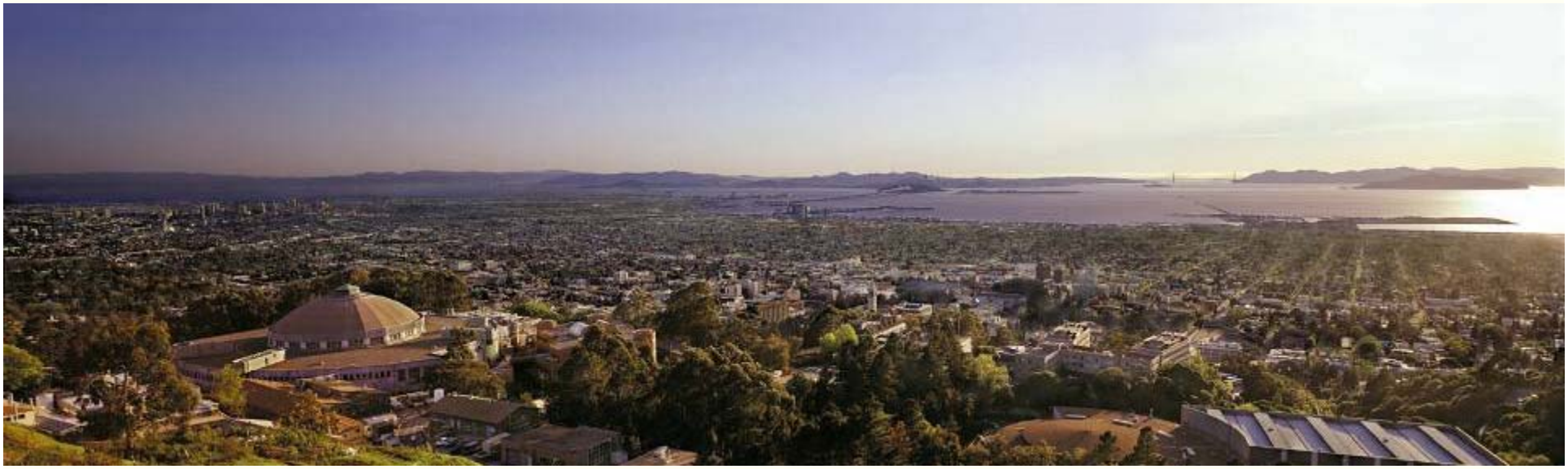
Action-Oriented Benchmarking

Identify and Prioritize Efficiency Opportunities in Commercial Buildings



Paul Mathew

Staff Scientist

Lawrence Berkeley National Laboratory

Berkeley, California

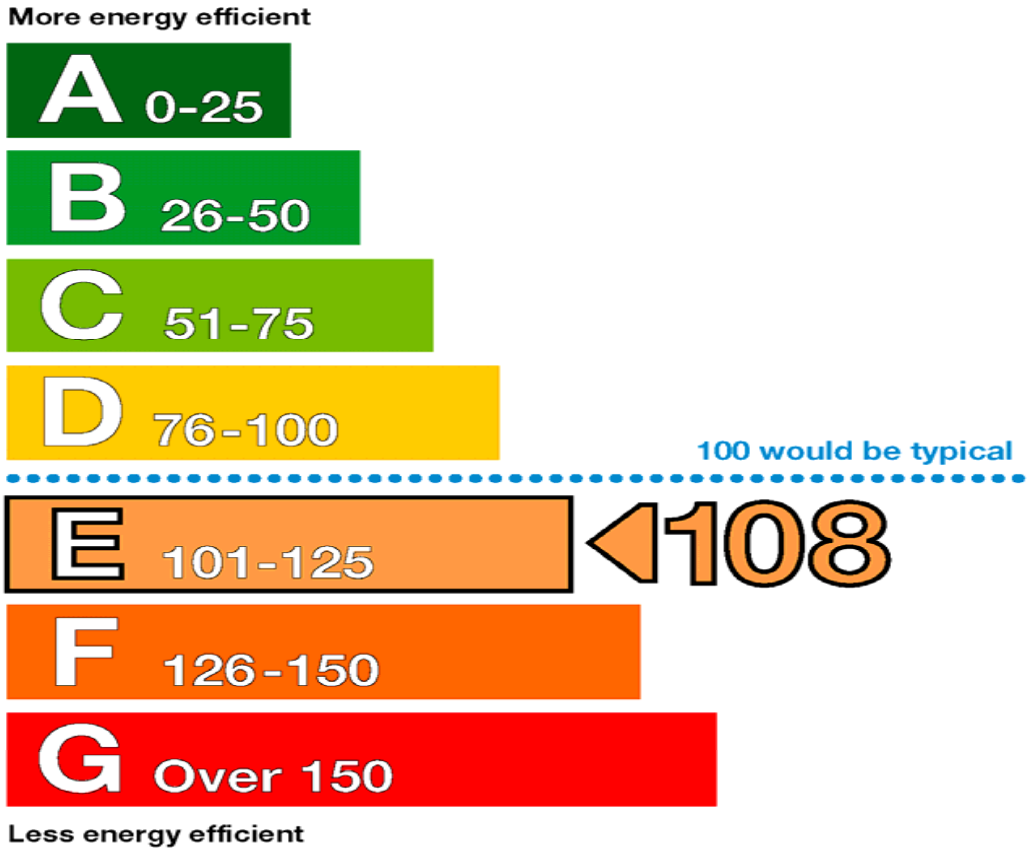
Recent Policy Developments

- California
  - AB1103 requires benchmarking of all commercial buildings at time of lease or sale.
  - Executive order S-20-04 requires benchmarking of all state buildings.
  - SB1 requires buildings applying for solar incentives to benchmark energy use intensity.
- Federal
  - EISA 2007 requires benchmarking of federal buildings to track performance of energy goals.
- Other
  - Minnesota requires all state buildings to be benchmarked.
  - Many organizations requiring LEED-EB, which requires benchmarking.
- Europe
  - Energy Performance of Buildings Directive requires energy performance to be publicly displayed.

Making Performance Visible
Display Energy Certificates (DECs) in the UK

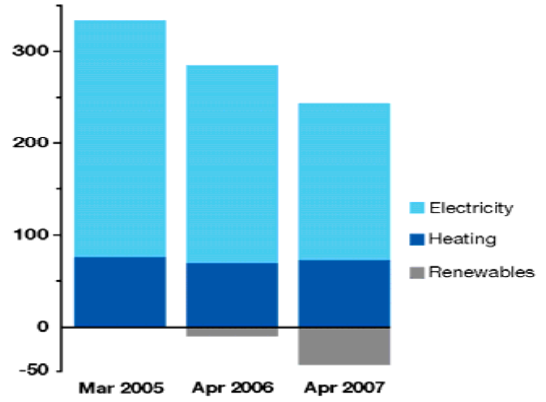
Energy Performance Operational Rating

This tells you how efficiently energy has been used in the building. The numbers do not represent actual units of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.



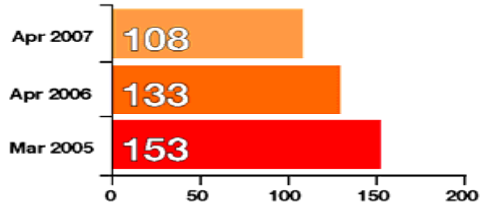
Total CO_2 Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO_2.

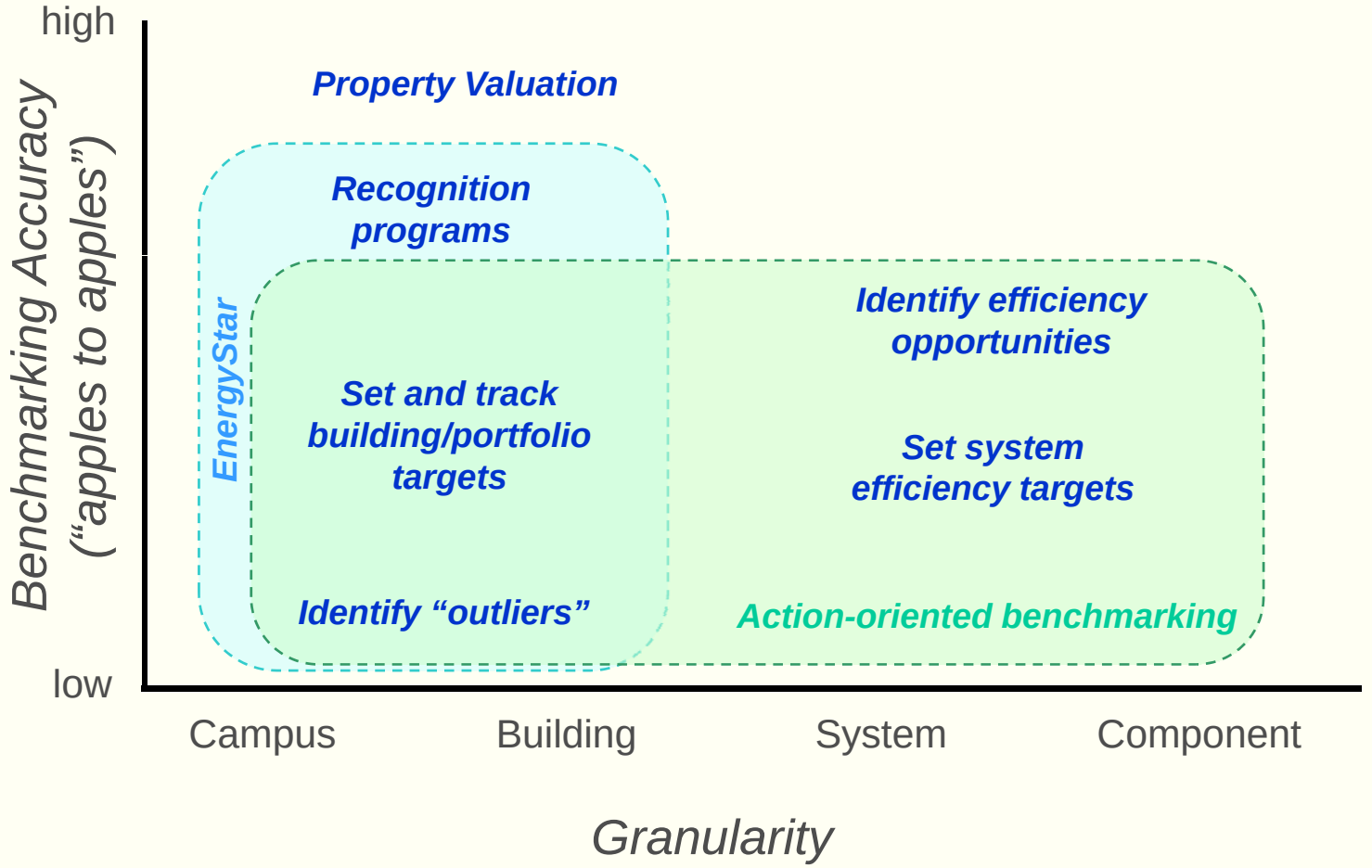


Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods

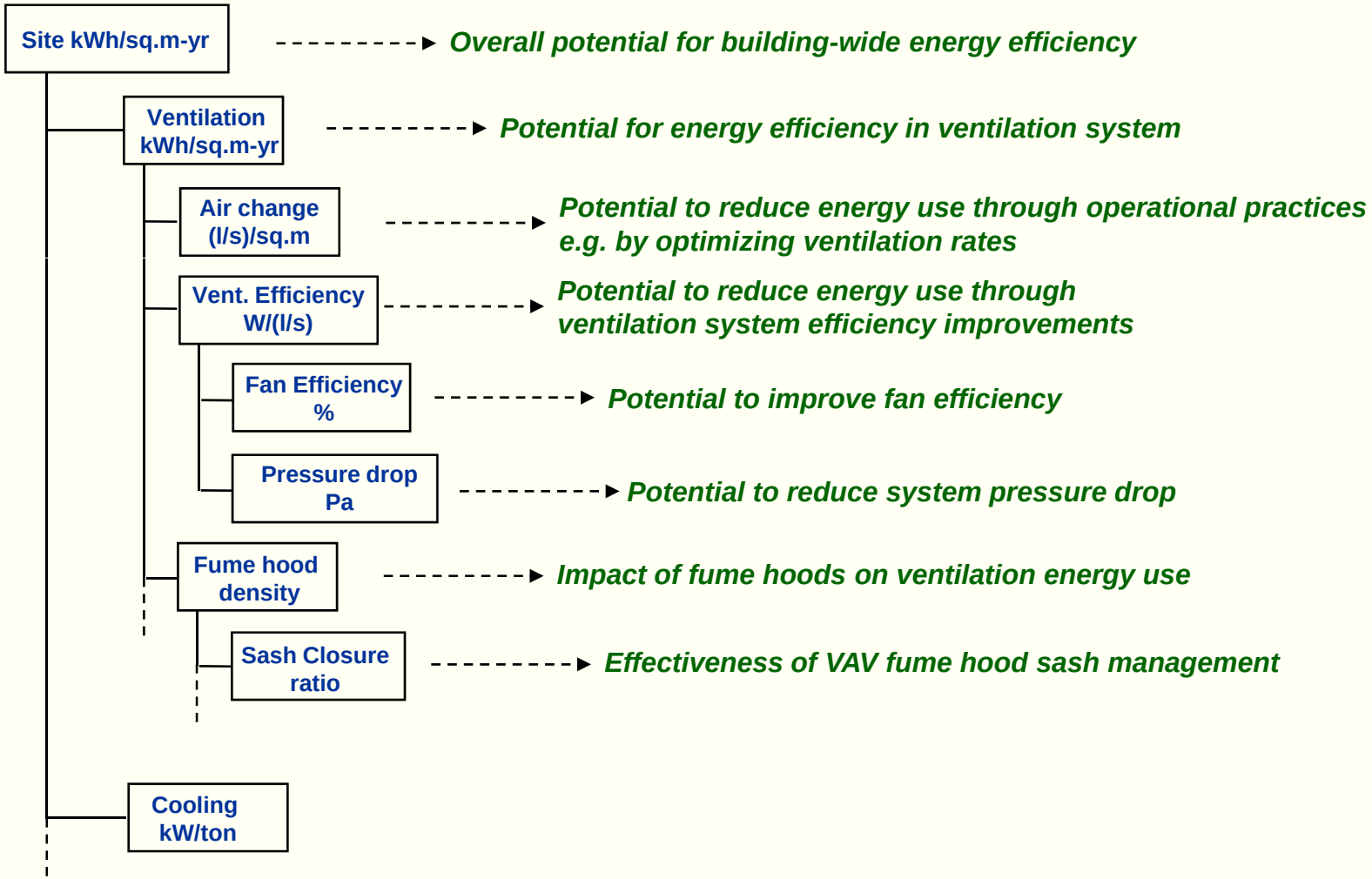


Many Applications for Energy Benchmarking



Action Oriented Benchmarking

A hierarchy of metrics can help identify potential actions



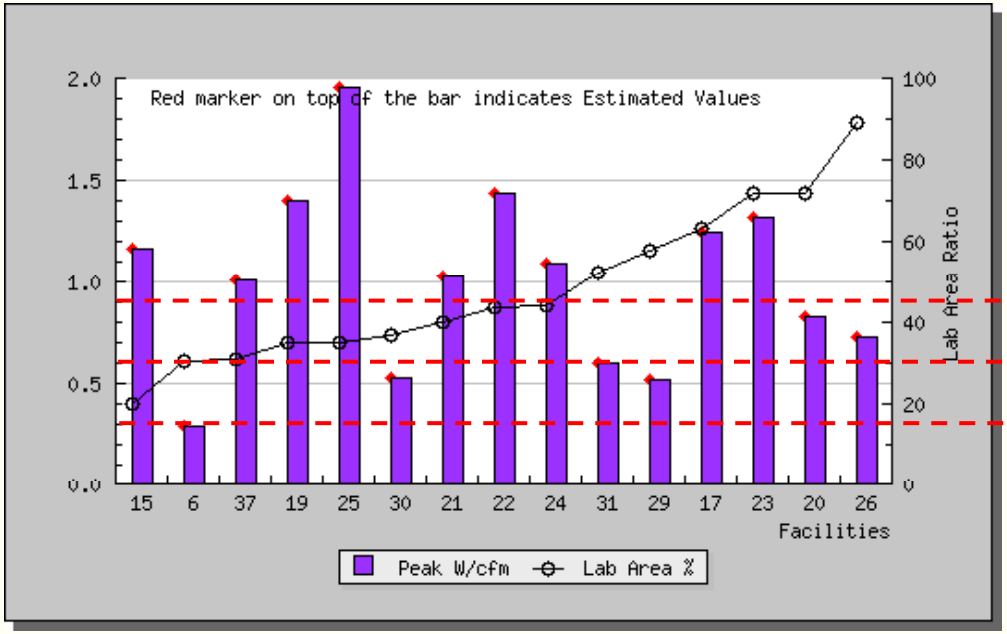
Ventilation System Airflow Efficiency

Metrics

Pressure Drop (in. w.g)
Efficiency (W/cfm)

Benchmarks

Standard: 9.7” ; 0.9 W/cfm
Good: 6.2” ; 0.6 W/cfm
Better: 3.2” ; 0.3 W/cfm



Actions

Low pressure drop design
Efficient fans (motors, belts, drives)

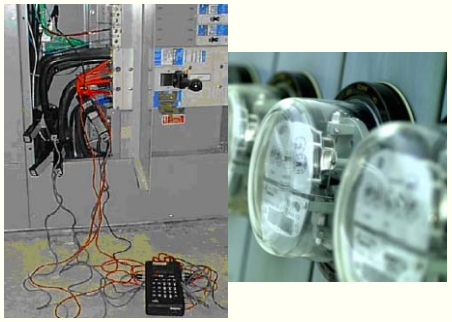
Action-oriented benchmarking extends whole-building benchmarking

Whole Building Energy Benchmarking

Screen facilities for overall potential

Minimal data requirements (utility bills, floor area, etc.)

Action-Oriented Energy Benchmarking



Identifies and prioritizes specific opportunities

Requires end-use data and system features

Highly applicable for RCx and CCx

Investment-Grade Energy Audit

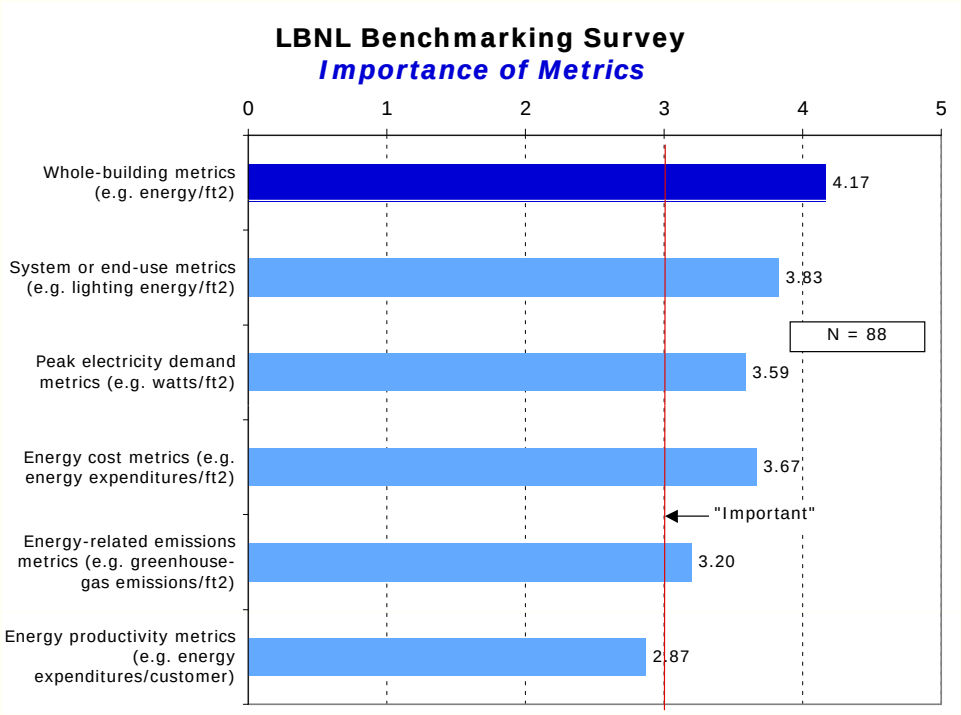
Estimates savings and cost for specific opportunities

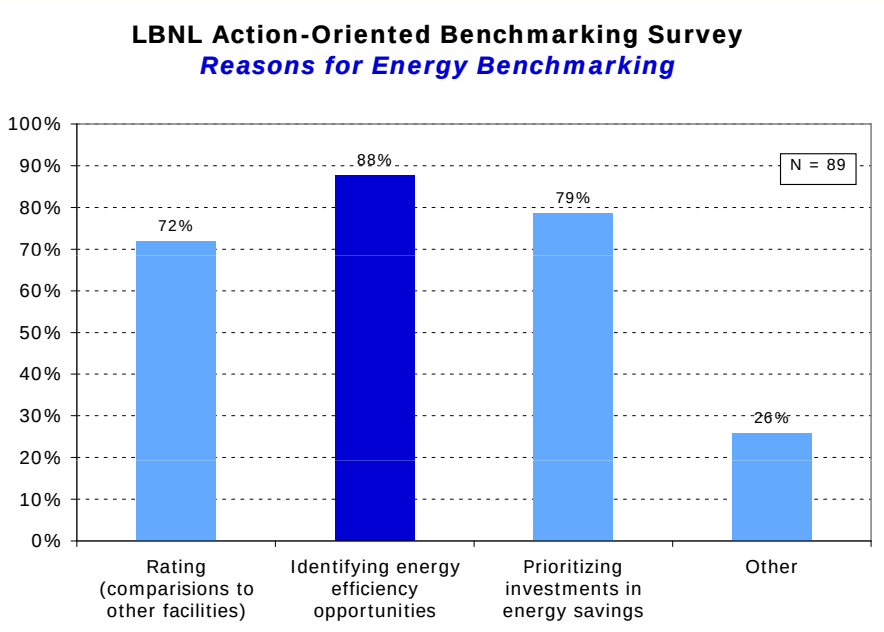
Requires detailed data collection, cost estimation, financial analysis

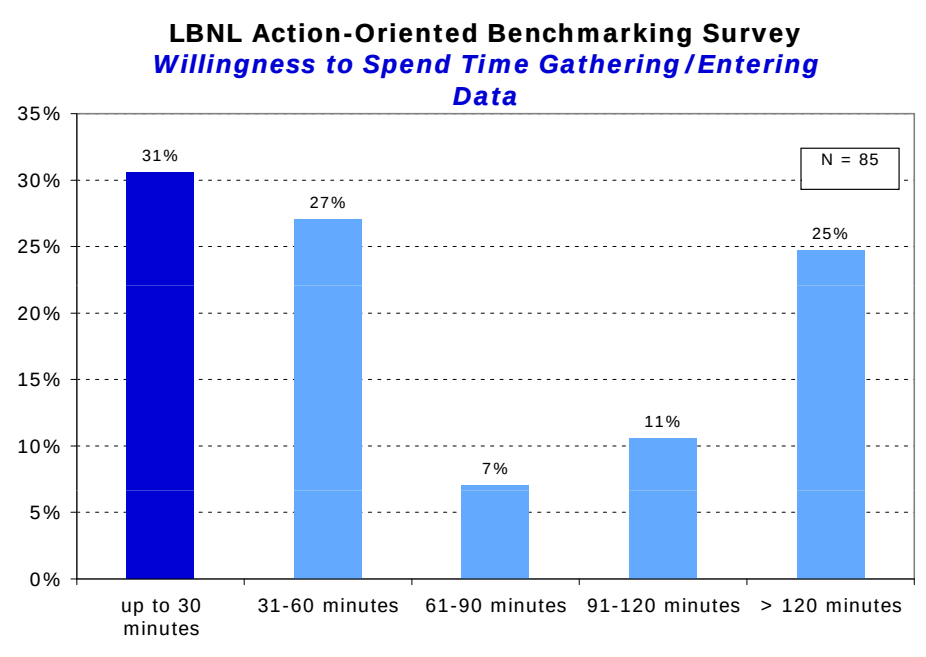
Necessary for retrofits with capital investments

Action-oriented Benchmarking User Surveys

- Existing benchmarking practices
- Features desired in action-oriented tool
- 101 respondents out ~500 stakeholders
  - Very good (20%) response rate; virtually all questions answered by each respondent
  - Respondents represent 554 million square feet of space directly influenced







Energy IQ

EnergyIQ Goals and Premises

1. Craft an AOB process that pairs “you-are-here” benchmarking with pointers to actions to reduce energy use, cost, and emissions.
2. Serves as bridge between conventional benchmarking and full audit or simulation study.
3. Enable (and motivate) users to select the peer group, metrics, and views that have meaning for them.
4. “Features” benchmarking is useful in addition to traditional “Energy” benchmarking.
5. Offer benchmarking on the fly - only enter as much data as needed for desired results.
6. Build AOB system as a web service so that third parties (public or private) can build custom applications for their constituencies
7. Complement and interoperate with existing methods (e.g. Energy Star Portfolio Manager)

Peer Comparison Datasets

- CEUS - California
  - 2800 facilities
  - On-site survey of building features
  - End use data from calibrated simulation models
- CBECS - National
  - 5215 facilities
  - Less data on building features than CEUS
  - End use data from regression models
- Other datasets (future)
  - High tech buildings – labs, cleanrooms, datacenters
  - User data

EnergyIQ Project Team

- LBNL *(prime)*
  - Evan Mills, Paul Mathew, Martin Stoufer, Chris Havstad
- Usability *(usability analysis, user interface)*
  - Kath Straub, Karen Fojas Lee, Vinit Jain, Amy Sullivan
- Itron *(simulation module)*
  - Robert Ramirez, Tom Mayer
- uTest *(testing)*
- William Bordass *(expert review)*

Energy IQ
demo
http://energyiq.lbl.gov/

LOGIN | ABOUT | HELP

EnergyIQ

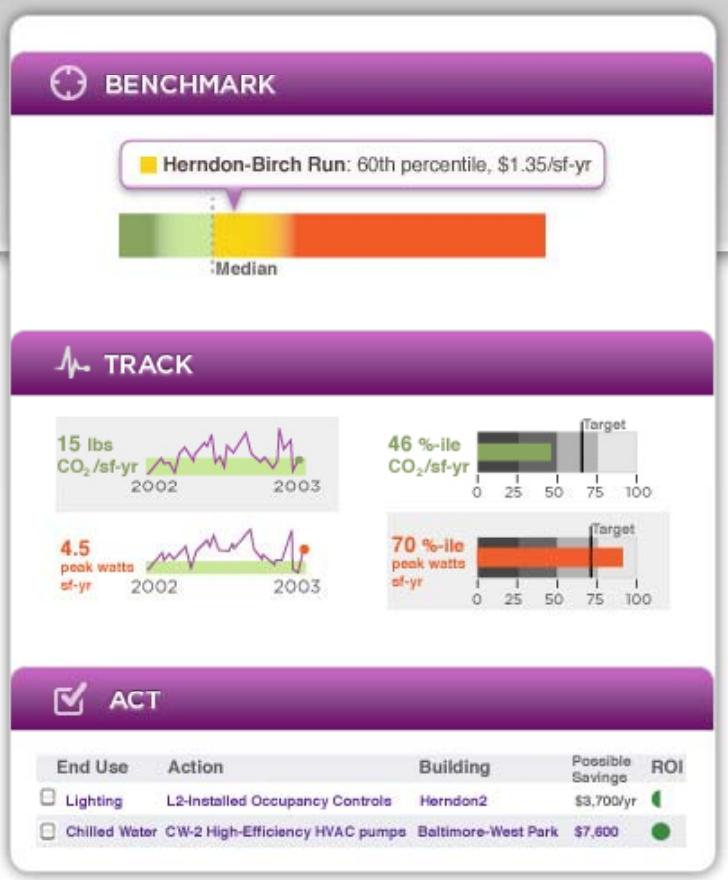
ACTION-ORIENTED ENERGY BENCHMARKING

What's your building's EnergyIQ?

EnergyIQ is an action-oriented benchmarking tool for non-residential buildings. Energy managers, building owners, architects and engineers use it to:

- Identify energy efficiency opportunities
- Save money
- Reduce carbon emissions

BENCHMARK A BUILDING

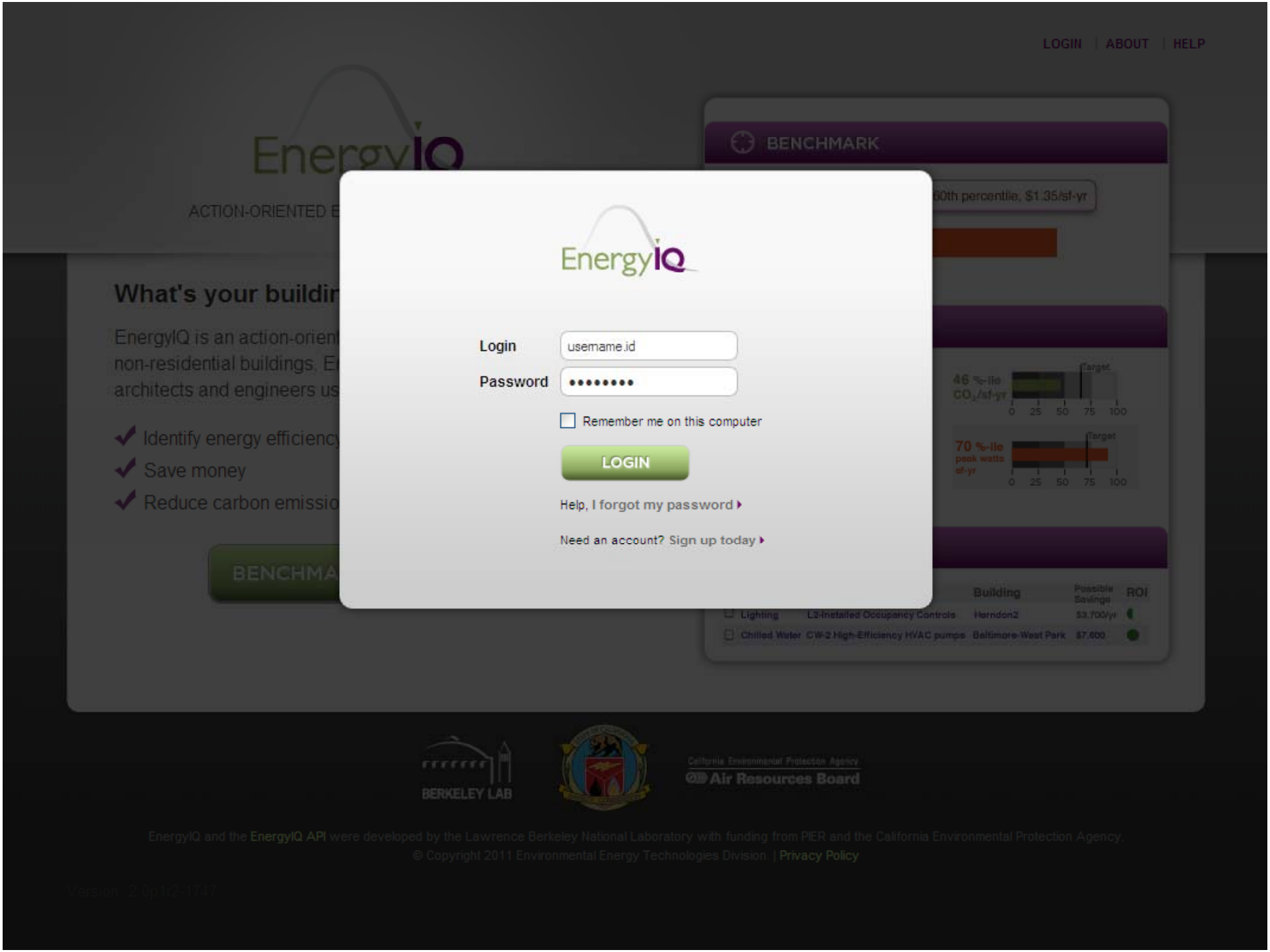


BERKELEY LAB

California Environmental Protection Agency
Air Resources Board

EnergyIQ and the EnergyIQ API were developed by the Lawrence Berkeley National Laboratory with funding from PIER and the California Environmental Protection Agency.

Version: 2.0p1r2-1747


LOGIN | ABOUT | HELP
EnergyIQ
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What's your buildir
EnergyIQ is an action-orient
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architects and engineers us
Identify energy efficiency
Save money
Reduce carbon emissio
BENCHMA
BENCHMARK
60th percentile, $1.35/sf-yr
46 %-ile
70 %-ile
peak watts
sf-yr
Target
0 25 50 75 100
Building
Possible Savings
ROI
Lighting
L2-Installed Occupancy Controls
Herndon2
$3,700/yr
Chilled Water
CW-2 High-Efficiency HVAC pumps
Baltimore-West Park
$7,600
EnergyIQ
Login
username.id
Password
Remember me on this computer
LOGIN
Help, I forgot my password
Need an account? Sign up today
BERKELEY LAB
California Environmental Protection Agency
Air Resources Board
EnergyIQ and the EnergyIQ API were developed by the Lawrence Berkeley National Laboratory with funding from PIER and the California Environmental Protection Agency.
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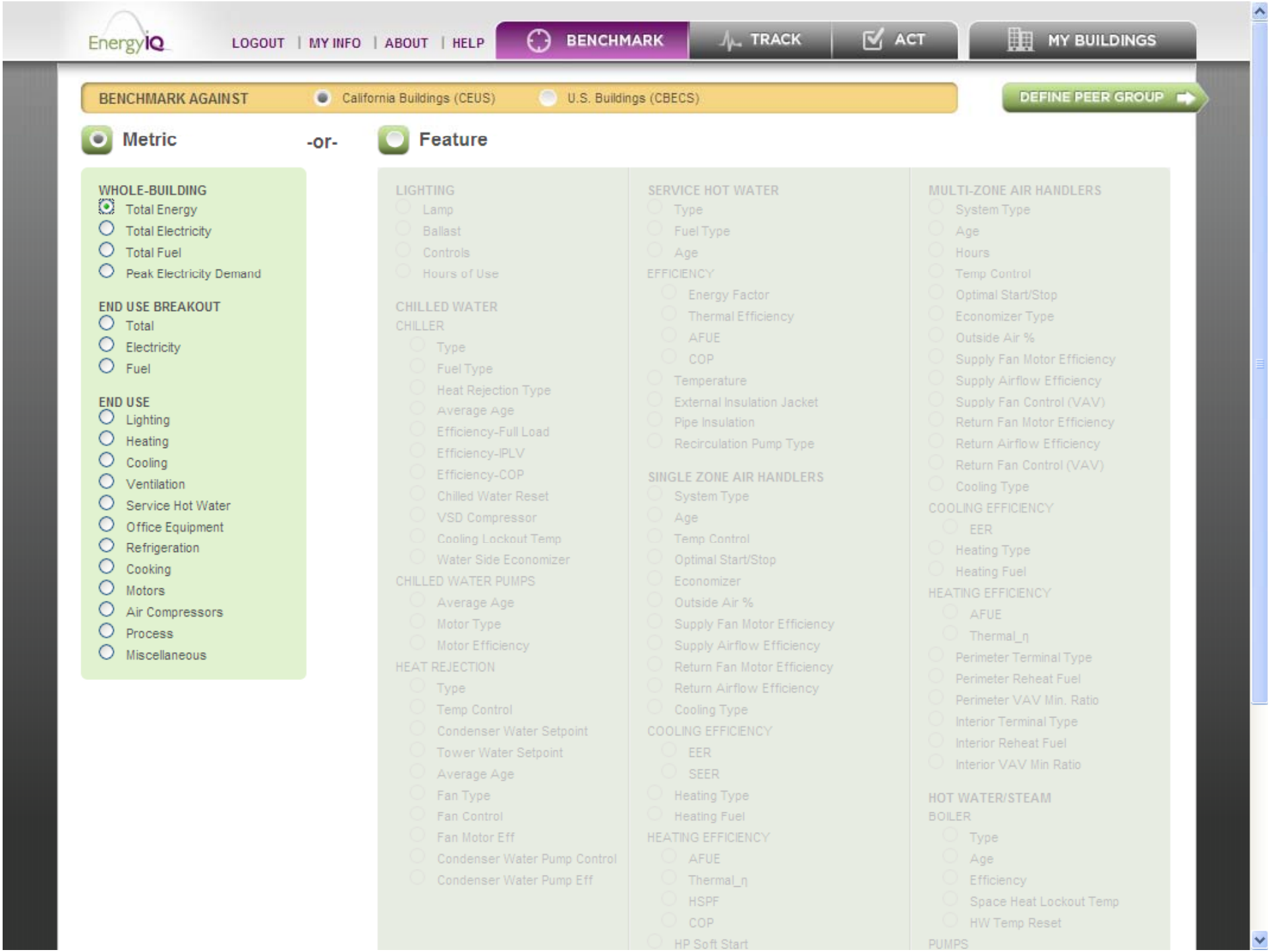

EnergyIQ
LOGOUT | MY INFO | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDINGS
BENCHMARK AGAINST
California Buildings (CEUS)
U.S. Buildings (CBECS)
DEFINE PEER GROUP
Metric
-or-
Feature
WHOLE-BUILDING
Total Energy
Total Electricity
Total Fuel
Peak Electricity Demand
END USE BREAKOUT
Total
Electricity
Fuel
END USE
Lighting
Heating
Cooling
Ventilation
Service Hot Water
Office Equipment
Refrigeration
Cooking
Motors
Air Compressors
Process
Miscellaneous
LIGHTING
Lamp
Ballast
Controls
Hours of Use
CHILLED WATER
CHILLER
Type
Fuel Type
Heat Rejection Type
Average Age
Efficiency-Full Load
Efficiency-IPLV
Efficiency-COP
Chilled Water Reset
VSD Compressor
Cooling Lockout Temp
Water Side Economizer
CHILLED WATER PUMPS
Average Age
Motor Type
Motor Efficiency
HEAT REJECTION
Type
Temp Control
Condenser Water Setpoint
Tower Water Setpoint
Average Age
Fan Type
Fan Control
Fan Motor Eff
Condenser Water Pump Control
Condenser Water Pump Eff
SERVICE HOT WATER
Type
Fuel Type
Age
EFFICIENCY
Energy Factor
Thermal Efficiency
AFUE
COP
Temperature
External Insulation Jacket
Pipe Insulation
Recirculation Pump Type
SINGLE ZONE AIR HANDLERS
System Type
Age
Temp Control
Optimal Start/Stop
Economizer
Outside Air %
Supply Fan Motor Efficiency
Supply Airflow Efficiency
Return Fan Motor Efficiency
Return Airflow Efficiency
Cooling Type
COOLING EFFICIENCY
EER
SEER
Heating Type
Heating Fuel
HEATING EFFICIENCY
AFUE
Thermal_η
HSPF
COP
HP Soft Start
MULTI-ZONE AIR HANDLERS
System Type
Age
Hours
Temp Control
Optimal Start/Stop
Economizer Type
Outside Air %
Supply Fan Motor Efficiency
Supply Airflow Efficiency
Supply Fan Control (VAV)
Return Fan Motor Efficiency
Return Airflow Efficiency
Return Fan Control (VAV)
Cooling Type
COOLING EFFICIENCY
EER
Heating Type
Heating Fuel
HEATING EFFICIENCY
AFUE
Thermal_η
Perimeter Terminal Type
Perimeter Reheat Fuel
Perimeter VAV Min. Ratio
Interior Terminal Type
Interior Reheat Fuel
Interior VAV Min Ratio
HOT WATER/STEAM
BOILER
Type
Age
Efficiency
Space Heat Lockout Temp
HW Temp Reset
PUMPS

Define Peer Group

Back to Metrics & Features DRAW CHART

Select floor area, vintage, and location.

FLOOR AREA
- [x] All sizes
  - [x] 0 - 25000 sq. ft.
  - [x] 25000 - 150000 sq. ft.
  - [x] over 150000 sq. ft.

VINTAGE
- [x] All years
  - [x] 1991 - Present
  - [x] 1979 - 1990
  - [x] 1941 - 1978
  - [x] 1901 - 1940
  - [x] Unknown

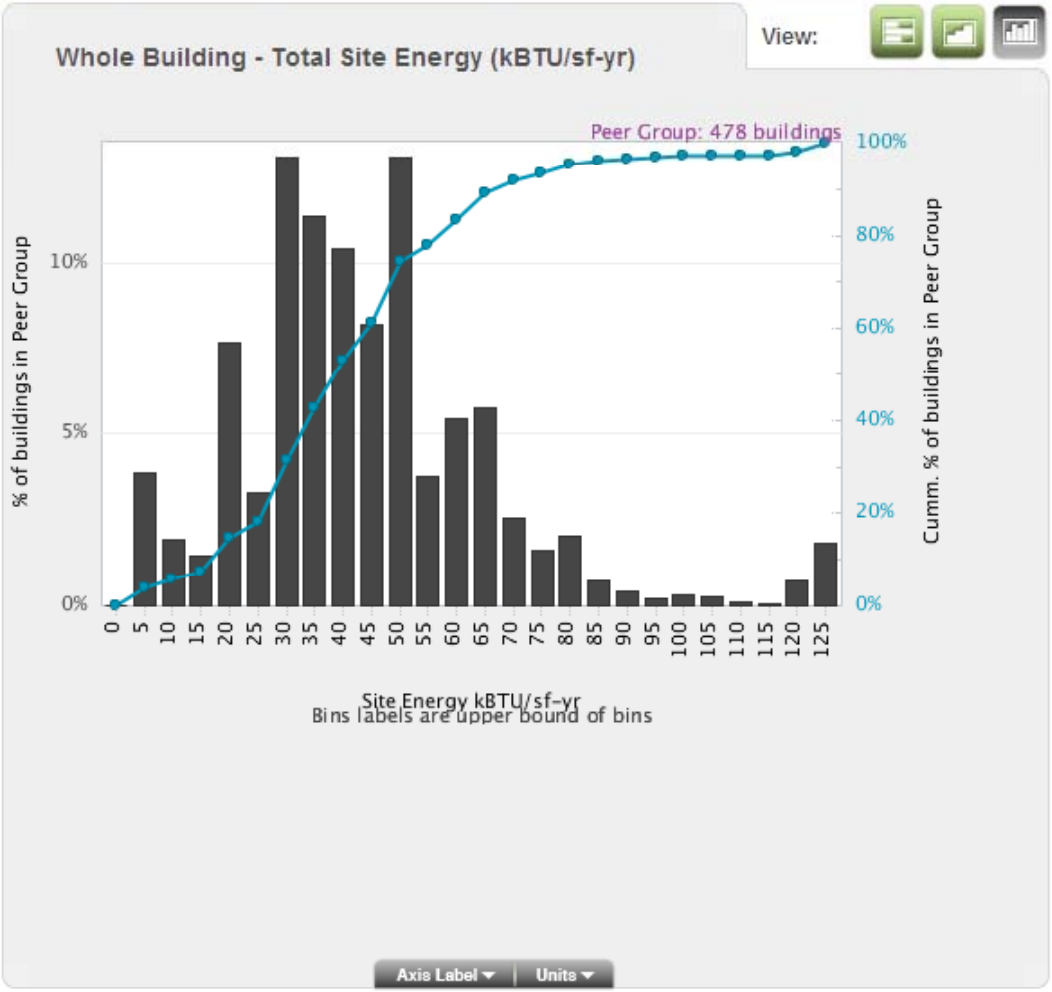
LOCATION
- [x] All Locations
  - [x] Central Coast
  - [x] Central Valley
  - [x] Desert
  - [x] Mountains
  - [x] North Coast
  - [x] South Coast
  - [x] South Inland

Then, select your building types.

- [x] **OFFICE**
  - [x] Administration and Management
  - [x] Financial/Legal
  - [x] Insurance/Real Estate
  - [x] Government Services
  - [x] Software Development
  - [x] Medical/Dental Office
  - [x] Assorted/Multi-tenant
  - [x] Other Office
- [ ] **DATA CENTER**
- [ ] **LABORATORY**
- [ ] **RESTAURANT**
  - [ ] Fast Food or Self Service
  - [ ] Specialty/Novelty food service
  - [ ] Table Service
  - [ ] BAR/Tavern/Nightclub/Other
  - [ ] Other Food Service
- [ ] **FOOD STORE**
  - [ ] Supermarkets
  - [ ] Small General Grocery
  - [ ] Specialty Ethnic Grocery
  - [ ] Convenience Store
  - [ ] Liquor Store
  - [ ] Other Food Store
- [ ] **RETAIL**
  - [ ] Department/Variety Store
  - [ ] Retail Warehouse/Clubs
  - [ ] Shop in Enclosed Mall
  - [ ] Shop in Strip Mall
  - [ ] Auto Sales
  - [ ] Other Retail Store
- [ ] **WAREHOUSE** (REFRIGERATED)
- [ ] **WAREHOUSE** (NON-REFRIGERATED)
  - [ ] Unconditioned WH High Bay
  - [ ] Unconditioned WH Low Bay
  - [ ] Conditioned WH High Bay
  - [ ] Conditioned WH Low Bay
- [ ] **HEALTHCARE**
  - [ ] Hospital
  - [ ] Nursing Home
  - [ ] Clinic/Outpatient Care
  - [ ] Medical/Dental Lab
- [ ] **SCHOOL**
  - [ ] Daytime or Preschool
  - [ ] Elementary School
  - [ ] Middle/Secondary School
- [ ] **COLLEGE**
  - [ ] College or University
  - [ ] Vocational or Trade School
- [ ] **LODGING**
  - [ ] Hotel
  - [ ] Motel
  - [ ] Resort
  - [ ] Other Lodging
- [ ] **PUBLIC ASSEMBLY**
  - [ ] Library/Museum
  - [ ] Conference /Convention Center
  - [ ] Religious Assembly (Worship only)
  - [ ] Religious Assembly (Mixed use)
  - [ ] Health/Fitness Center
  - [ ] Theater/Performing Arts
  - [ ] Community Center
  - [ ] Other Recreation/Public Assembly
- [ ] **MISCELLANEOUS**
  - [ ] Gas Station
  - [ ] Gas with Convenience Store
  - [ ] Repair (Non-Auto)
  - [ ] Other Service Shop
  - [ ] Assembly / Light Mfg.
  - [ ] Police / Fire Stations
  - [ ] Post Office
  - [ ] Other Unlisted Type

Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:



Peer Group Information

SUMMARY The Site Energy for typical buildings of the type(s) you've specified is 43.6 kBTU/sf-yr [median value], with a range of 13.7 to 82.3 kBTU/sf-yr [5th to 95th percentiles] for the population. Enter your own building information at the left to see how yours compares. Try other Views for graphical and tabular detail. This analysis includes population weights for each building.

DATA SET California only (CEUS)

LOCATION California= Central Coast, Central Valley, Desert, Mountains, North Coast, South Coast, South Inland

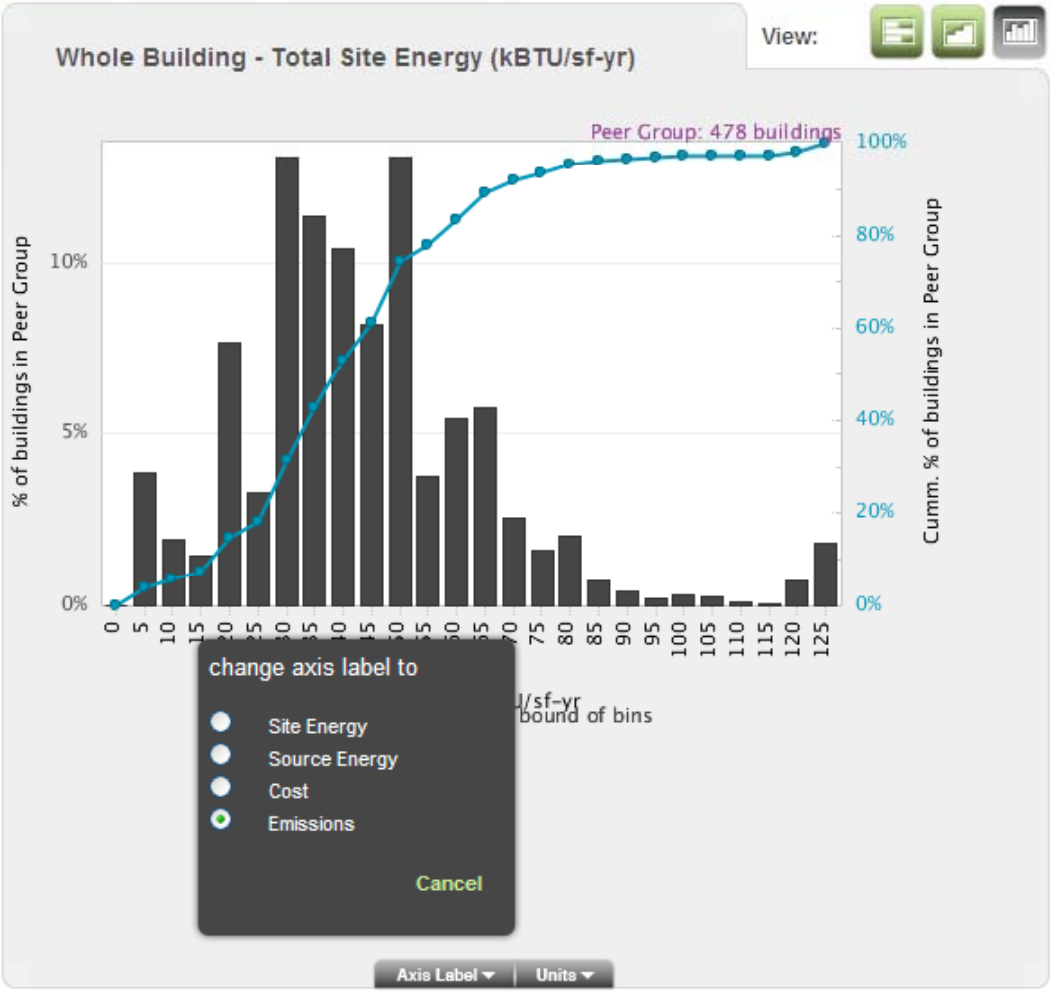
SIZE 0 - 25,000 sf, 25,001 - 150,000 sf, Over 150,000 sf

VINTAGE 1901 through 1940, 1941 through 1978, 1979 through 1990, 1991 through Present, Unknown

TYPE Administration and Management, Assorted/Multi-tenant, Financial/Legal, Government Services, Insurance/Real Estate, Medical/Dental Office, Other Office, Software Development

Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:



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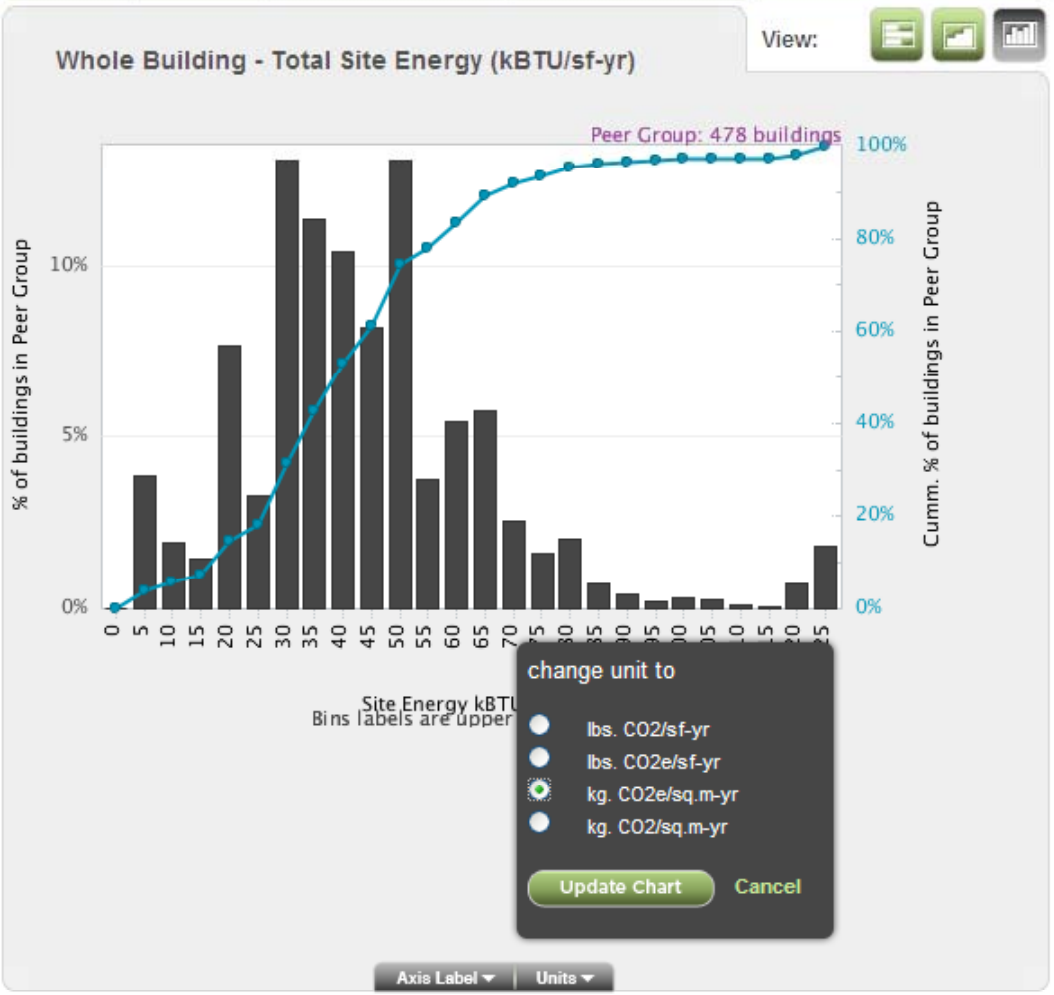

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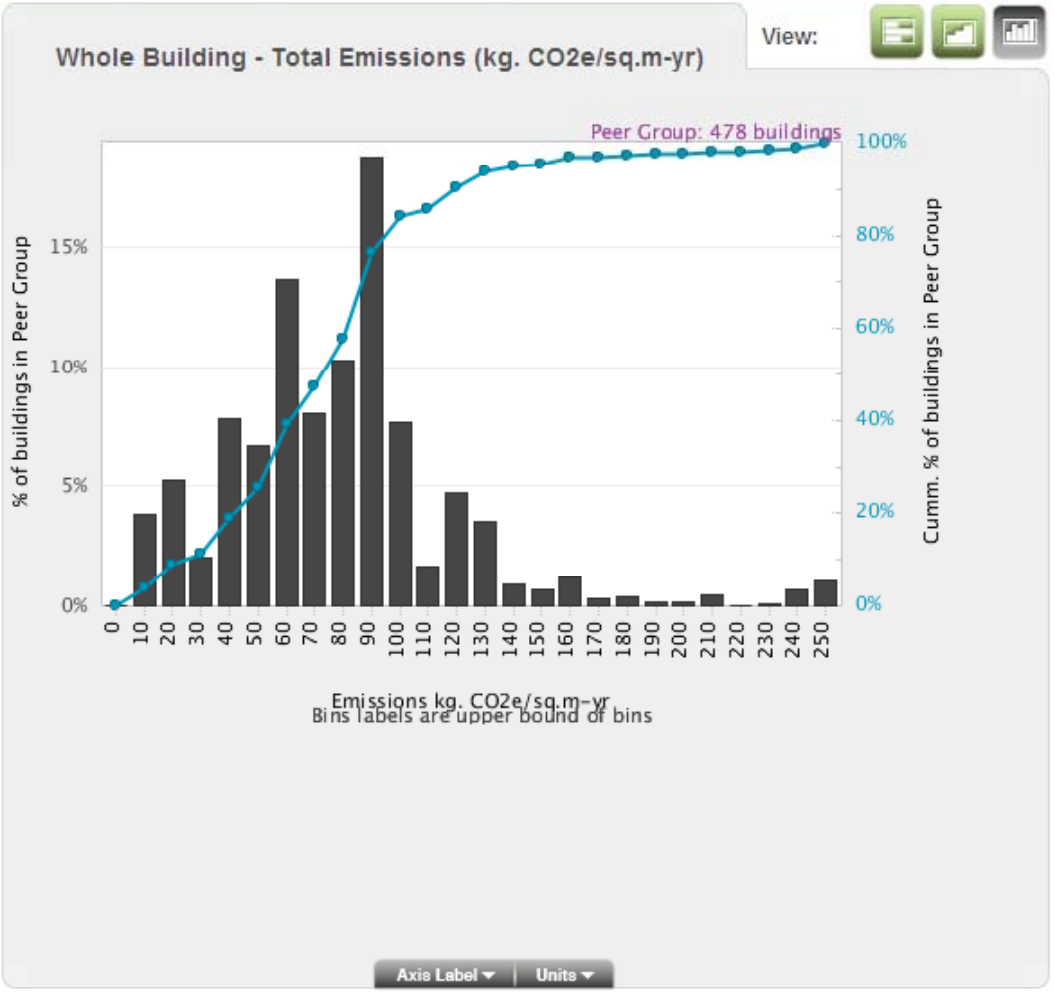
View:



Peer Group Information

SUMMARY The CO2 Equivalent for typical buildings of the type(s) you've specified is 81.3 kg. CO2e/sq.m-yr [median value], with a range of 25.5 to 151.1 kg. CO2e/sq.m-yr [5th to 95th percentiles] for the population. Enter your own building information at the left to see how yours compares. Try other Views for graphical and tabular detail. This analysis includes population weights for each building.

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Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:

SHOW OUTLIERS

Peer Group Information

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The data in the plot is an *unweighted* representation of the values you selected.

DATA SET California only (CEUS)

LOCATION California= Central Coast, Central Valley, Desert, Mountains, North Coast, South Coast, South Inland

SIZE 0 - 25,000 sf, 25,001 - 150,000 sf, Over 150,000 sf

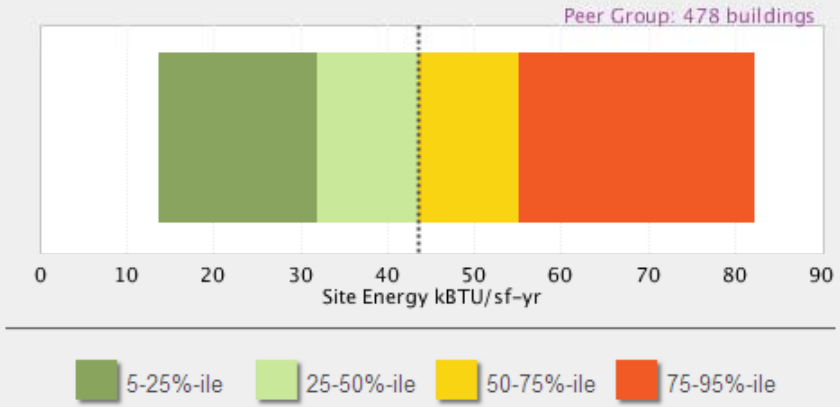
VINTAGE 1901 through 1940, 1941 through 1978, 1979 through 1990, 1991 through Present, Unknown

TYPE Administration and Management, Assorted/Multi-tenant, Financial/Legal, Government Services, Insurance/Real Estate, Medical/Dental Office, Other Office, Software Development

Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:

Whole Building - Total Site Energy (kBTU/sf-yr)



Axis Label | Units

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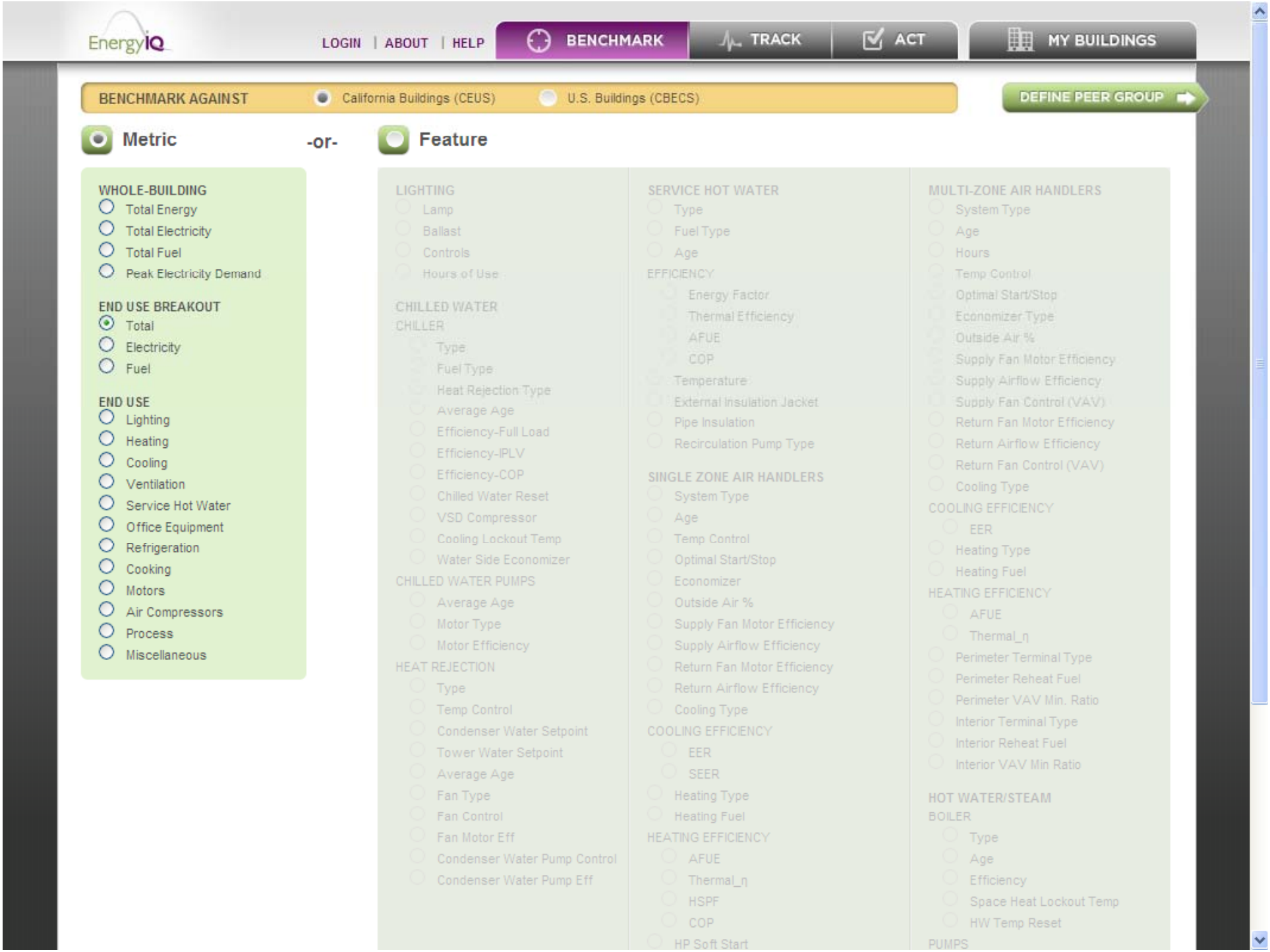
EnergyIQ
LOGIN | ABOUT | HELP
BENCHMARK
TRACK
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MY BUILDINGS
BENCHMARK AGAINST
California Buildings (CEUS)
U.S. Buildings (CBECS)
DEFINE PEER GROUP
Metric
-or-
Feature
WHOLE-BUILDING
Total Energy
Total Electricity
Total Fuel
Peak Electricity Demand
END USE BREAKOUT
Total
Electricity
Fuel
END USE
Lighting
Heating
Cooling
Ventilation
Service Hot Water
Office Equipment
Refrigeration
Cooking
Motors
Air Compressors
Process
Miscellaneous
LIGHTING
Lamp
Ballast
Controls
Hours of Use
CHILLED WATER
CHILLER
Type
Fuel Type
Heat Rejection Type
Average Age
Efficiency-Full Load
Efficiency-IPLV
Efficiency-COP
Chilled Water Reset
VSD Compressor
Cooling Lockout Temp
Water Side Economizer
CHILLED WATER PUMPS
Average Age
Motor Type
Motor Efficiency
HEAT REJECTION
Type
Temp Control
Condenser Water Setpoint
Tower Water Setpoint
Average Age
Fan Type
Fan Control
Fan Motor Eff
Condenser Water Pump Control
Condenser Water Pump Eff
SERVICE HOT WATER
Type
Fuel Type
Age
EFFICIENCY
Energy Factor
Thermal Efficiency
AFUE
COP
Temperature
External Insulation Jacket
Pipe Insulation
Recirculation Pump Type
SINGLE ZONE AIR HANDLERS
System Type
Age
Temp Control
Optimal Start/Stop
Economizer
Outside Air %
Supply Fan Motor Efficiency
Supply Airflow Efficiency
Return Fan Motor Efficiency
Return Airflow Efficiency
Cooling Type
COOLING EFFICIENCY
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Heating Type
Heating Fuel
HEATING EFFICIENCY
AFUE
Thermal_η
HSPF
COP
HP Soft Start
MULTI-ZONE AIR HANDLERS
System Type
Age
Hours
Temp Control
Optimal Start/Stop
Economizer Type
Outside Air %
Supply Fan Motor Efficiency
Supply Airflow Efficiency
Supply Fan Control (VAV)
Return Fan Motor Efficiency
Return Airflow Efficiency
Return Fan Control (VAV)
Cooling Type
COOLING EFFICIENCY
EER
Heating Type
Heating Fuel
HEATING EFFICIENCY
AFUE
Thermal_η
Perimeter Terminal Type
Perimeter Reheat Fuel
Perimeter VAV Min. Ratio
Interior Terminal Type
Interior Reheat Fuel
Interior VAV Min Ratio
HOT WATER/STEAM
BOILER
Type
Age
Efficiency
Space Heat Lockout Temp
HW Temp Reset
PUMPS

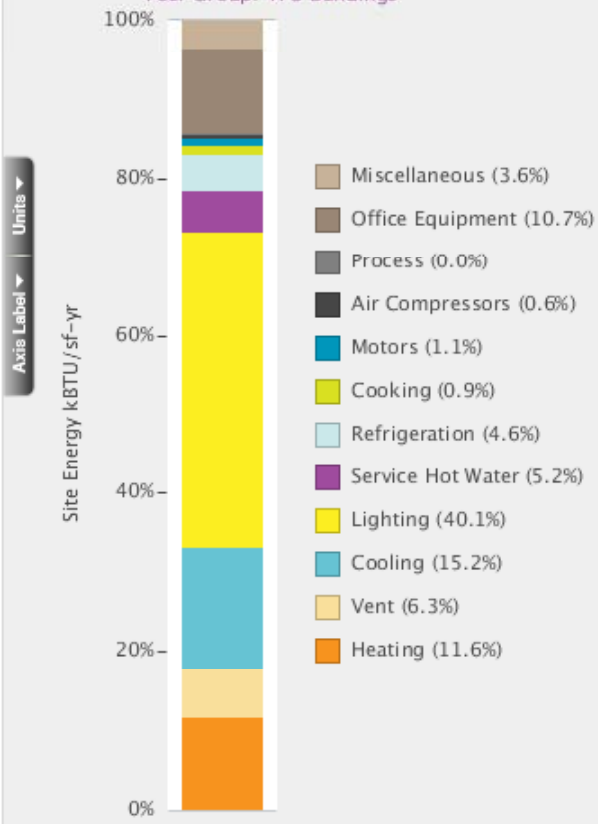
Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:

Absolute Value | By Percentage

End Use Breakout - Total Site Energy

Peer Group: 478 buildings



Peer Group Information

SUMMARY The Site Energy for typical buildings of the type(s) you've specified is 43.6 kBTU/sf-yr [median value], with a range of 13.7 to 82.3 kBTU/sf-yr [5th to 95th percentiles] for the population. Enter your own building information at the left to see how yours compares. Try other Views for graphical and tabular detail. This analysis includes population weights for each building.

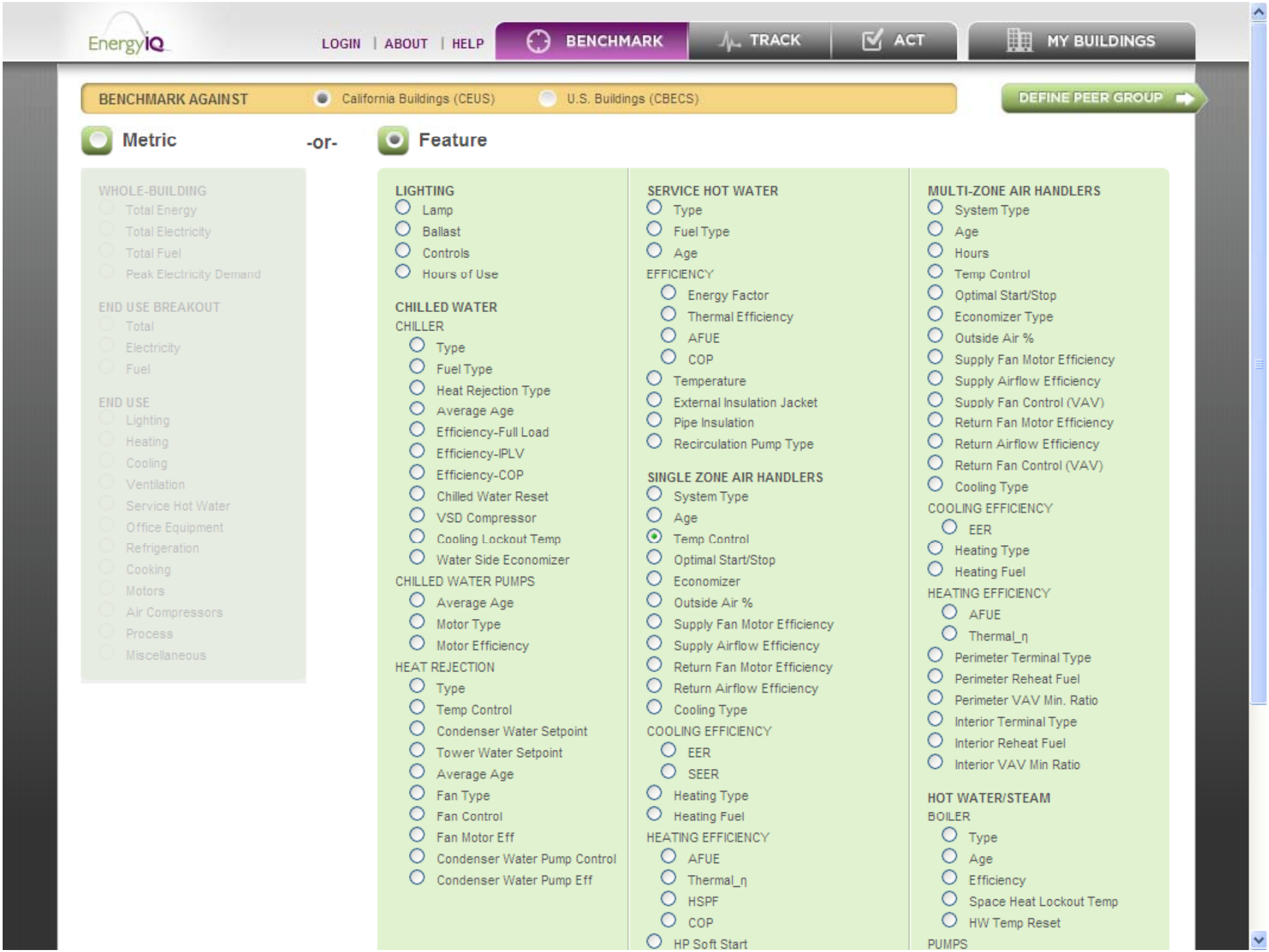
DATA SET California only (CEUS)

LOCATION California= Central Coast, Central Valley, Desert, Mountains, North Coast, South Coast, South Inland

SIZE 0 - 25,000 sf, 25,001 - 150,000 sf, Over 150,000 sf

VINTAGE 1901 through 1940, 1941 through 1978, 1979 through 1990, 1991 through Present, Unknown

TYPE Administration and Management, Assorted/Multi-tenant, Financial/Legal, Government Services, Insurance/Real Estate, Medical/Dental Office, Other Office, Software Development

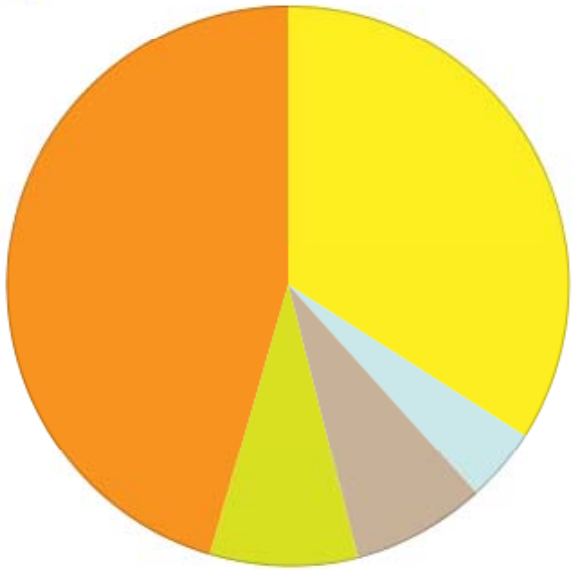

EnergyIQ
LOGIN | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDINGS
BENCHMARK AGAINST
California Buildings (CEUS)
U.S. Buildings (CBECS)
DEFINE PEER GROUP
Metric
-or-
Feature
WHOLE-BUILDING
Total Energy
Total Electricity
Total Fuel
Peak Electricity Demand
END USE BREAKOUT
Total
Electricity
Fuel
END USE
Lighting
Heating
Cooling
Ventilation
Service Hot Water
Office Equipment
Refrigeration
Cooking
Motors
Air Compressors
Process
Miscellaneous
LIGHTING
Lamp
Ballast
Controls
Hours of Use
CHILLED WATER
CHILLER
Type
Fuel Type
Heat Rejection Type
Average Age
Efficiency-Full Load
Efficiency-IPLV
Efficiency-COP
Chilled Water Reset
VSD Compressor
Cooling Lockout Temp
Water Side Economizer
CHILLED WATER PUMPS
Average Age
Motor Type
Motor Efficiency
HEAT REJECTION
Type
Temp Control
Condenser Water Setpoint
Tower Water Setpoint
Average Age
Fan Type
Fan Control
Fan Motor Eff
Condenser Water Pump Control
Condenser Water Pump Eff
SERVICE HOT WATER
Type
Fuel Type
Age
EFFICIENCY
Energy Factor
Thermal Efficiency
AFUE
COP
Temperature
External Insulation Jacket
Pipe Insulation
Recirculation Pump Type
SINGLE ZONE AIR HANDLERS
System Type
Age
Temp Control
Optimal Start/Stop
Economizer
Outside Air %
Supply Fan Motor Efficiency
Supply Airflow Efficiency
Return Fan Motor Efficiency
Return Airflow Efficiency
Cooling Type
COOLING EFFICIENCY
EER
SEER
Heating Type
Heating Fuel
HEATING EFFICIENCY
AFUE
Thermal_η
HSPF
COP
HP Soft Start
MULTI-ZONE AIR HANDLERS
System Type
Age
Hours
Temp Control
Optimal Start/Stop
Economizer Type
Outside Air %
Supply Fan Motor Efficiency
Supply Airflow Efficiency
Supply Fan Control (VAV)
Return Fan Motor Efficiency
Return Airflow Efficiency
Return Fan Control (VAV)
Cooling Type
COOLING EFFICIENCY
EER
Heating Type
Heating Fuel
HEATING EFFICIENCY
AFUE
Thermal_η
Perimeter Terminal Type
Perimeter Reheat Fuel
Perimeter VAV Min. Ratio
Interior Terminal Type
Interior Reheat Fuel
Interior VAV Min Ratio
HOT WATER/STEAM
BOILER
Type
Age
Efficiency
Space Heat Lockout Temp
HW Temp Reset
PUMPS

Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:

Single-zone Air Handlers Temp Control by Count

Peer Group: 343 buildings



- Manual (34.0%)
- Always on, const temp (4.3%)
- Timeclock (7.7%)
- EMS (8.5%)
- Programmable Tstat (45.5%)

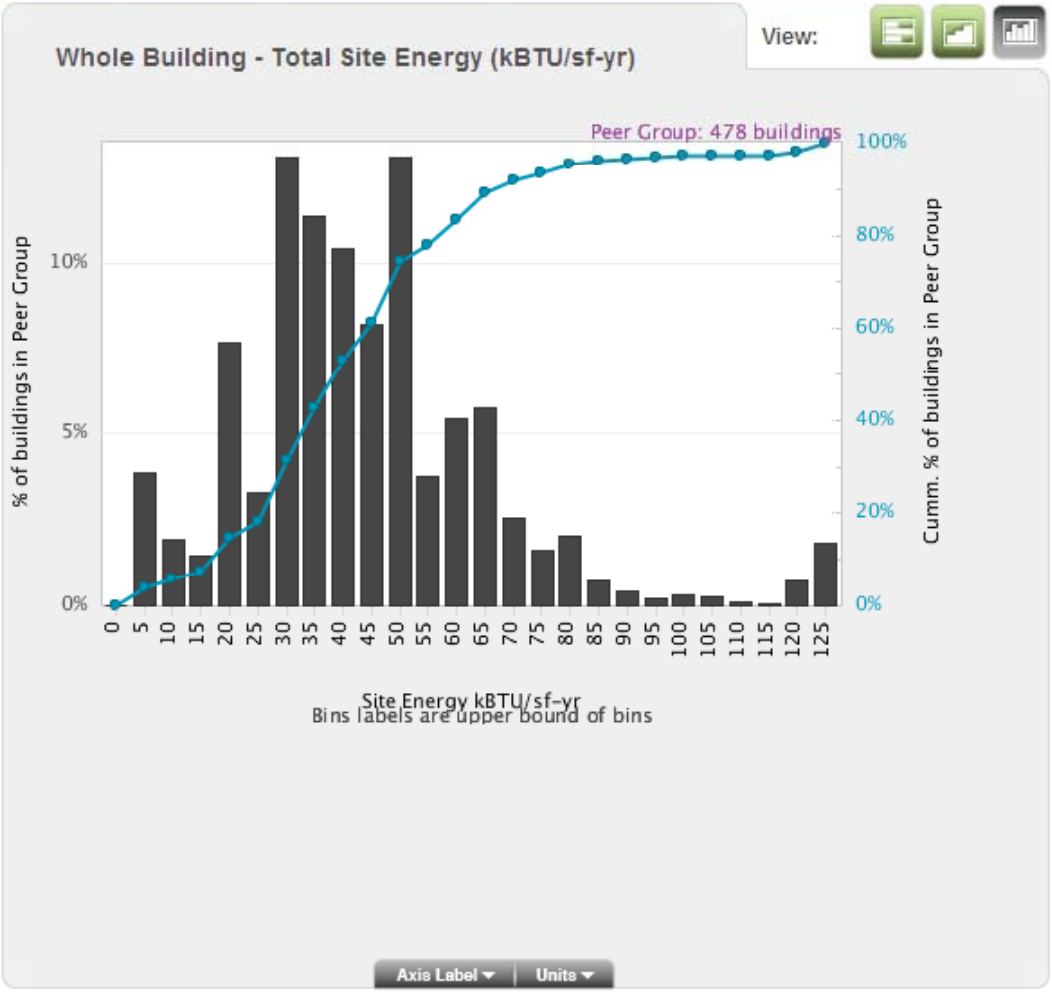
Axis Label | Units

Peer Group Information

SUMMARY	45.5% of the types of buildings you have selected use Programmable Tstat.
DATA SET	California only (CEUS)
LOCATION	California= Central Coast, Central Valley, Desert, Mountains, North Coast, South Coast, South Inland
SIZE	0 - 25,000 sf, 25,001 - 150,000 sf, Over 150,000 sf
VINTAGE	1901 through 1940, 1941 through 1978, 1979 through 1990, 1991 through Present, Unknown
TYPE	Administration and Management, Assorted/Multi-tenant, Financial/Legal, Government Services, Insurance/Real Estate, Medical/Dental Office, Other Office, Software Development

Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:



Peer Group Information

SUMMARY The Site Energy for typical buildings of the type(s) you've specified is 43.6 kBTU/sf-yr [median value], with a range of 13.7 to 82.3 kBTU/sf-yr [5th to 95th percentiles] for the population. Enter your own building information at the left to see how yours compares. Try other Views for graphical and tabular detail. This analysis includes population weights for each building.

DATA SET California only (CEUS)

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VINTAGE 1901 through 1940, 1941 through 1978, 1979 through 1990, 1991 through Present, Unknown

TYPE Administration and Management, Assorted/Multi-tenant, Financial/Legal, Government Services, Insurance/Real Estate, Medical/Dental Office, Other Office, Software Development

Export | Email | Add to Dashboard | Create New Chart | Add a Building

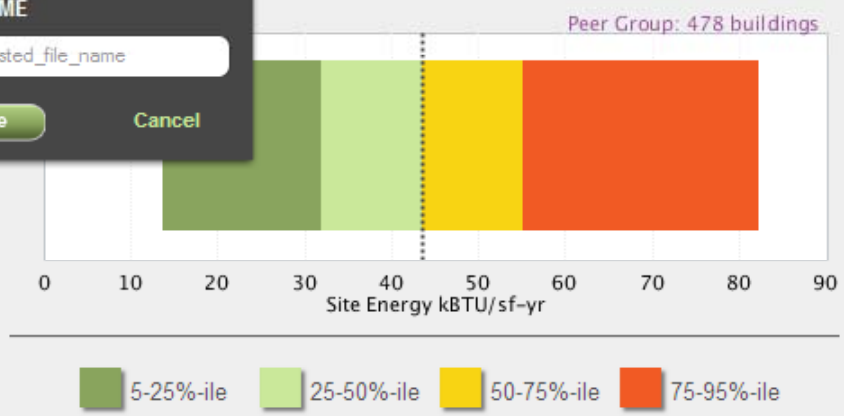
SAVE AS
Excel workbook

FILENAME
Suggested_file_name

Save Cancel

ite Energy (kBTU/sf-yr)

View:



Axis Label | Units

Peer Group Information

SUMMARY The Site Energy for typical buildings of the type(s) you've specified is 43.6 kBTU/sf-yr [median value], with a range of 13.7 to 82.3 kBTU/sf-yr [5th to 95th percentiles] for the population. Enter your own building information at the left to see how yours compares. Try other Views for graphical and tabular detail. This analysis includes population weights for each building.

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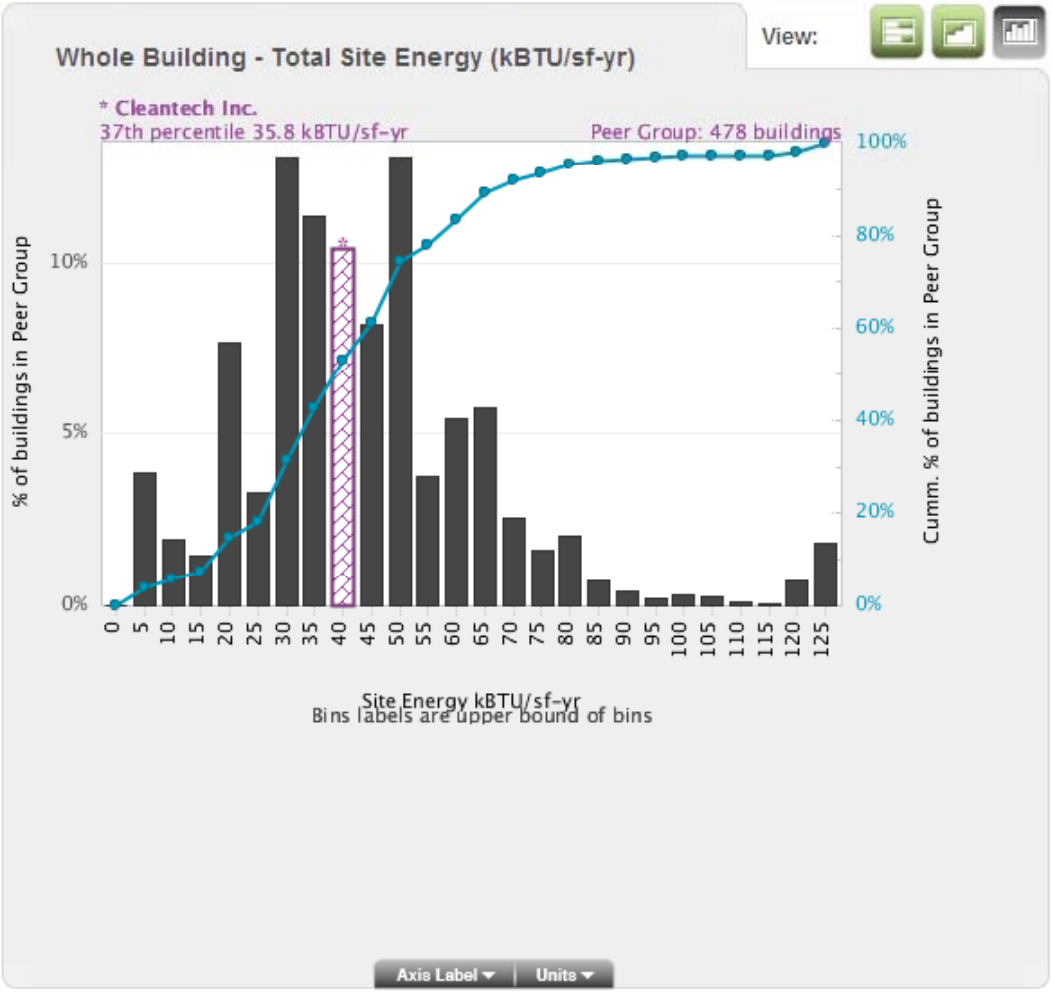
Export | Email | Add to Dashboard | Create New Chart | Add a Building

View:



Peer Group Information

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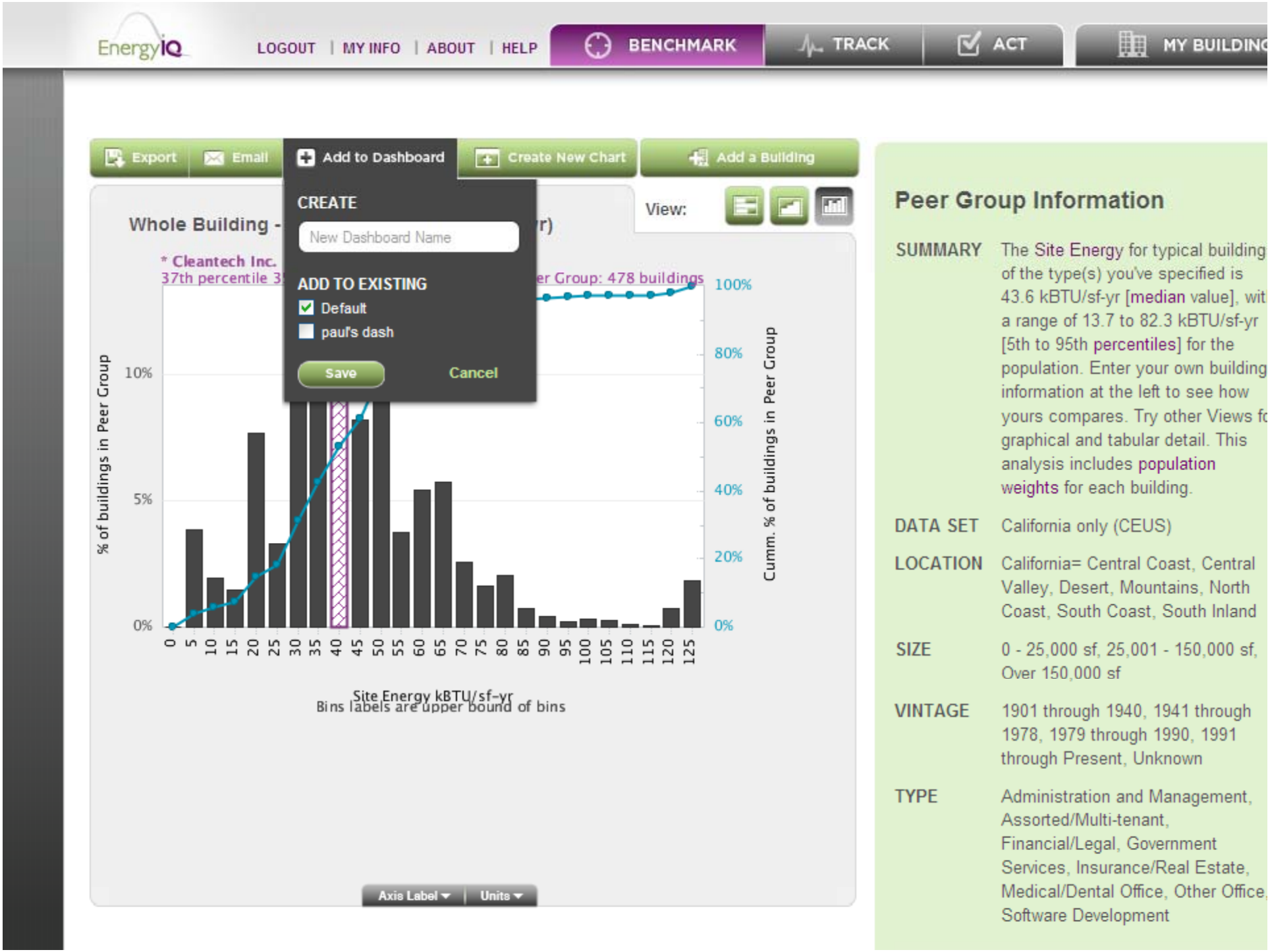

Peer Group Information

SUMMARY	The Site Energy for typical building of the type(s) you've specified is 43.6 kBTU/sf-yr [median value], wit a range of 13.7 to 82.3 kBTU/sf-yr [5th to 95th percentiles] for the population. Enter your own building information at the left to see how yours compares. Try other Views fo graphical and tabular detail. This analysis includes population weights for each building.
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LOCATION	California= Central Coast, Central Valley, Desert, Mountains, North Coast, South Coast, South Inland
SIZE	0 - 25,000 sf, 25,001 - 150,000 sf, Over 150,000 sf
VINTAGE	1901 through 1940, 1941 through 1978, 1979 through 1990, 1991 through Present, Unknown
TYPE	Administration and Management, Assorted/Multi-tenant, Financial/Legal, Government Services, Insurance/Real Estate, Medical/Dental Office, Other Office, Software Development

My Buildings

Add a Building

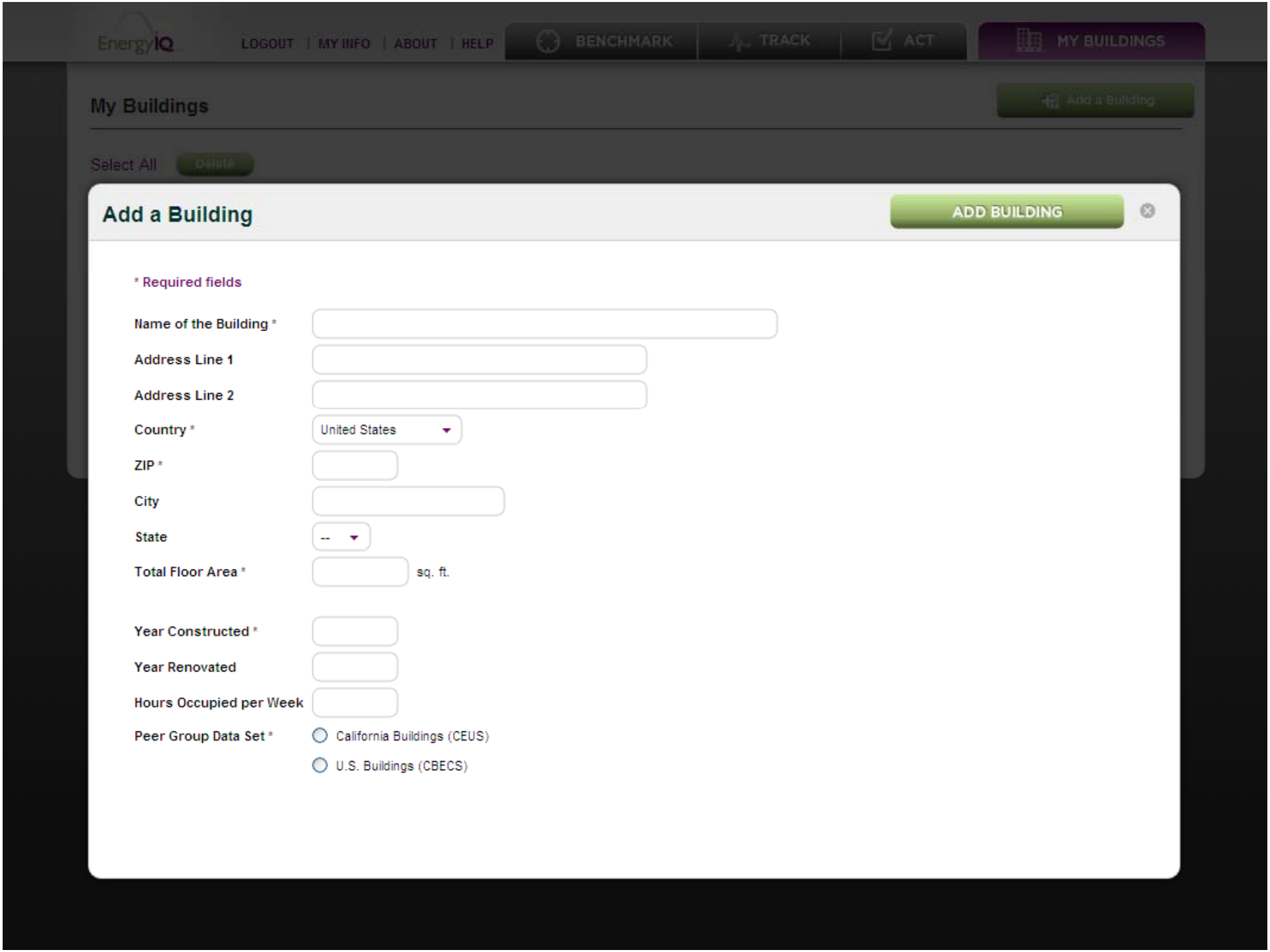
Select All Delete

	BUILDING	LOCATION
☐	Cleantech Inc.	Berkeley CA USA
☐	Dilbert Park	Los Angeles CA USA
☐	Energy place	Berkeley CA USA
☐	Holistic organica	Pittsburgh PA USA
☐	Natural grocery co.	Pittsburgh PA USA
☐	Sunset Park	Los Angeles CA United States

BERKELEY LAB

California Environmental Protection Agency
Air Resources Board

EnergyIQ and the EnergyIQ API were developed by the Lawrence Berkeley National Laboratory with funding from PIER and the California Environmental Protection Agency.


EnergyIQ
LOGOUT | MY INFO | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDINGS
My Buildings
Add a Building
Select All
Delete
Add a Building
ADD BUILDING
* Required fields
Name of the Building *
Address Line 1
Address Line 2
Country *
United States
ZIP *
City
State
--
Total Floor Area *
sq. ft.
Year Constructed *
Year Renovated
Hours Occupied per Week
Peer Group Data Set *
California Buildings (CEUS)
U.S. Buildings (CBECS)

My Buildings ▸ Cleantech Inc.

Building Details | Peer Group | Energy Use

BUILDING DETAILS

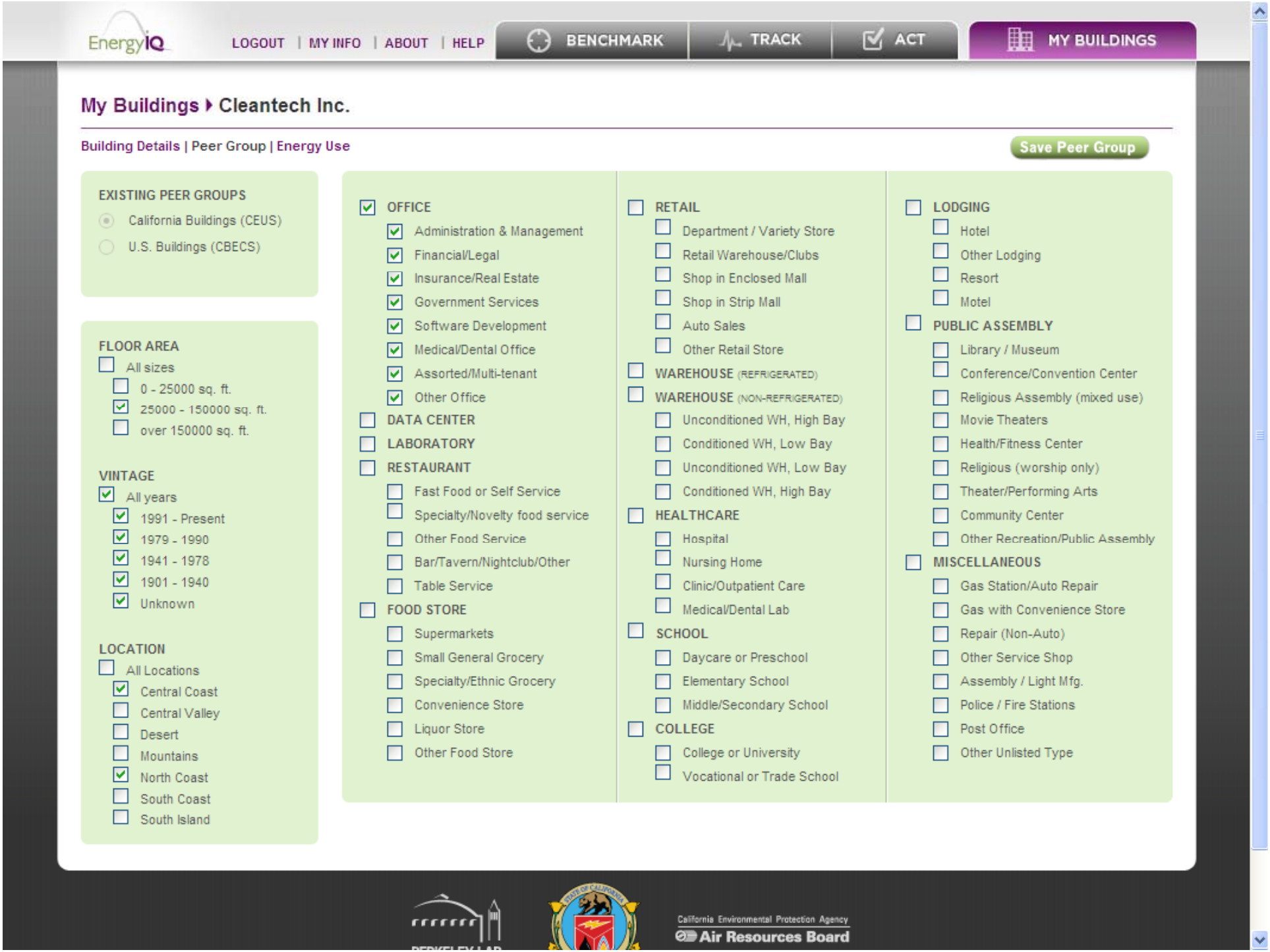
Edit

Cleantech Inc.	Ratings:	Built:	Major Retrofits
		1972	1999
Berkeley California, USA 94720			

TARGETS

Save

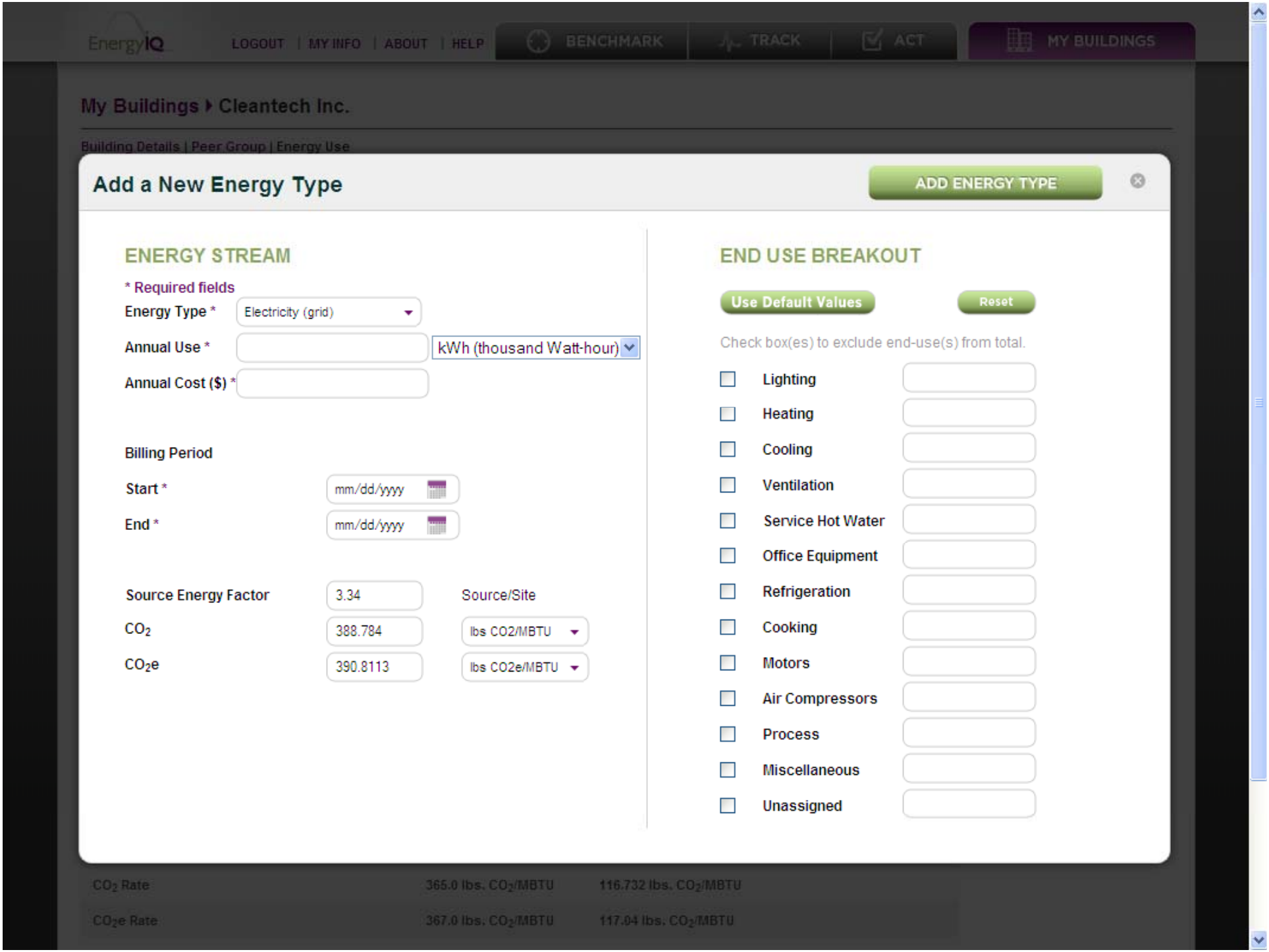
COST–Total	47.5	$ ('000)
COST– Per sq. ft.	0.95	$/sf
EMISSIONS–Total	650.0	lbs CO_2e ('000)
EMISSIONS–Per sq. ft.	13.00	lbs CO_2e/sf
ENERGY–Total	4750.0	Source MBTU
ENERGY–Per sq. ft.	95.00	Source kBTU/sf
FUEL–Total		Site MBTU
FUEL–Per sq. ft.		Site kBTU/sf
ELECTRICITY–Total		Site MWh
ELECTRICITY–Per sq. ft.		Site kWh/sf

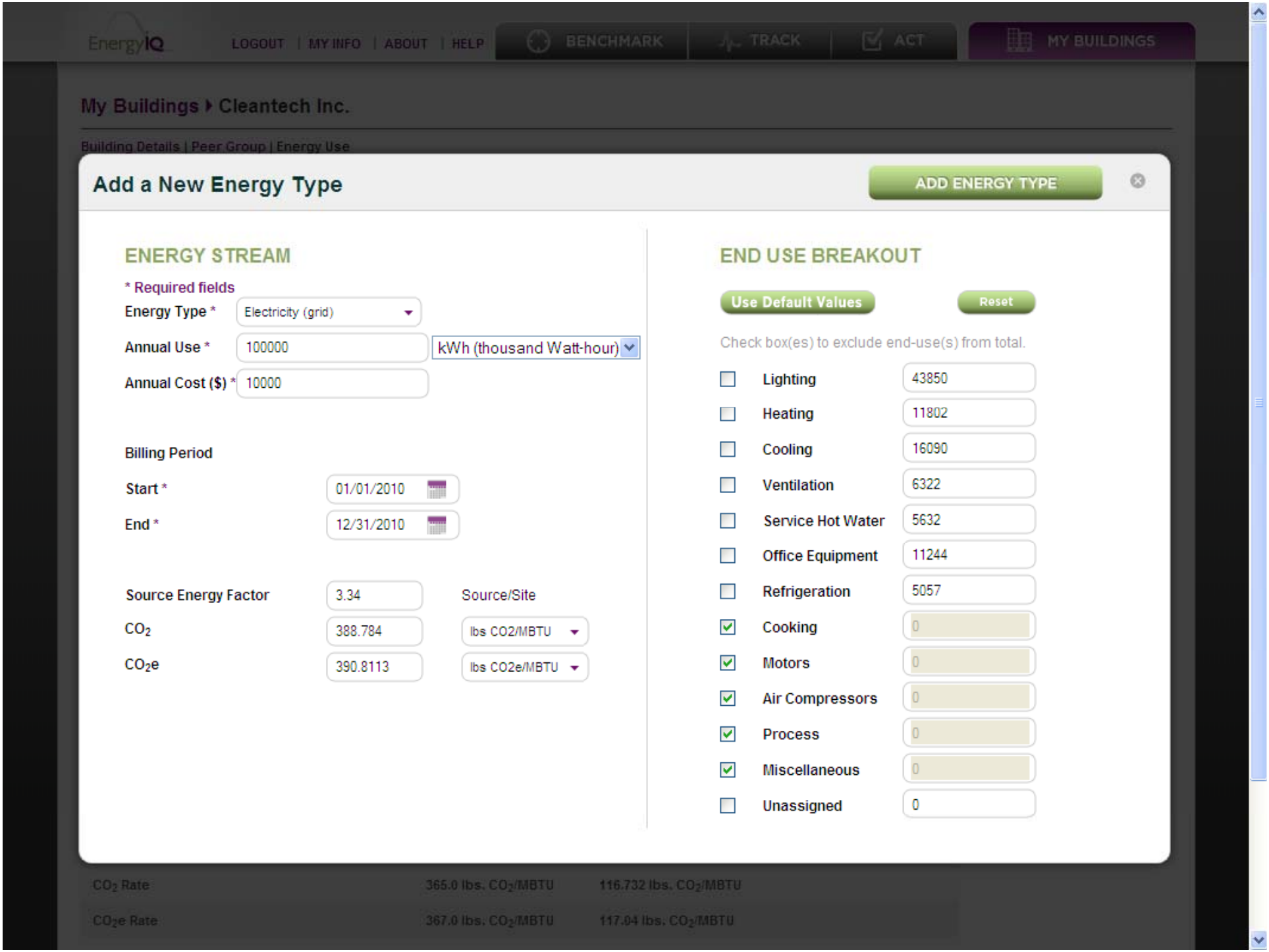

EnergyIQ
LOGOUT | MY INFO | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDINGS
My Buildings ▸ Cleantech Inc.
Building Details | Peer Group | Energy Use
Save Peer Group
EXISTING PEER GROUPS
California Buildings (CEUS)
U.S. Buildings (CBECS)
FLOOR AREA
All sizes
0 - 25000 sq. ft.
25000 - 150000 sq. ft.
over 150000 sq. ft.
VINTAGE
All years
1991 - Present
1979 - 1990
1941 - 1978
1901 - 1940
Unknown
LOCATION
All Locations
Central Coast
Central Valley
Desert
Mountains
North Coast
South Coast
South Island
OFFICE
Administration & Management
Financial/Legal
Insurance/Real Estate
Government Services
Software Development
Medical/Dental Office
Assorted/Multi-tenant
Other Office
DATA CENTER
LABORATORY
RESTAURANT
Fast Food or Self Service
Specialty/Novelty food service
Other Food Service
Bar/Tavern/Nightclub/Other
Table Service
FOOD STORE
Supermarkets
Small General Grocery
Specialty/Ethnic Grocery
Convenience Store
Liquor Store
Other Food Store
RETAIL
Department / Variety Store
Retail Warehouse/Clubs
Shop in Enclosed Mall
Shop in Strip Mall
Auto Sales
Other Retail Store
WAREHOUSE (REFRIGERATED)
WAREHOUSE (NON-REFRIGERATED)
Unconditioned WH, High Bay
Conditioned WH, Low Bay
Unconditioned WH, Low Bay
Conditioned WH, High Bay
HEALTHCARE
Hospital
Nursing Home
Clinic/Outpatient Care
Medical/Dental Lab
SCHOOL
Daycare or Preschool
Elementary School
Middle/Secondary School
COLLEGE
College or University
Vocational or Trade School
LODGING
Hotel
Other Lodging
Resort
Motel
PUBLIC ASSEMBLY
Library / Museum
Conference/Convention Center
Religious Assembly (mixed use)
Movie Theaters
Health/Fitness Center
Religious (worship only)
Theater/Performing Arts
Community Center
Other Recreation/Public Assembly
MISCELLANEOUS
Gas Station/Auto Repair
Gas with Convenience Store
Repair (Non-Auto)
Other Service Shop
Assembly / Light Mfg.
Police / Fire Stations
Post Office
Other Unlisted Type
California Environmental Protection Agency
Air Resources Board

My Buildings ▸ Cleantech Inc.

ADD ENERGY TYPE

	Electricity (grid)	Natural Gas
Annual Use	525,000 kWh	680 MBTU
Annual Cost	$63,000	$7,140
End date	12/31/2010	12/31/2010
Start date	01/01/2010	01/01/2010
Lighting	180,000 (34.29%)	0 (0.00%)
Heating	0 (0.00%)	600 (88.24%)
Cooling	100,000 (19.05%)	0 (0.00%)
Ventilation	95,000 (18.10%)	0 (0.00%)
Service Hot Water	0 (0.00%)	80 (11.76%)
Office Equipment	150,000 (28.57%)	0 (0.00%)
Refrigeration	0 (0.00%)	0 (0.00%)
Cooking	0 (0.00%)	0 (0.00%)
Motors	0 (0.00%)	0 (0.00%)
Air Compressors	0 (0.00%)	0 (0.00%)
Process	0 (0.00%)	0 (0.00%)
Miscellaneous	0 (0.00%)	0 (0.00%)
Unassigned	0 (0.00%)	0 (0.00%)
Source Energy Factor	2.94 Source/Site	1.047 Source/Site
CO_2 Rate	365.0 lbs. CO_2/MBTU	116.732 lbs. CO_2/MBTU
CO_2e Rate	367.0 lbs. CO_2/MBTU	117.04 lbs. CO_2/MBTU


EnergyIQ
LOGOUT | MY INFO | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDINGS
My Buildings ▸ Cleantech Inc.
Building Details | Peer Group | Energy Use
Add a New Energy Type
ADD ENERGY TYPE
ENERGY STREAM
* Required fields
Energy Type * Electricity (grid)
Annual Use * kWh (thousand Watt-hour)
Annual Cost ($) *
Billing Period
Start * mm/dd/yyyy
End * mm/dd/yyyy
Source Energy Factor 3.34 Source/Site
CO2 388.784 lbs CO2/MBTU
CO2e 390.8113 lbs CO2e/MBTU
END USE BREAKOUT
Use Default Values
Reset
Check box(es) to exclude end-use(s) from total.
Lighting
Heating
Cooling
Ventilation
Service Hot Water
Office Equipment
Refrigeration
Cooking
Motors
Air Compressors
Process
Miscellaneous
Unassigned
CO2 Rate 365.0 lbs. CO2/MBTU 116.732 lbs. CO2/MBTU
CO2e Rate 367.0 lbs. CO2/MBTU 117.04 lbs. CO2/MBTU


EnergyIQ
LOGOUT | MY INFO | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDINGS
My Buildings ▸ Cleantech Inc.
Building Details | Peer Group | Energy Use
Add a New Energy Type
ADD ENERGY TYPE
ENERGY STREAM
* Required fields
Energy Type * Electricity (grid)
Annual Use * 100000 kWh (thousand Watt-hour)
Annual Cost ($) * 10000
Billing Period
Start * 01/01/2010
End * 12/31/2010
Source Energy Factor 3.34 Source/Site
CO2 388.784 lbs CO2/MBTU
CO2e 390.8113 lbs CO2e/MBTU
END USE BREAKOUT
Use Default Values
Reset
Check box(es) to exclude end-use(s) from total.
Lighting 43850
Heating 11802
Cooling 16090
Ventilation 6322
Service Hot Water 5632
Office Equipment 11244
Refrigeration 5057
Cooking 0
Motors 0
Air Compressors 0
Process 0
Miscellaneous 0
Unassigned 0
CO2 Rate 365.0 lbs. CO2/MBTU 116.732 lbs. CO2/MBTU
CO2e Rate 367.0 lbs. CO2/MBTU 117.04 lbs. CO2/MBTU

paul's dash | Default

Top 5 Performers	ENERGY-Per sq. ft.	COST-Total	EMISSIONS-Per sq. ft.	EMISSIONS-Total
	Source kBTU/sf	$ ('000)	lbs CO2e/sf	lbs CO2e ('000)
Cleantech Inc.	120	$70	15 (2006–2010)	737
Dilbert Park	192	$213	24 (2006–2010)	2,423
Energy place	88	$31	11 (2006–2010)	325
Holistic organica	72	$12	8 (2006–2010)	165
Natural grocery co.	86	$7	10 (2006–2010)	99

| = Target ¦ = Target not specified

Shadings = peer group quartiles

Green band is target

Bottom 5 Performers	ENERGY-Per sq. ft.	COST-Total	COST-Per sq. ft.	EMISSIONS-Per sq. ft.
	Source MBTU	$ ('000)	$/sf	lbs CO2e/sf
Sunset Park	Peer group and Energy use required.	$0	Energy use required.	0

| = Target ¦ = Target not specified

Shadings = peer group quartiles

Green band is target

BERKELEY LAB

California Environmental Protection Agency Air Resources Board

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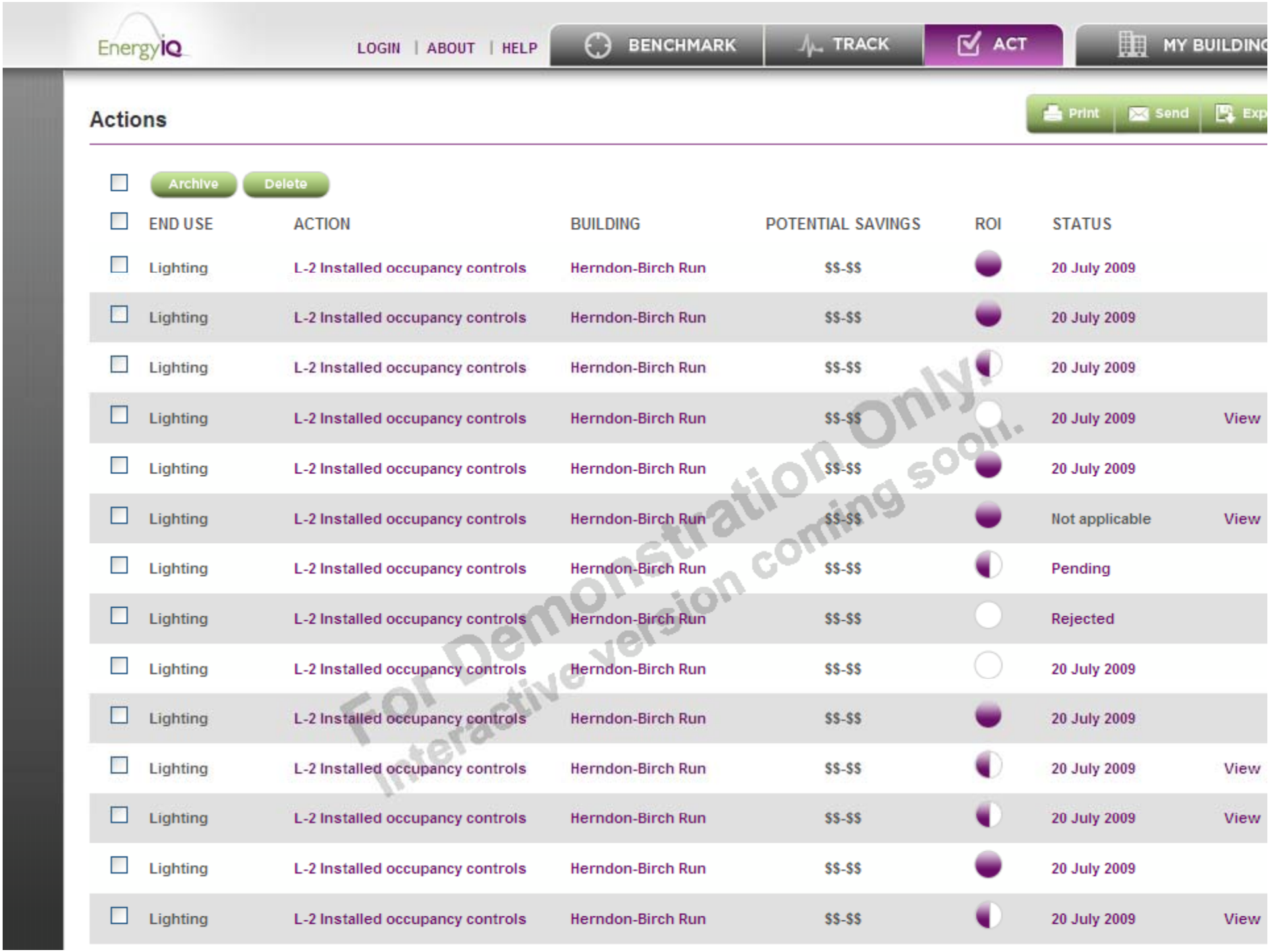
EnergyIQ
LOGIN | ABOUT | HELP
BENCHMARK
TRACK
ACT
MY BUILDING
Actions
Print
Send
Archive
Delete
END USE
ACTION
BUILDING
POTENTIAL SAVINGS
ROI
STATUS
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009 View
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ Not applicable View
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ Pending
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ Rejected
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009 View
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009 View
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009
Lighting L-2 Installed occupancy controls Herndon-Birch Run $$-$$ 20 July 2009 View
For Demonstration Only!
Interactive version coming soon.

Summary

- AOB provides quantitative measures for efficiency at building and system level
  - Design: incorporate benchmarks in program documents
  - Operations: use benchmarks to evaluate and track performance over time.

- AOB is not “audit in a box”
  - AOB helps identify potential actions and prioritize areas for more detailed analysis and audits.

Get Started with Action Oriented Benchmarking in Your Organization

- Define purpose of energy benchmarking
- Set up benchmarking system
  - Select metrics
  - Set benchmarks (levels of performance)
  - Set up practical data collection and analysis strategy
- Consider integration with existing non-energy benchmarking systems or KPIs
- Define how information will be used
  - Benchmarking is a means to an end…. What will be done with the information?

http://energyiq.lbl.gov/

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