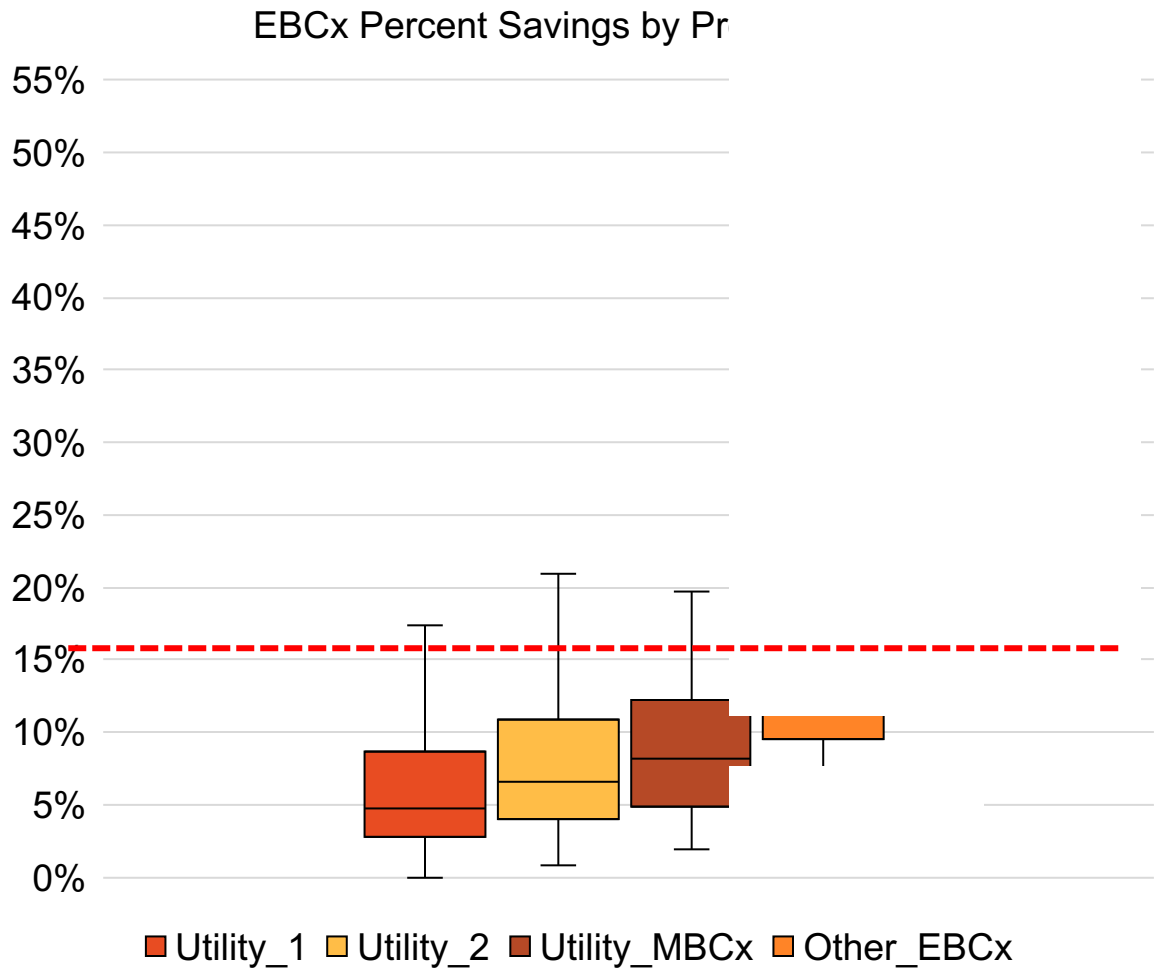

	Median	n
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Utility_2	7%	156
Utility_MBCx	8%	17

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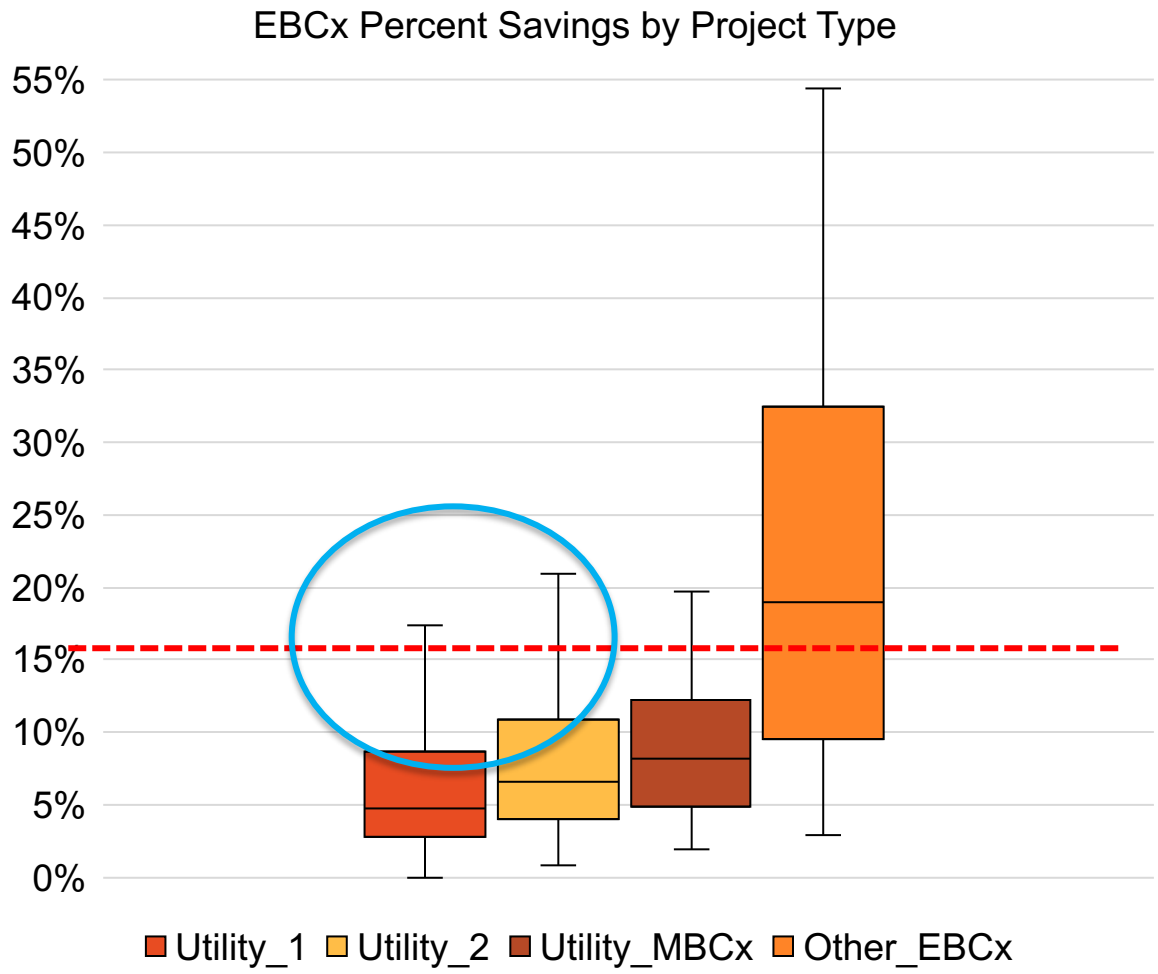
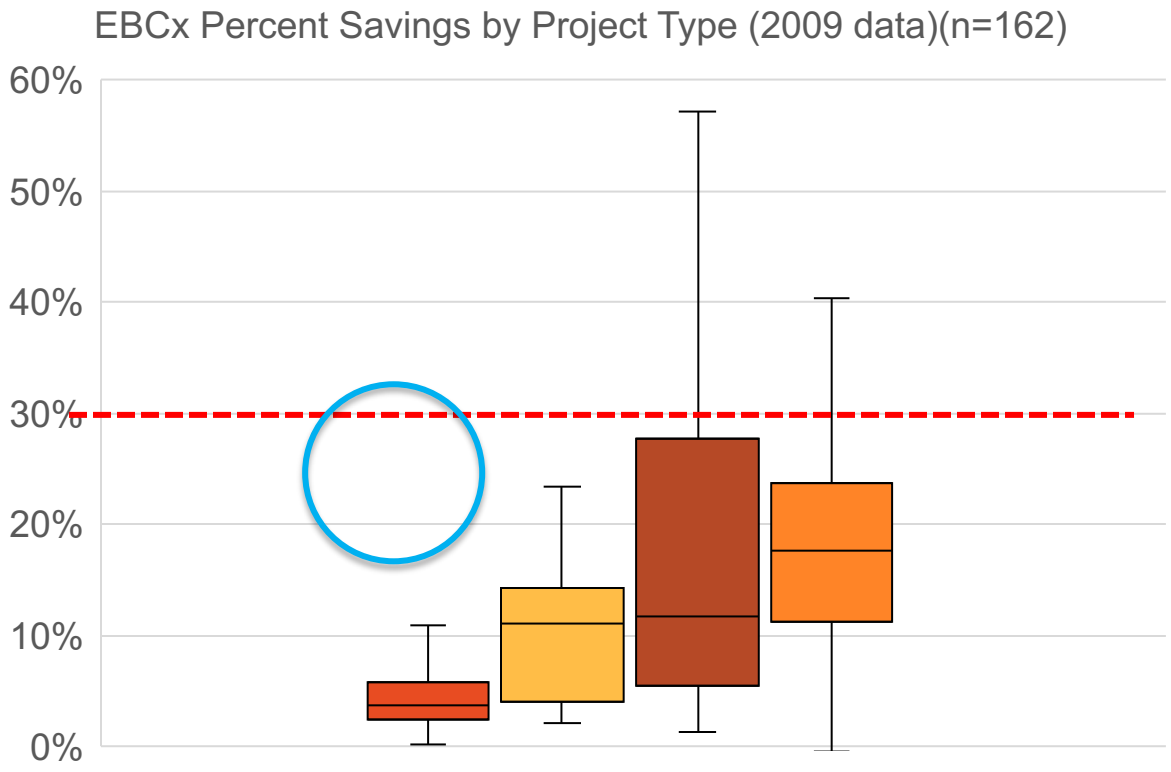


	Median	n
Utility_1	5%	411
Utility_2	7%	156
Utility_MBCx	8%	17
Other_EBCx	19%	13

#3 – EBCx Percent Savings by Project Type (2009 Data)

	Median	n
Utility_EBCx	4%	47
Utility_MBCx	11%	21
Other_EBCx	12%	54
Other_MBCx	18%	40



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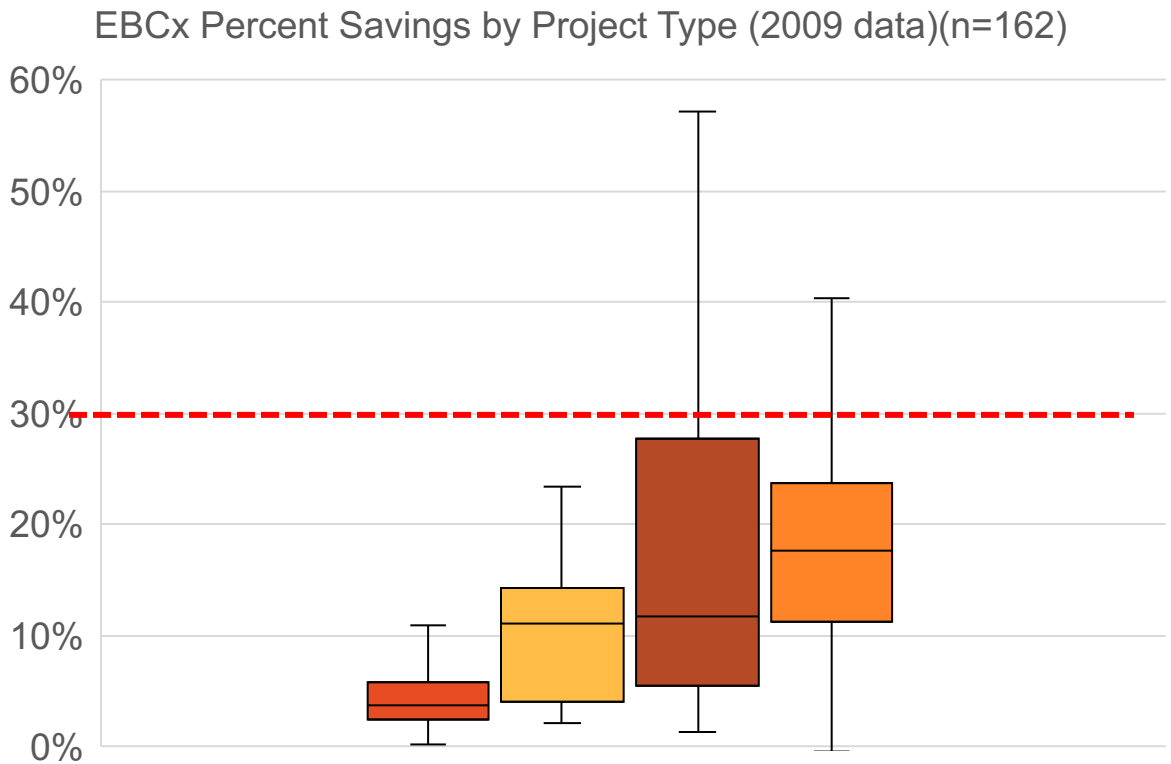
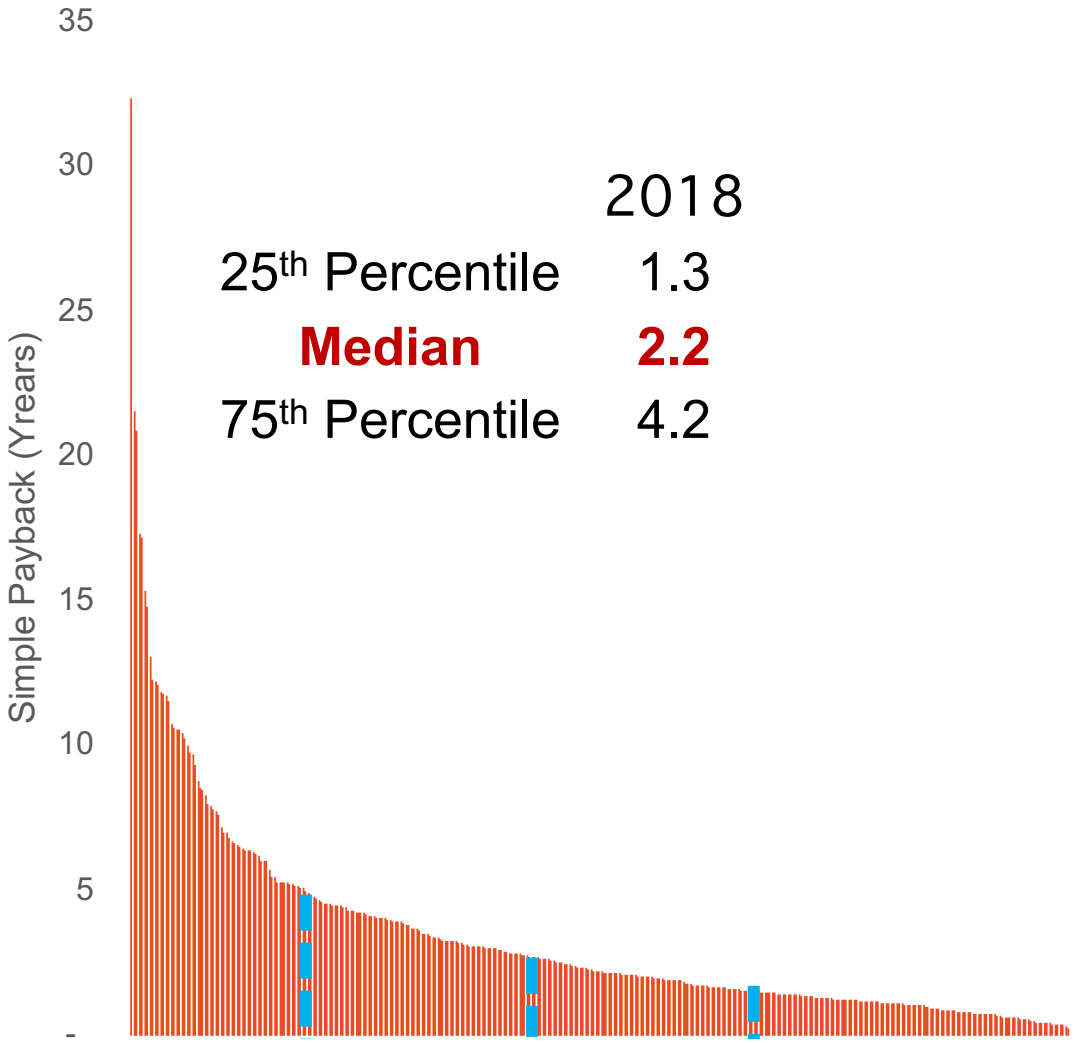


EBCx Simple Payback

#3 – EBCx Simple Payback (Years)

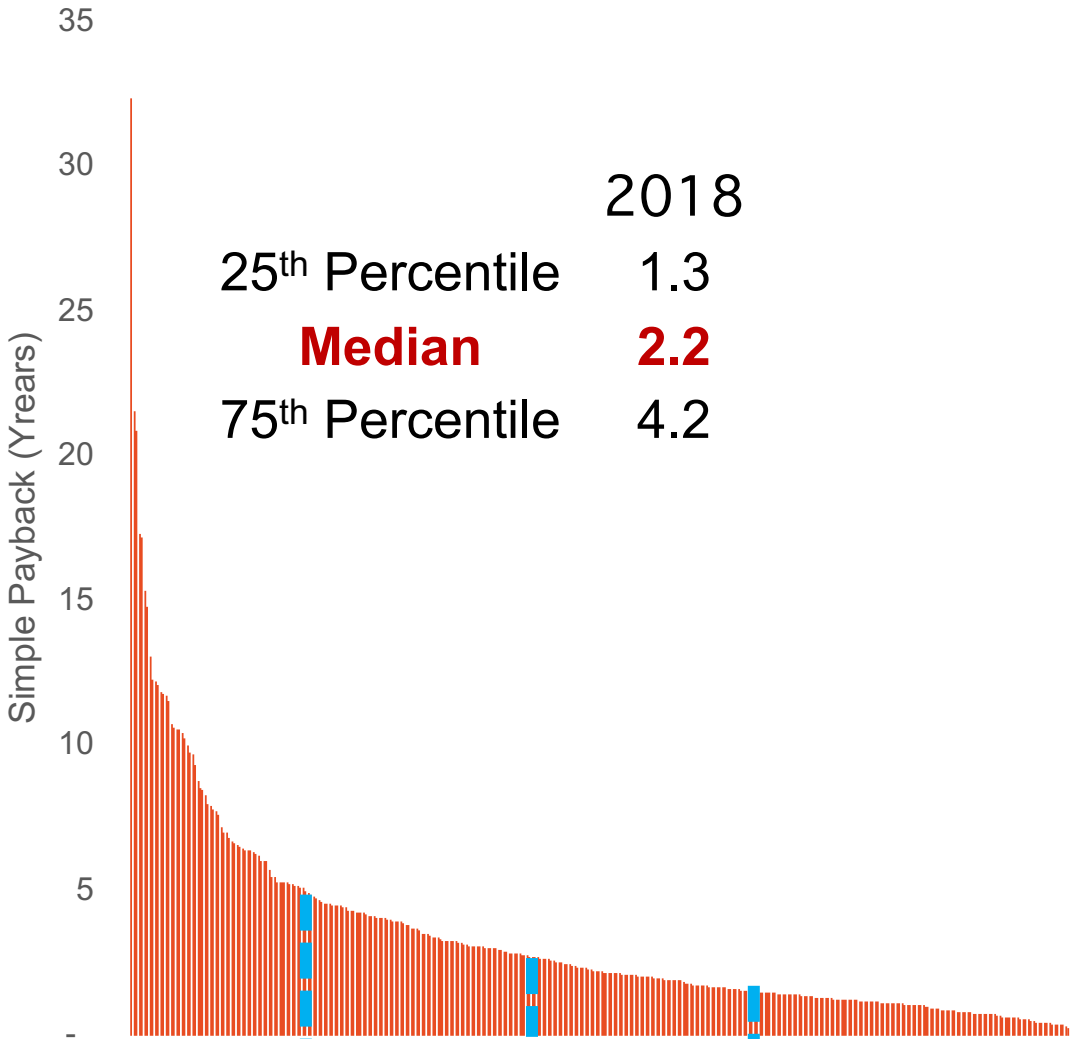
(n=356 bldgs.)



	2018
25th Percentile	1.3
Median	**2.2**
75th Percentile	4.2

#3 – EBCx Simple Payback (Years)

(n=356 bldgs.)

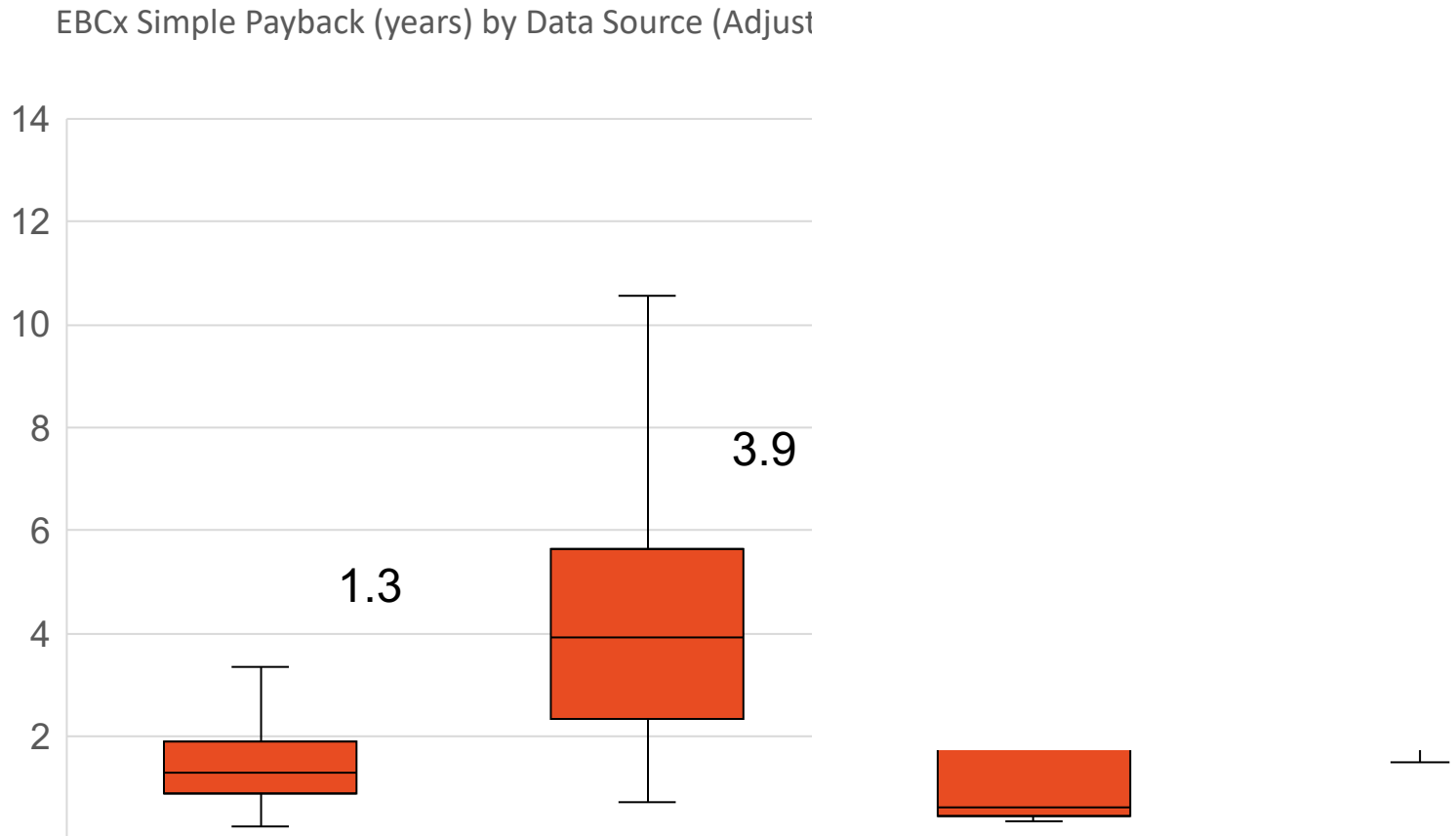


	2018
25th Percentile	1.3
Median	**2.2**
75th Percentile	4.2

2.2

Simp

#3 – EBCx Simple Payback by Project Type



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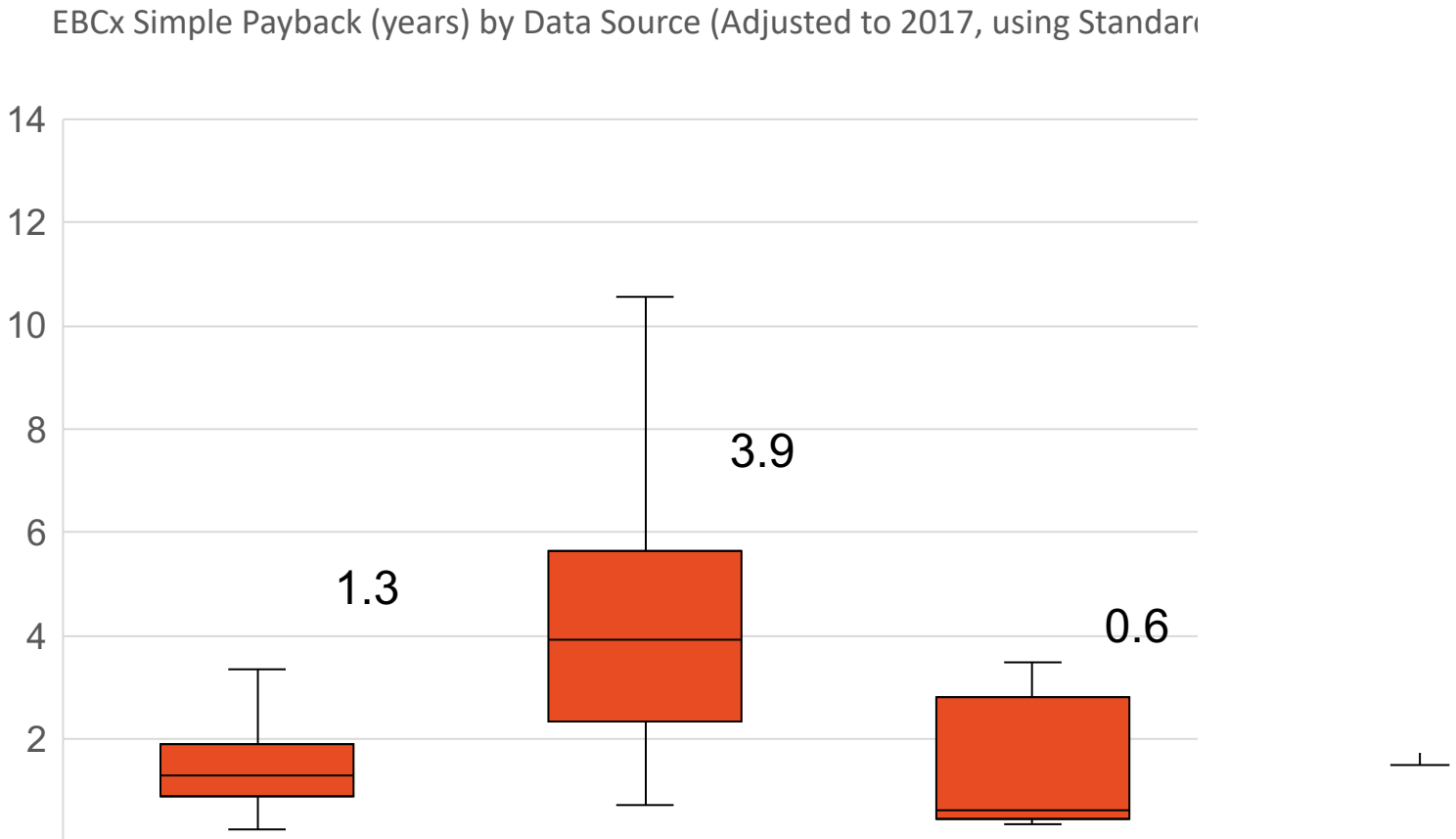

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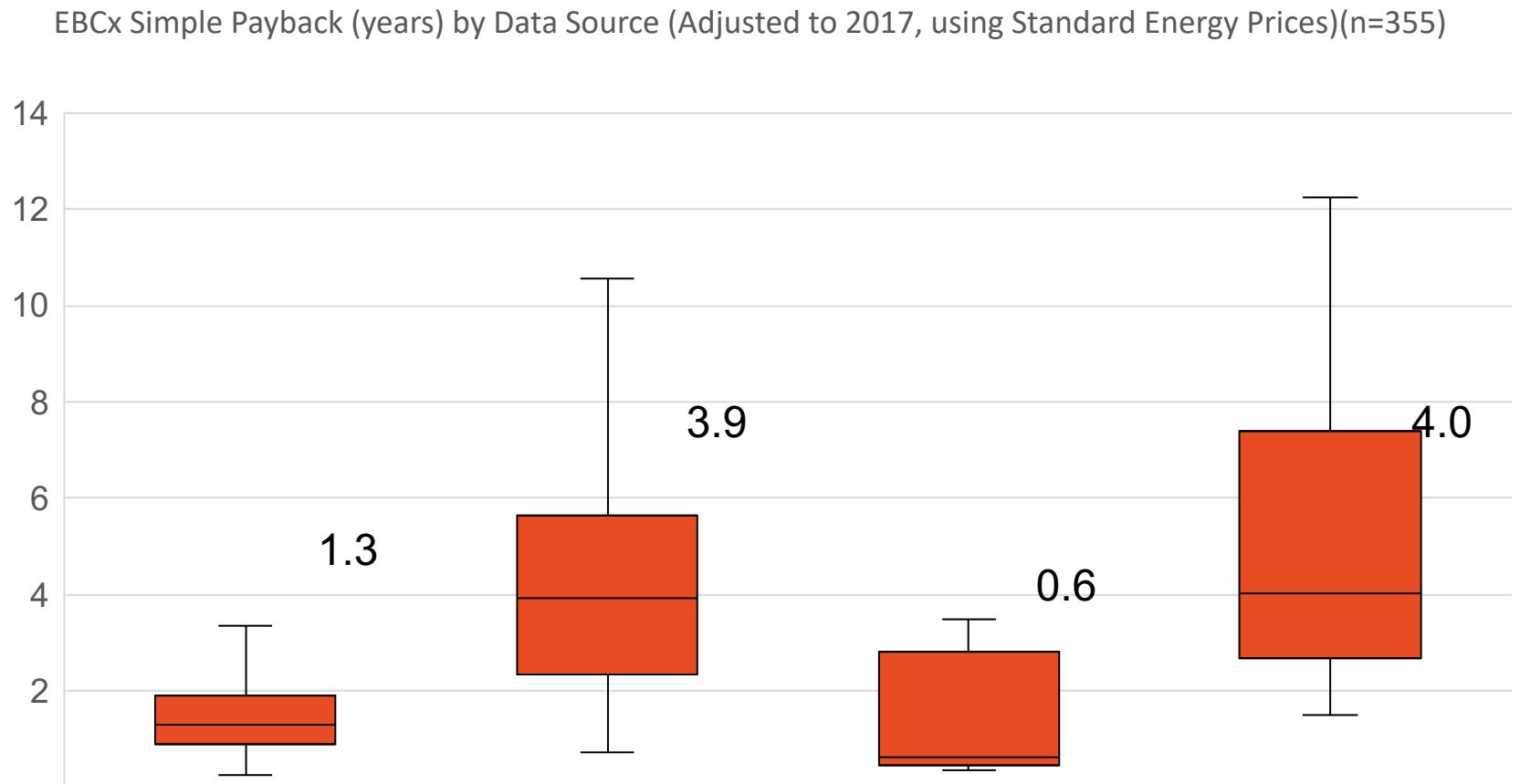
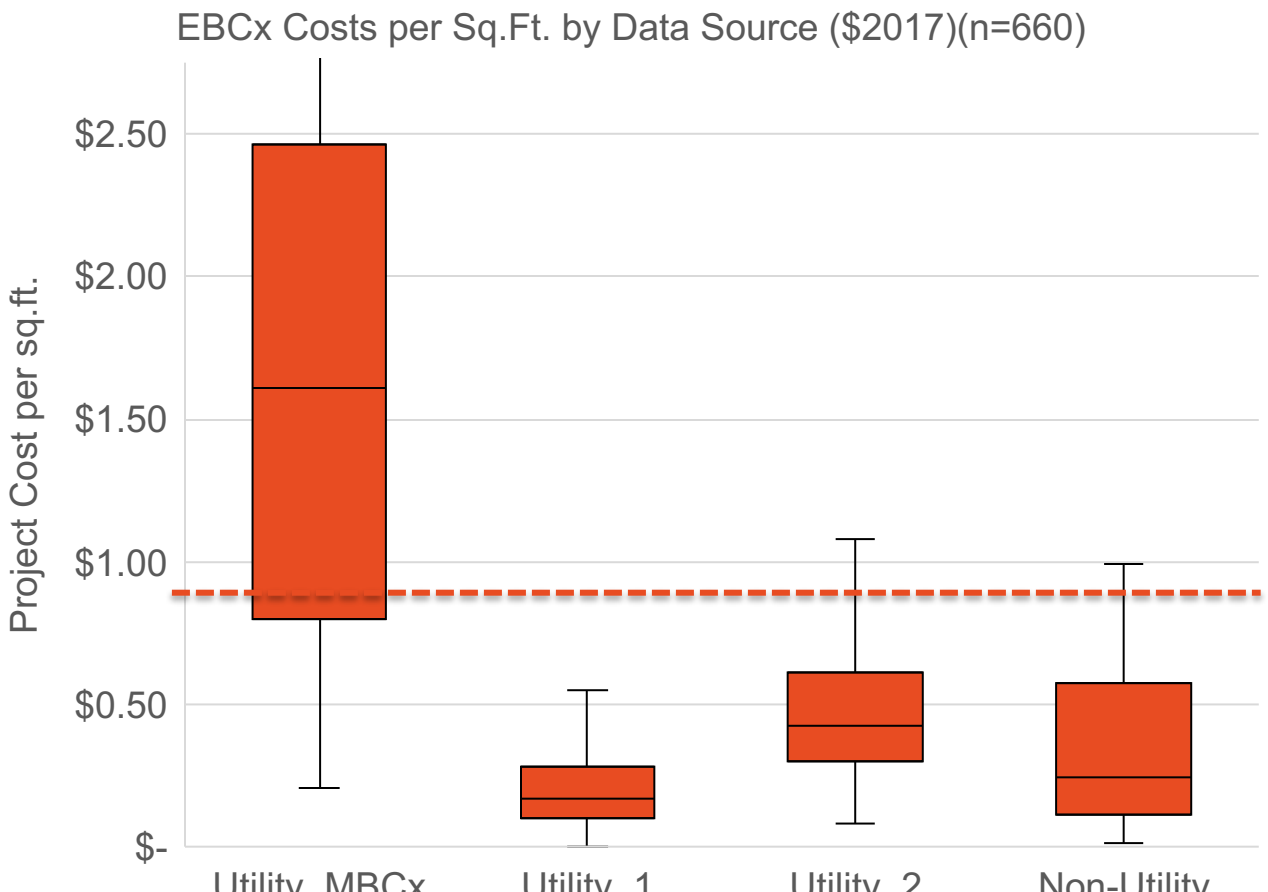


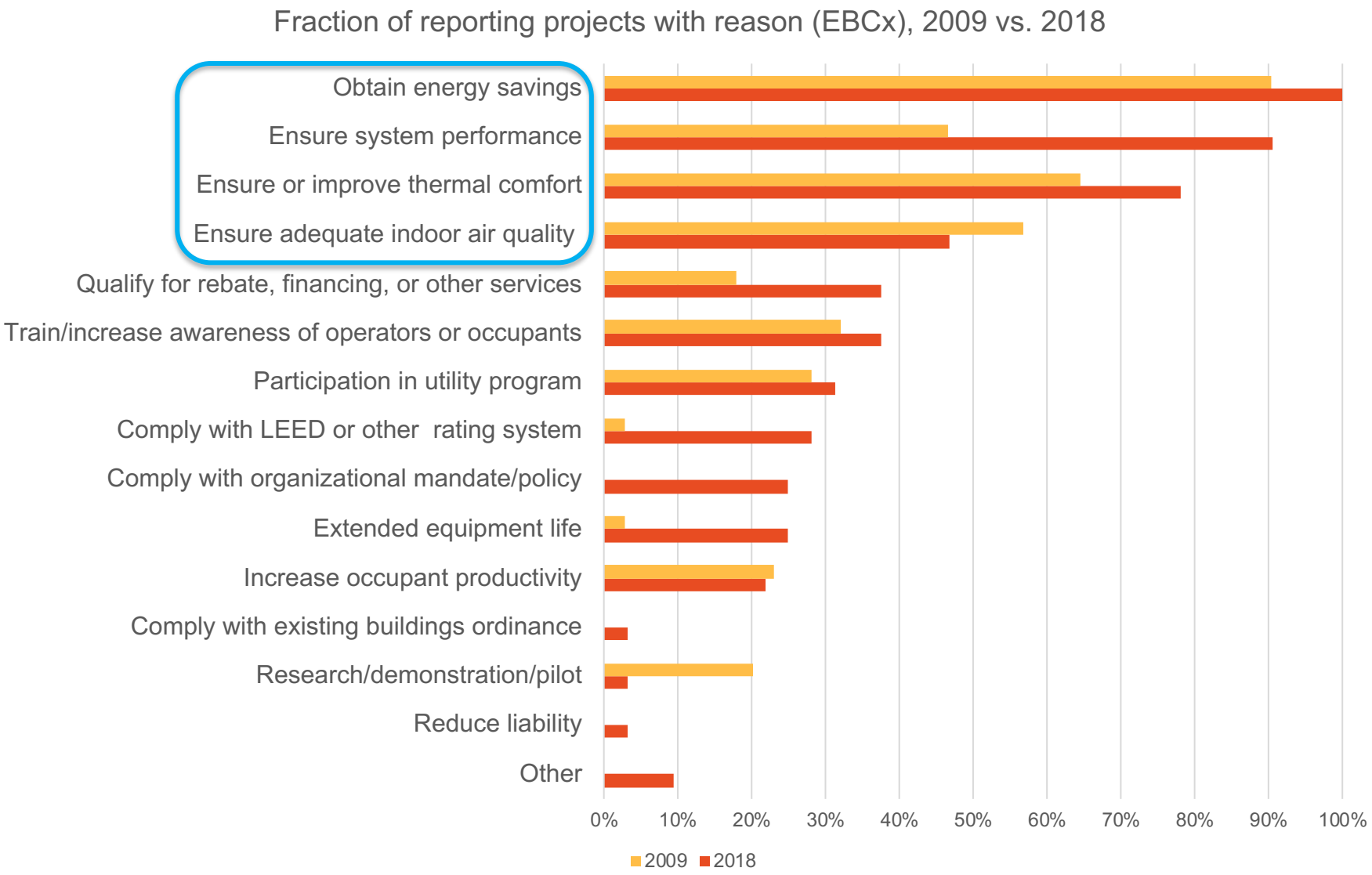
#3 – EBCx Cost per Square Foot



	N =	Median
Utility_1	414	$0.17
Non-Utility	36	$0.24
Utility_2	156	$0.42
Utility_MBCx	54	$1.61

$0.25 Median overall

#3 – Reasons for Implementing EBCx



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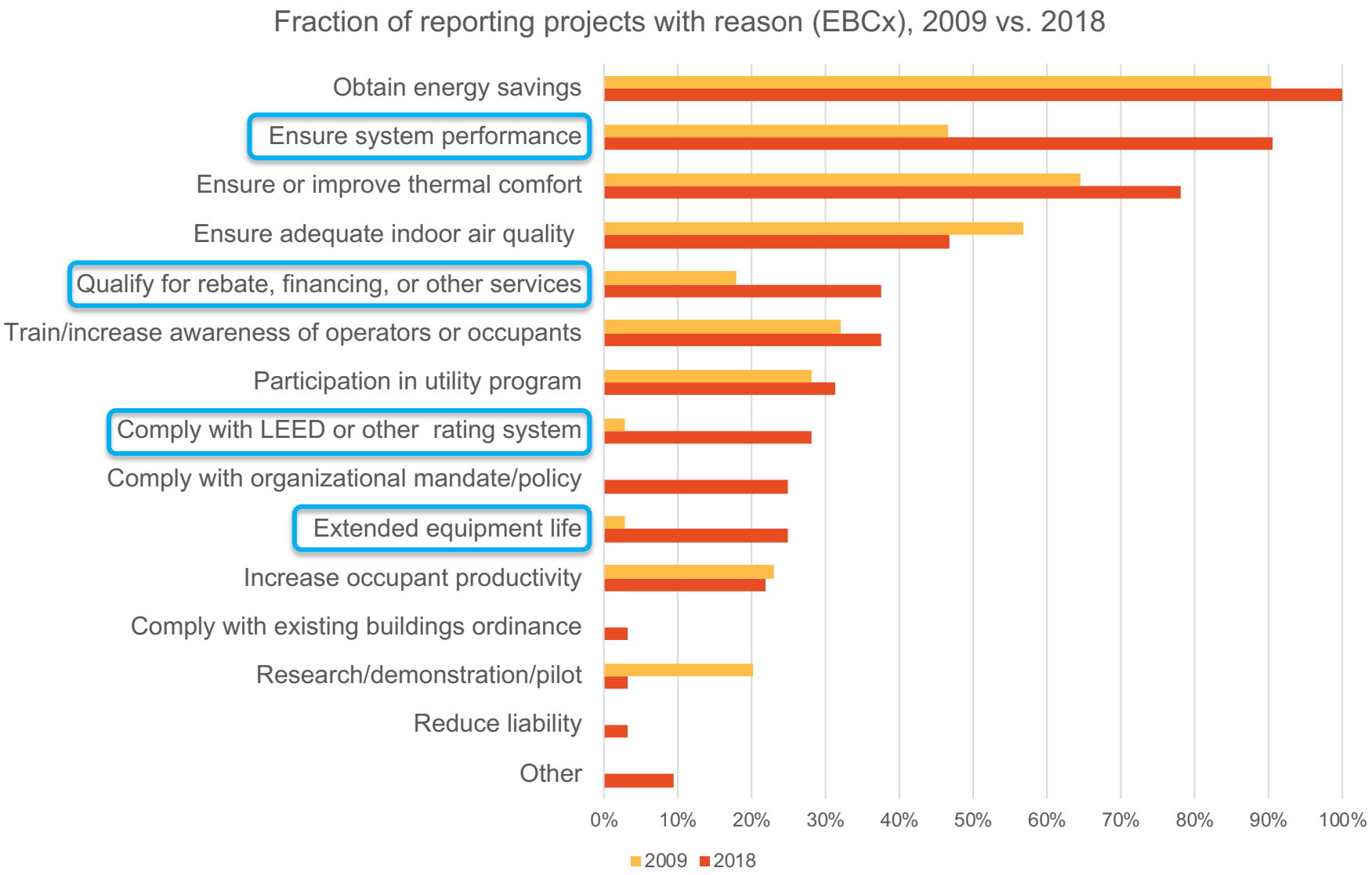
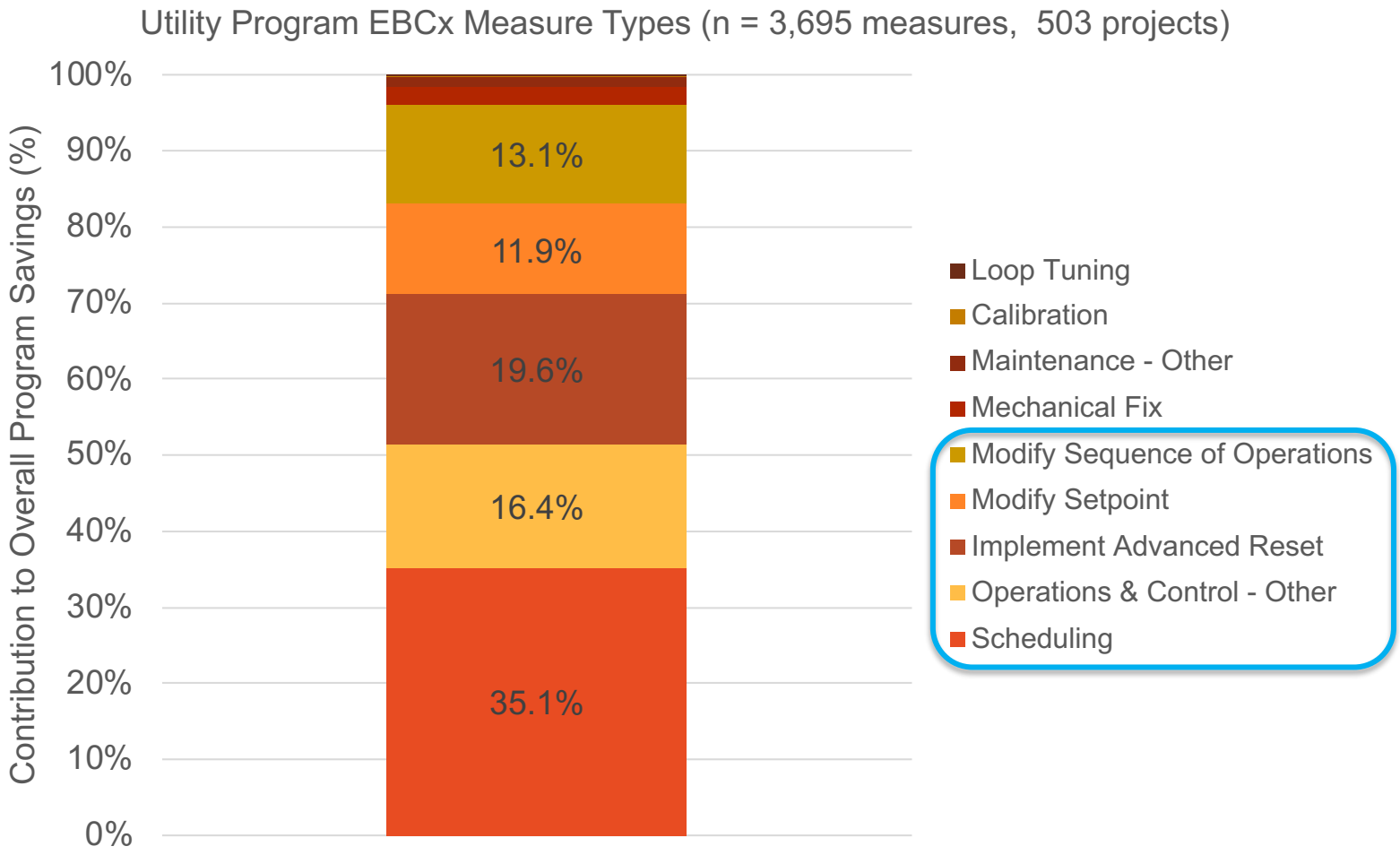


#3 – Measure Mix



#3–EBCx Economics

1. Energy Savings
    a. Median 6%, typical range 3%-10%
    b. MBCx or EBCx outside utility programs could hit 10%-20% range (but data is limited)
    c. 2018 median down from 2009, though looking at project type suggests no major market shift
2. Simple Payback
    a. Median 2.2 years. Range generally 1 and 4 years payback
    b. Median $0.25 project cost per sq.ft., with a typical range $0.13-$0.48
    c. Projects at lower percent savings can still be highly cost-effective

Next Steps

1. Closing Session @ 3:30 pm – Cx Study Workshop
    - Data Available for Your Review
    - Gather in small groups
    - Spend 15 minutes reviewing data for 3 stories
    - Each small group will report out on initial findings
    - Group notes will be turned in to committee
2. Committees will review data and create technical articles, presentations, and social media blogs.
    - Marketing Committee
    - Value of Cx Task Force

Next Steps

3. Look for monthly updates in the Checklist

4. Deliverables will be posted to website,

   https://www.bcxa.org/knowledge-center/

   - Technical Narratives
   - Blogs
   - Presentations
   - Data, Research
   - Related Surveys

Questions?

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EBCx Payback - Glean from this data

What is the average simple payback achieved by EBCx projects?	
Answer Choices	Responses
Less than 6 months	4.71%
7 to 11 months	11.76%
1 to 2 years	42.35%
3 to 5 years	37.65%
Over 5 years	3.53%

When issues were discovered during EBCx investigation, what percent of issues were addressed with:

	less than 10%	10 - 20%	20 - 40 %	40 - 60%	60 - 80%	Greater than 80%
2 years or less payback	5%	8%	16%	20%	34%	17%
3 to 4 years payback	8%	19%	40%	26%	6%	1%
5 year payback	41%	29%	19%	9%	1%	1%

What is the average simple payback achieved by OCx projects?	
Less than 6 months	13.24%
6 to 11 months	14.71%
1 to 2 years	36.76%
3 to 5 years	27.94%
Over 5 years	7.35%

When issues were discovered during OCx investigation, what percent of issues were addressed with:

	Less than 10%	10 - 20%	20 - 40%	40 - 60%	60 - 80%	Greater than 80%
2 years or less payback	9%	10%	13%	30%	18%	19%
3 - 4 years payback	23%	18%	35%	18%	5%	2%
5 year payback	48%	25%	16%	9%	2%	0%
Greater than 50%	66%	19%	6%	9%	0%	0%

#1–NCCx Cost vs. Project Size (2017)