



**CEE<sup>®</sup> WORLD**

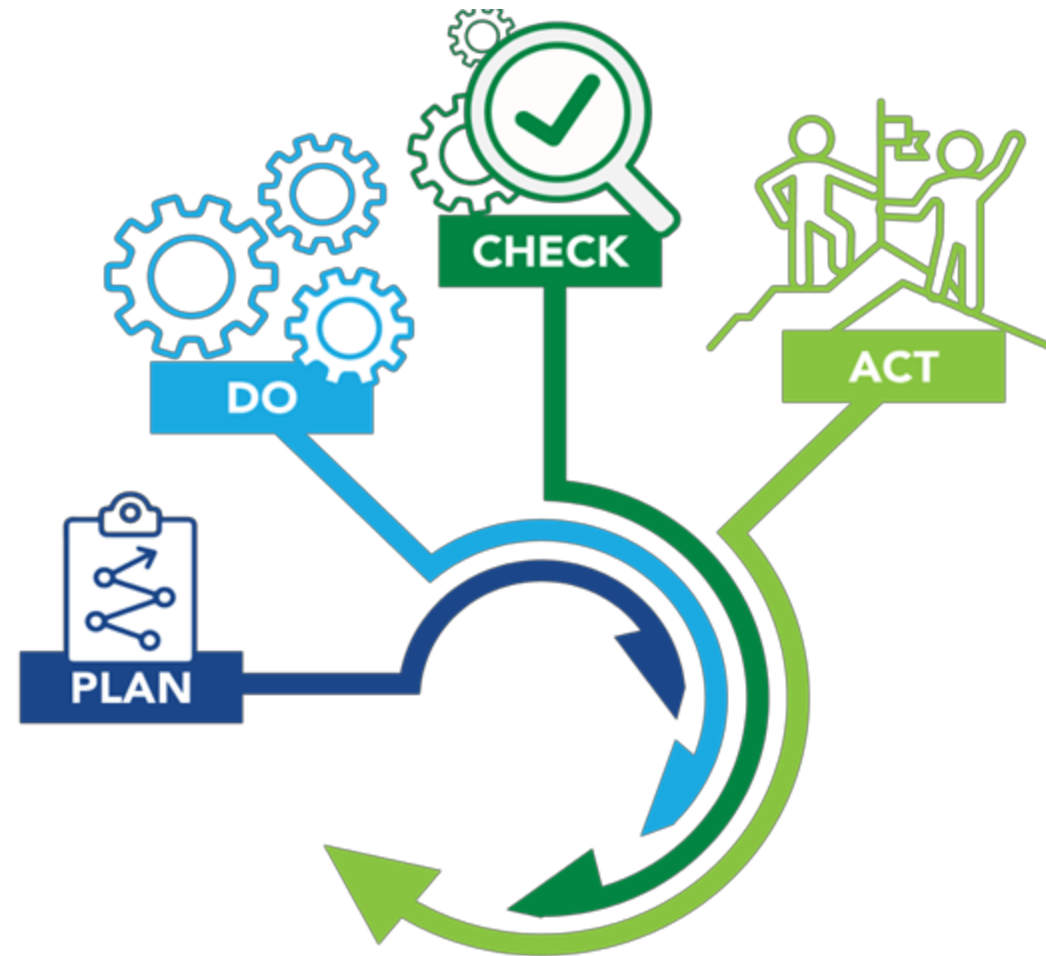
ENERGY CONFERENCE & EXPO

September 25-27, 2024 | Nashville, TN

# Making Energy Management Systems Case Studies Easily Searchable and Shareable

Heidi Fuchs, Lawrence Berkeley National Laboratory

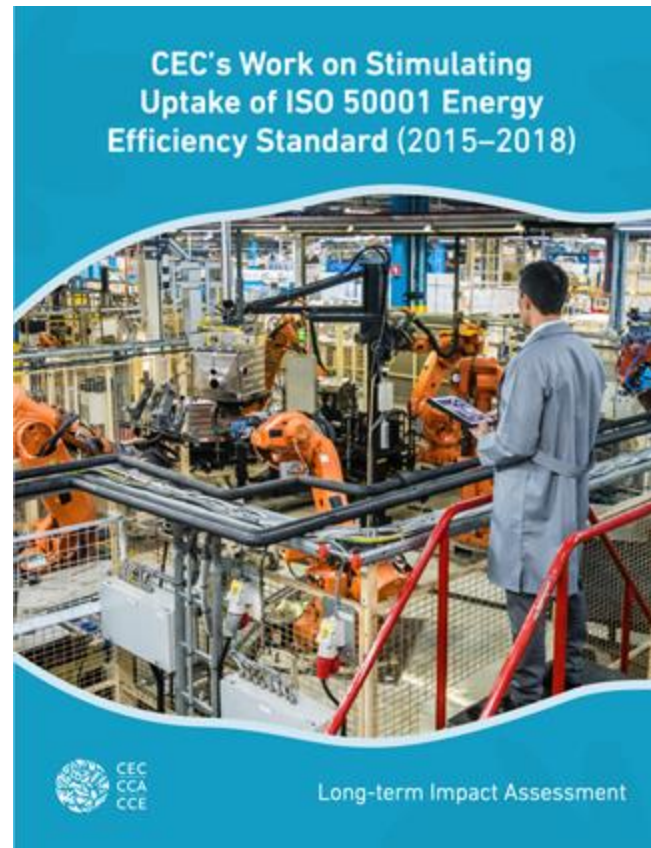
50001-based energy management systems (EnMSs) **integrate energy management** into everyday business practices/procedures to save energy and money while helping reach climate goals



# 50001-based EnMSs achieve persistent average annual energy savings of 3–4% compared to business as usual of 1% per year



4% year 1, 3.4% / y (up to 12y)



4.1% / y for 3–7y

## Features and Performance of Energy Management Programs

Ethan Rogers, Andrew Whitlock, and Kelly Rohrer  
 January 2019  
 Report IE1901

© American Council for an Energy-Efficient Economy  
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2–5.25% year 1



*Credit: Flickr/Andy Spearing, CC BY 2.0*

# Old way of searching for EnMS case studies

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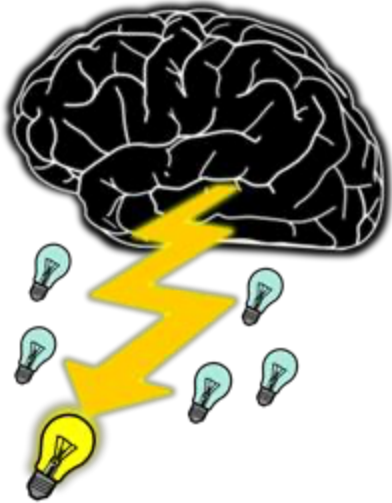
# *Energy Management Systems Insights*

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50001insights.lbl.gov

We employed **user-centered design** and sought input **early** and **often** on database design from dozens of stakeholders

Brainstorms via  
Jamboard



Occasional  
questionnaires



Live working session



Beta testers



*Credit: Flickr/Rylie Howerter,  
CC BY-NC-SA 2.0*





# 328 EnMS case studies

**BERKELEY LAB** Energy Management Systems Insights SEARCH ▾ ABOUT ▾ SUBMIT A CASE STUDY ▾

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**CASE STUDIES MATCHING SEARCH** 328 [PRINT RESULTS REPORT](#) [DOWNLOAD SELECTED CASE STUDIES](#) [DOWNLOAD RAW DATA](#)

**KEY METRICS SUMMARY TABLE**

METRIC	MIN	MAX	MEDIAN	SUM
Improvement Period (years)	0.3	12	3	-
Annual Energy Performance Improvement (%)	0.1	25.5	3.2	-
Annual Energy Savings (MWh/year)	0.1	152.4M	9.5K	189.1M
Annual CO2 Reduction (MT/year)	0.2	103.8B	5.2K	103.8B
Cost to Implement (USD 1,000)	0.2	556K	196.1	1.3M
Payback Period (years)	0	71.7	0.7	-

**KEY TESTIMONIALS**

"We believe that our decisive actions today can indeed lead to a better tomorrow."

- Michael Crocker  
Executive VP Strategy & Technology  
Schneider Electric  
2016

5 of 152

"The nature of SEP and ISO 50001 is that they fuel themselves. As more people see that these approaches work and save significant amounts of money, they will choose to participate."

- Rob Bechtold  
President  
HARDEC, Inc.  
2016

6 of 152

"Improved energy management has helped us become a reference for the most demanding clients, providing superior quality premises with low-environmental impact."

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Property Management Director  
Molva Madrid/la  
2016

7 of 152

**RESULTS BY COUNTRY**

Ukraine  
1 Case Studies  
2K Annual Energy Savings (MWh/yr)  
432 Annual CO2 Reduction (MT/yr)  
7 Average Energy Improvement (%)  
[Apply Filter](#)

**RESULTS CHARTS**

Annual energy performance improvement (%)

**CASE STUDIES**  
Select the download icon on the right in each row to download individual PDF's

COMPANY	COUNTRY	INDUSTRY	PUBLICATION YEAR	ENMS PROGRAM	PAYBACK	ANNUAL ENERGY IMPRV.	ANNUAL ENERGY SAVINGS
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# Customizable search criteria

The screenshot displays the Berkeley Lab Energy Management Systems Insights search filters interface. At the top, the Berkeley Lab logo and "Energy Management Systems Insights" are on the left, and navigation links for "SEARCH", "ABOUT", and "SUBMIT A CASE STUDY" are on the right. Below the header is a "SEARCH FILTERS" section with a search bar labeled "Keyword Filters".

The filters are organized into several columns:

- Geographic Filters:** Continent (All), Country (All), and State/Province (US & Canada only) (All).
- Publication Filters:** Publication Year (range) from 2015 to 2024+, and Annual Energy Performance Improvement (%) from 0 to 10+.
- Sector and Industry:** Sector (All) and Industry (All).
- Enterprise Size:** A checkbox for "Small/Midsize Only".
- EnMS Program:** A dropdown menu set to "All".
- Number of Featured Certified Sites:** Checkboxes for "Single-site" and "Multi-site".
- Organization:** A checkbox for "Organizations with multiple case studies".
- Performance Metrics (Sliders):** Payback Period (years) from 0 to 4+, Energy Performance Improvement Period (yr) from 0 to 7+, Annual Energy Cost Savings (\$USD/yr) from 0 to 5M+, Cost to Implement EnMS (USD 1,000) from 0 to 2M+, Annual Energy Savings (MWh/yr) from 0 to 100K+, and Annual CO2 Reduction (MMT/yr) from 0 to 50K+.
- Content Tags:** A list of tags with checkboxes: Climate change/Decarbonization, Cross-sector key energy systems, Electrification, Environment, social and governance (ESG) commitments, Utility/other program involvement, Non-energy benefits, and Renewables. A "Definitions" link is also present.

At the bottom of the filter section are two buttons: "SUBMIT SEARCH" and "RESET FILTERS".

# All case studies reviewed for whether content tags should be applied

**BERKELEY LAB** Energy Management Systems Insights

SEARCH ^ ABOUT v SUBMIT A CASE STUDY v

**SEARCH FILTERS** ?

Keyword Filters

**Content**  
All

**Country**  
All

**State/Province (US & Canada only)**  
All

**Publication Year (range)**  
2015 2024+

**Annual Energy Performance Improvement (%)**  
0 10+

**Sector**  
All

**Industry**  
All

**Enterprise Size** ?  
 Small/Midsize Only

**EnMS Program**  
All

**Number of Featured Certified Sites**  
 Single-site  Multi-site

**Organization**  
 Organizations with multiple case studies

**Payback Period (years)**  
0 4+

**Energy Performance Improvement Period (yr)**  
0 7+

**Annual Energy Cost Savings (\$USD/yr)**  
0 5M+

**Cost to Implement EnMS (USD 1,000)**  
0 2M+

**Annual Energy Savings (MWh/yr)**  
0 100K+

**Annual CO2 Reduction (MMT/yr)**  
0 50K+

**Content Tags** ?

- Climate change/Decarbonization
- Cross-sector key energy systems
- Electrification
- Environment, social and governance (ESG) commitments
- Utility/other program involvement
- Non-energy benefits
- Renewables

[Definitions](#)

SUBMIT SEARCH RESET FILTERS

# Key testimonials are extracted from all case studies

BERKELEY LAB Energy Management Systems Insights

SEARCH ▾ ABOUT ▾ SUBMIT A CASE STUDY ▾

CASE STUDIES MATCHING SEARCH 328 PRINT RESULTS REPORT DOWNLOAD SELECTED CASE STUDIES DOWNLOAD RAW DATA

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2 Annual Energy Performance Improvement (%)	0.1	25.5	3.2	-
3 Annual Energy Savings (MWh/year)	0.1	152.4M	9.5K	189.1M
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6 Payback Period (years)	0	71.7	0.7	-

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RESULTS BY COUNTRY

RESULTS CHARTS

Annual energy performance improvement (%)

CASE STUDIES

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COMPANY	COUNTRY	INDUSTRY	PUBLICATION YEAR	ENMS PROGRAM	PAYBACK	ANNUAL ENERGY IMPRV.	ANNUAL ENERGY SAVINGS
---------	---------	----------	------------------	--------------	---------	----------------------	-----------------------

# Results are summarized and visualized

Energy Management Systems Insights

SEARCH ABOUT SUBMIT A CASE STUDY

CASE STUDIES MATCHING SEARCH 328

PRINT RESULTS REPORT

DOWNLOAD SELECTED CASE STUDIES

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# Raw data, case study PDFs, search results, and visuals can be downloaded and easily shared

**BERKELEY LAB** Energy Management Systems Insights SEARCH ▾ ABOUT ▾ SUBMIT A CASE STUDY ▾

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**CASE STUDIES MATCHING SEARCH** 328

PRINT RESULTS REPORT
DOWNLOAD SELECTED CASE STUDIES (ZIP FILE)
DOWNLOAD RAW DATA (XLSX FILE)

**KEY METRICS SUMMARY TABLE** 📄

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📄  
Save Image

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Annual energy performance improvement (%)

📄  
Save Image

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# Qualifying case studies can be easily submitted

## SUBMIT A CASE STUDY

Thank you for your interest in submitting a case study for inclusion in this database. Note that only case studies of 50001-based energy management systems will be considered. Please complete the form below and upload the PDF of your case study. Once Berkeley Lab researchers have reviewed your submission, we will reach out for further details before posting to the database. Through your submission, you acknowledge that you have all the necessary rights to make this submission and that Berkeley Lab and the U.S. Department of Energy have the rights to use it and redistribute it.

<i>Project Name*</i> <input type="text"/>	<i>Your Full Name (First Last)*</i> <input type="text"/>	<i>Your Email*</i> <input type="text"/>
<i>Organization/Company Name*</i> <input type="text"/>	<i>Organization/Company Website*</i> <input type="text"/>	<i>Phone Number*</i> <input type="text"/>
<i>Your Role in the Project*</i> <input type="text"/>		

**UPLOAD YOUR CASE STUDY (PDF ONLY)\***

**Content Tags** [?](#)

<input type="checkbox"/>  Climate change/Decarbonization	<input type="checkbox"/>  Cross-sector key energy systems
<input type="checkbox"/>  Electrification	<input type="checkbox"/>  Environment, social and governance (ESG) commitments
<input type="checkbox"/>  Utility/other program involvement	<input type="checkbox"/>  Non-energy benefits
<input type="checkbox"/>  Renewables	

[Definitions](#)

Through your submission, you acknowledge that you have all the necessary rights to make this submission and that Berkeley Lab and the U.S. Department of Energy have the rights to use it and redistribute it.

**SUBMIT STUDY** **CANCEL**

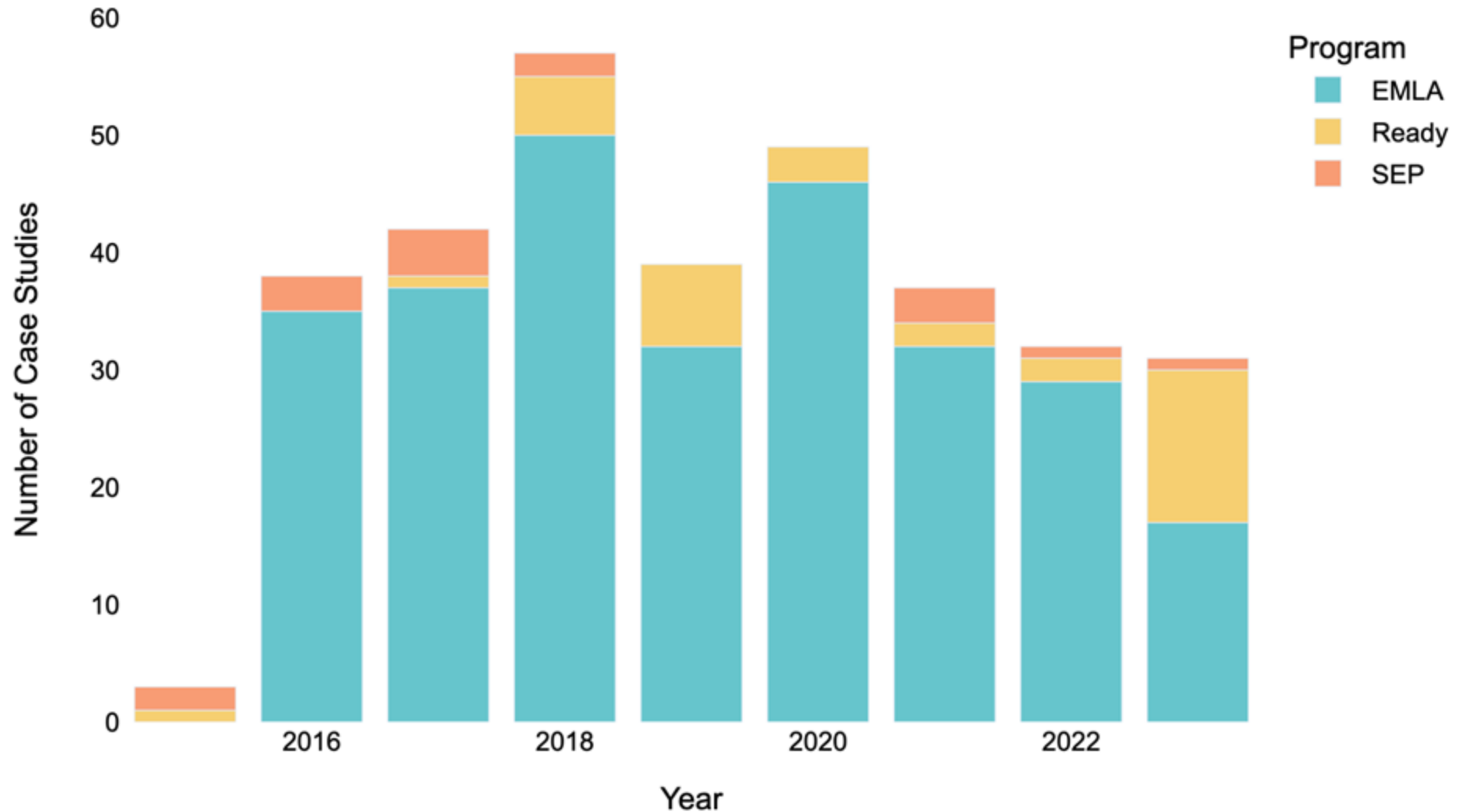


# Analysis of aggregated case studies data

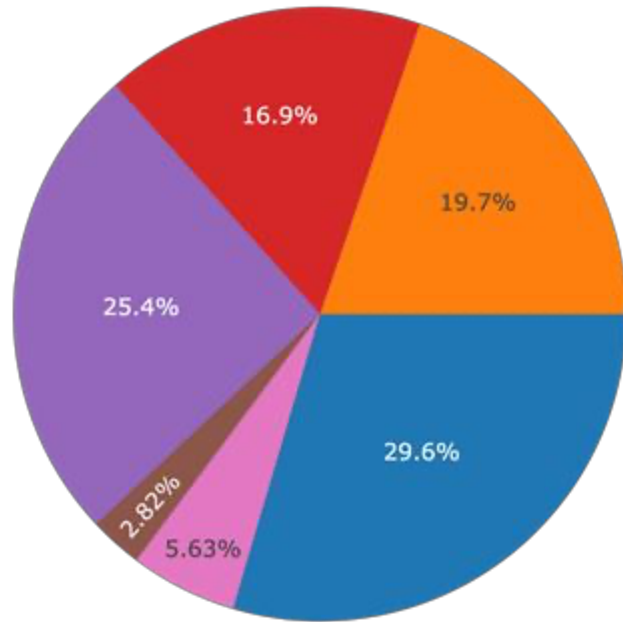
For illustrative purposes

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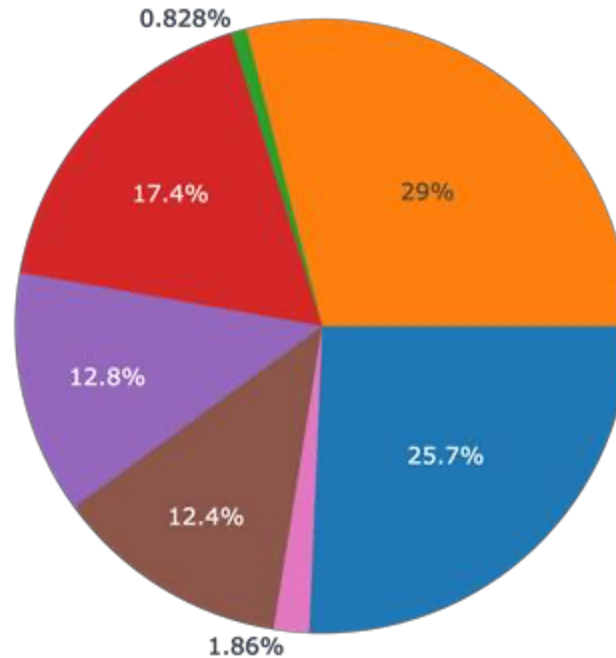
# Most case studies in the database relate to ISO 50001 implementation (from the Energy Management Leadership Awards)



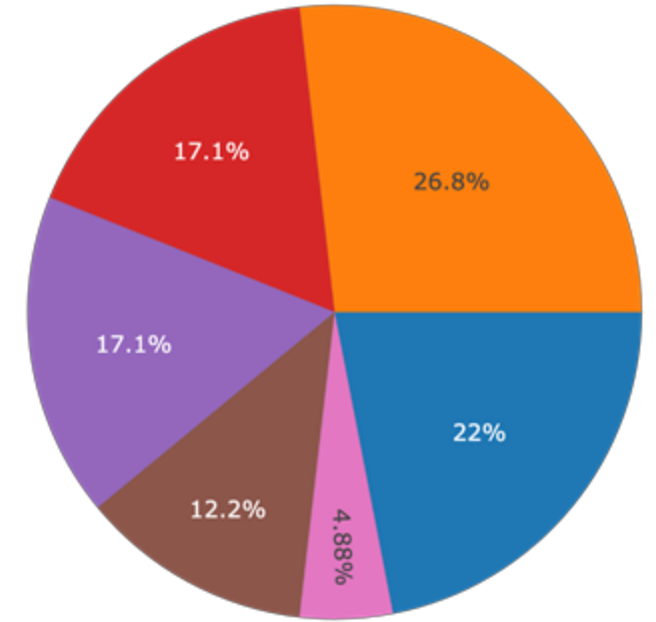
# Content tags vary somewhat by sector



Commercial



Industrial



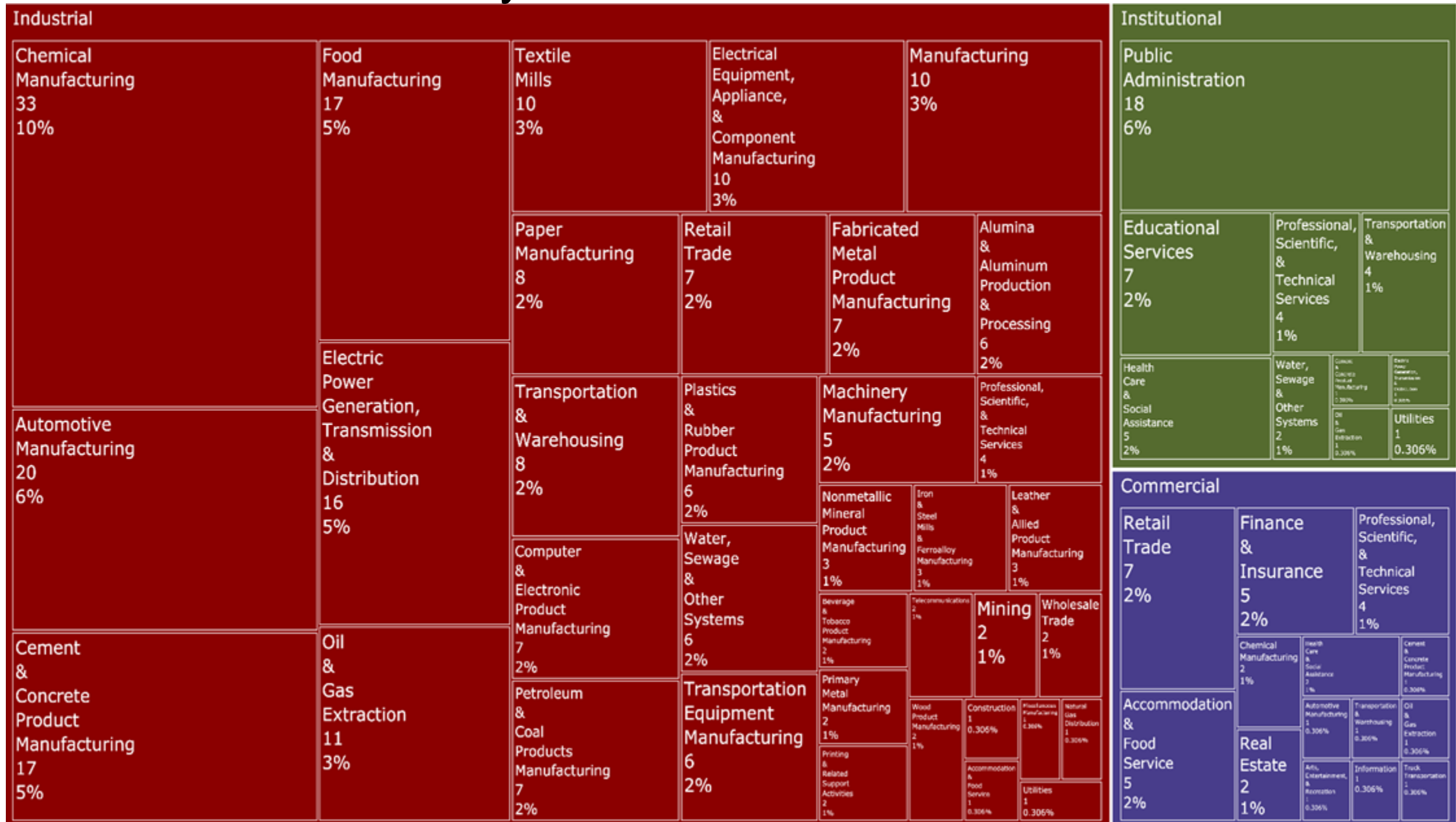
Institutional

■ Climate change/Decarbonization  
■ Cross-sector key energy systems

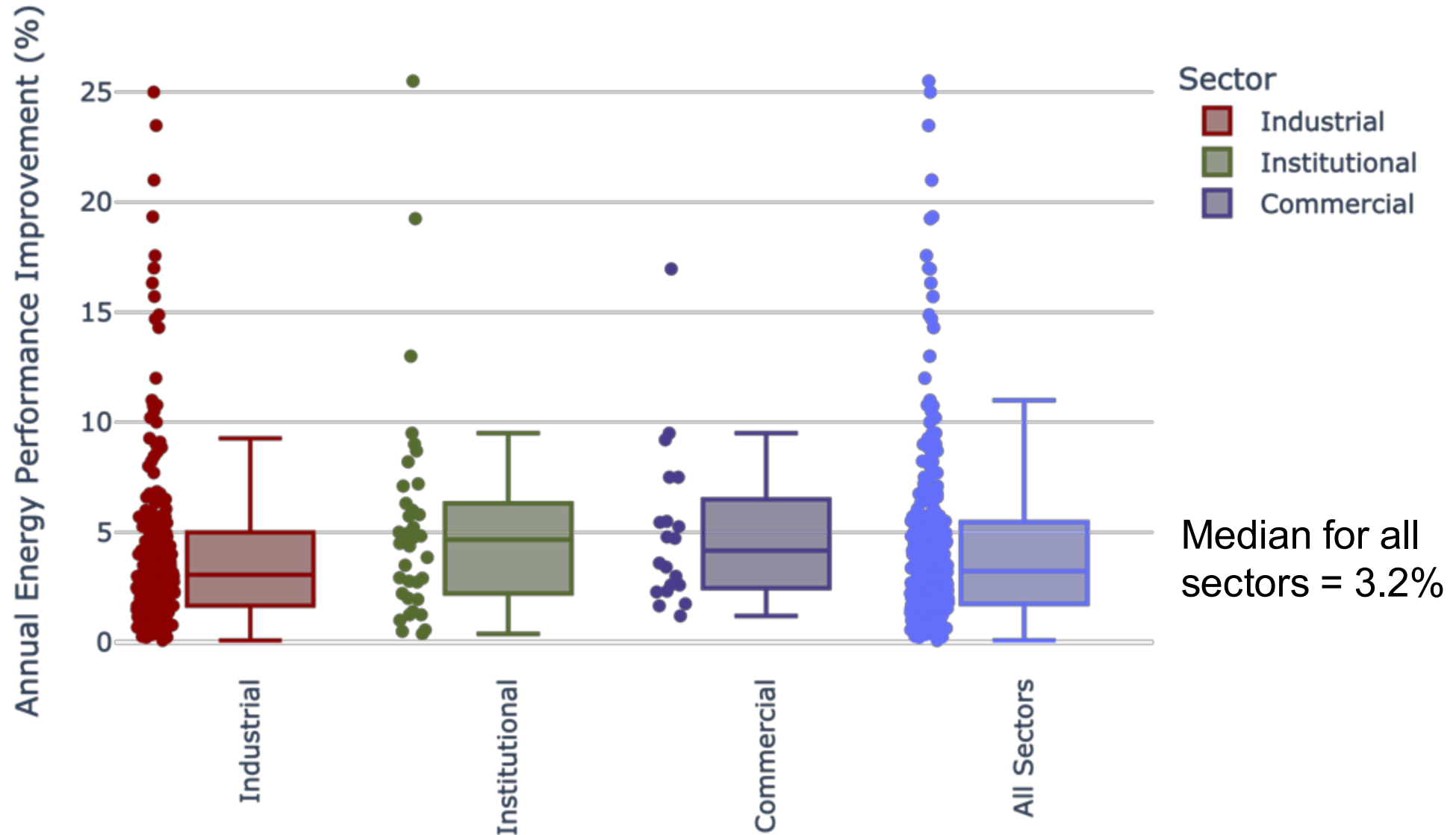
■ ESG commitments  
■ Non-energy benefits

■ Renewables  
■ Utility/other program involvement  
■ Electrification

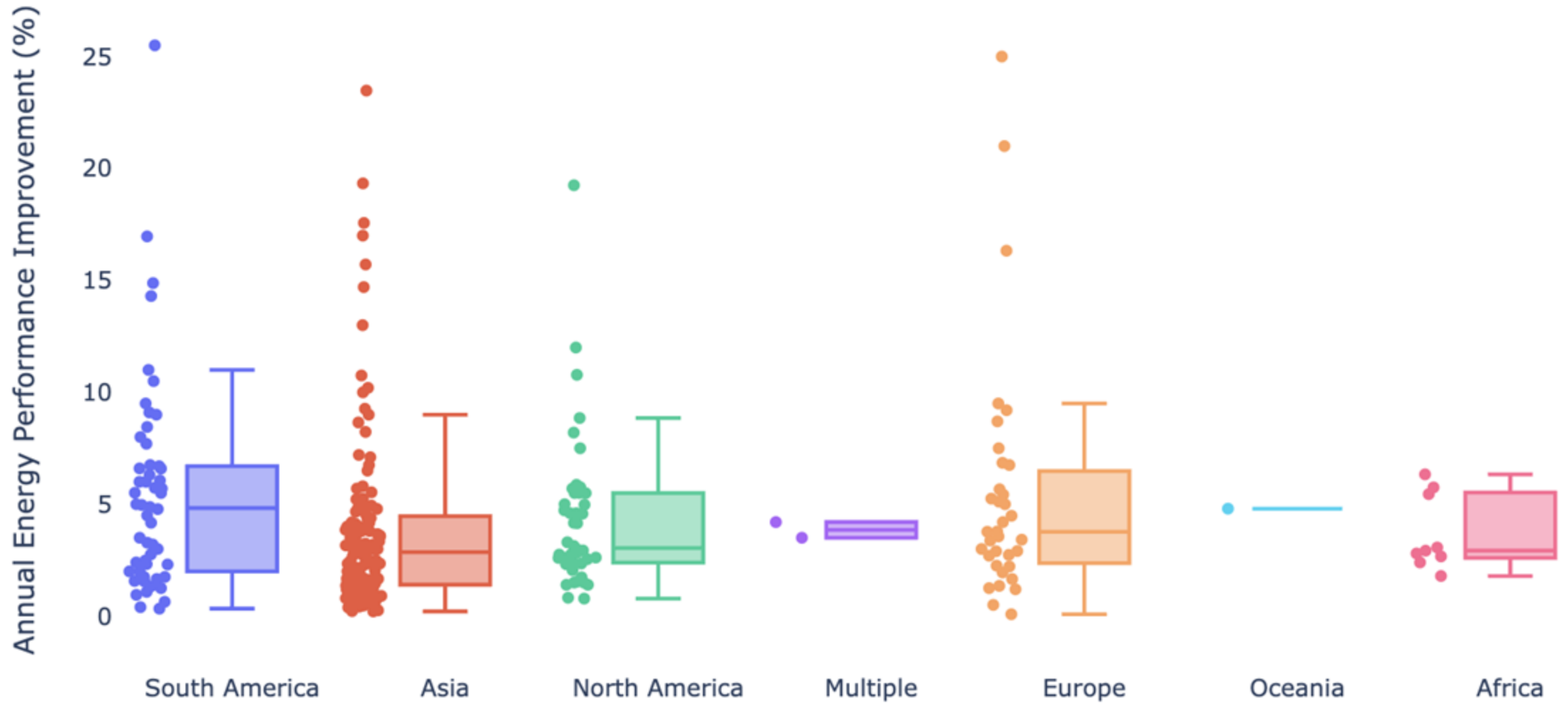
# Case studies are mostly from the industrial sector



We find no statistically significant difference in annual energy savings by sector or subsector



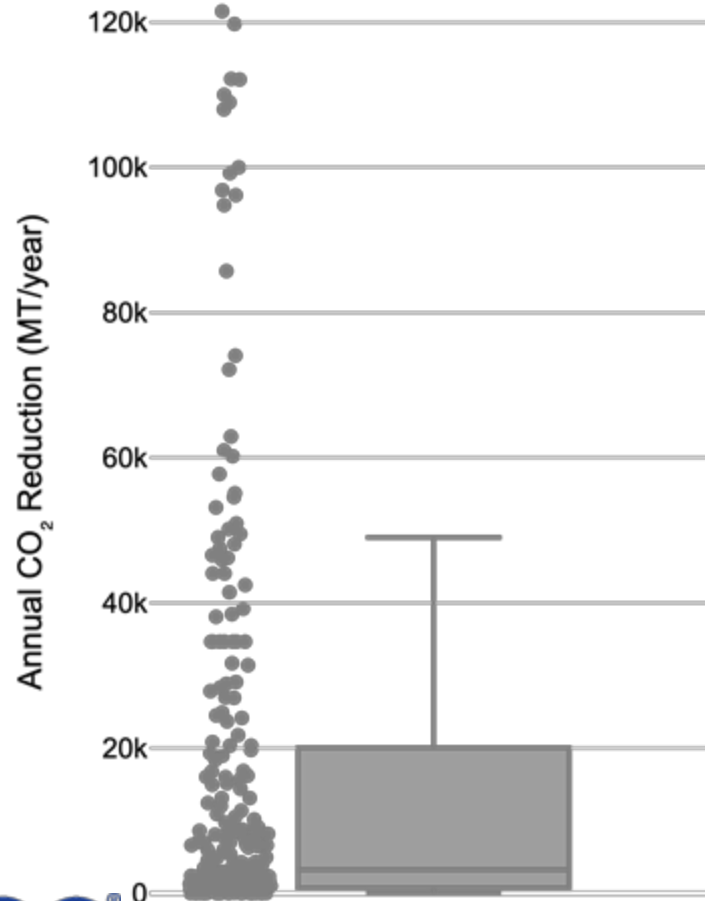
There is no statistically significant difference in annual energy savings by continent or country



# We similarly saw no stat. significant correlations for these metrics

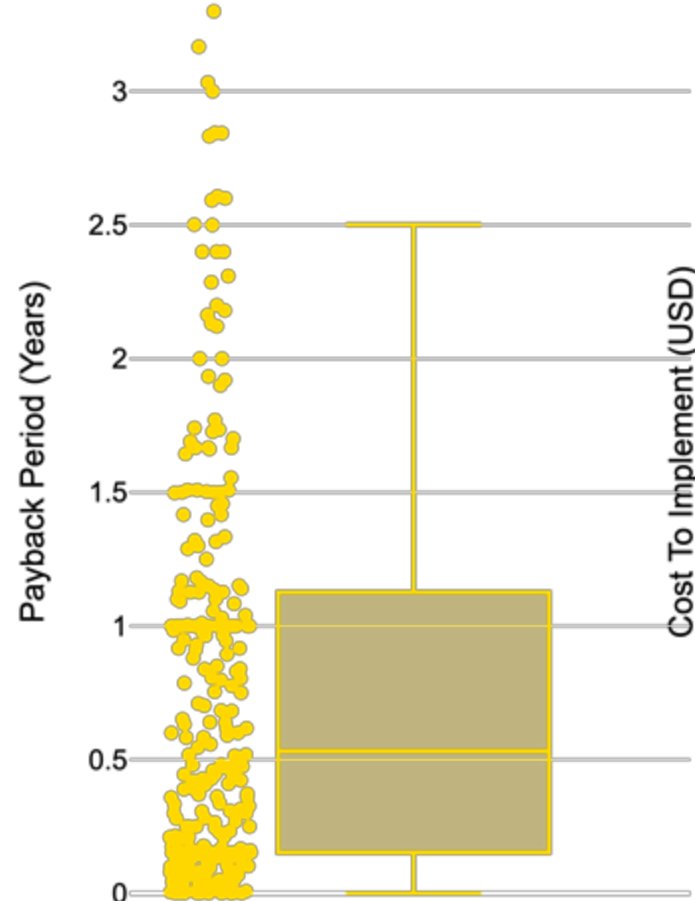
Box Plot of Annual CO<sub>2</sub>-e Reduction for All Case Studies (Excluding Outliers)

Median = 3,256 MT/y



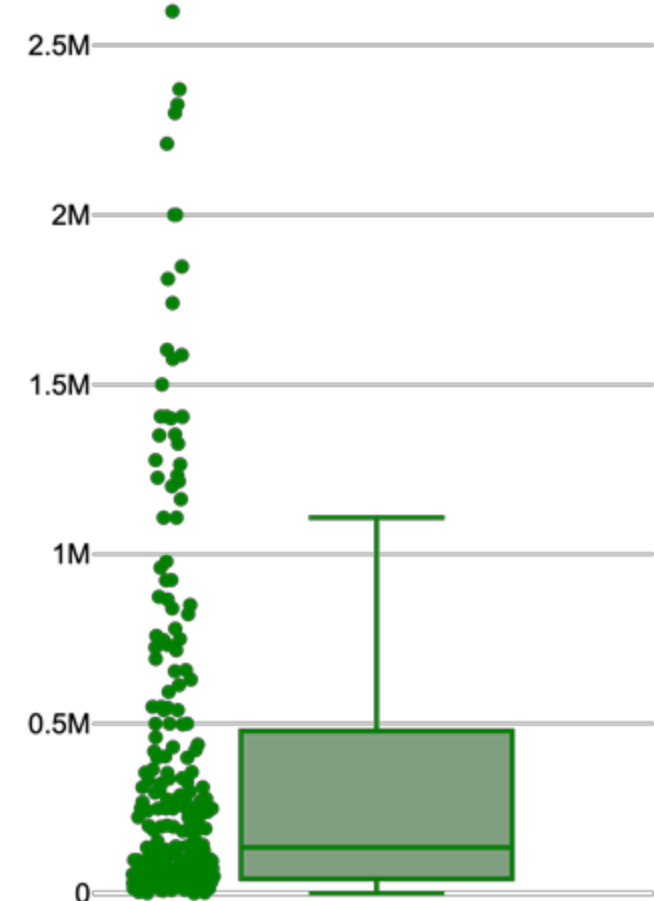
Box Plot of Payback Period for All Case Studies (Excluding Outliers)

Median = 0.53 years

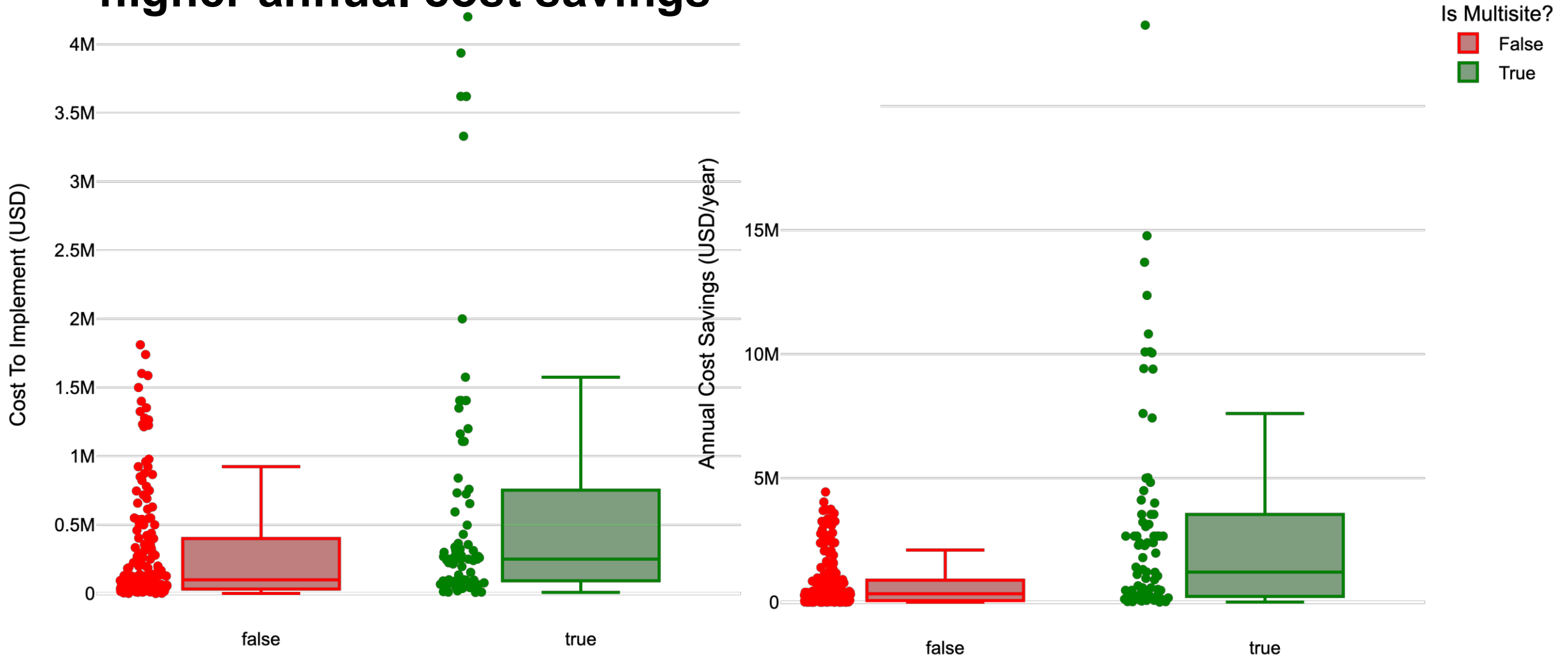


Box Plot of Cost to Implement for All Case Studies (Excluding Outliers)

Median = \$135,000



# Multi-site implementations **cost more to implement** but yield **higher annual cost savings**



Being a multi-site implementation has a statistically significant effect on both annual cost savings ( $p = 0.021$ ) and cost to implement ( $p = 0.017$ )



In summary, regardless of sector, industry, and location, organizations can reasonably expect ~3% annual energy savings from a 50001-based EnMS

Median annual energy savings for all database case studies is **3.2%**

Analysis of Variance (ANOVA) showed **no statistically significant correlation** between energy savings, CO<sub>2</sub>e reduction, cost, or payback period and these parameters: program, sector, industry, location



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