



CALIFORNIA ENERGY COMMISSION

# Rating the Energy Performance of CA Commercial Buildings

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High Performance Buildings &  
Standards Development Office

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AB 1103 Workshop



# CEC Staff Presentation

- Intent of AB 1103
- Operational Ratings vs. Asset Ratings
- CA Ratings & National Ratings
- Alternative Rating Scales
- Producing Disclosure Forms for AB 1103



# AB 1103 Intent

## Value the Energy Performance of Commercial Property

- Provide decision makers with comparable energy performance information for buildings in California under consideration for purchase, lease or financing
- Enable energy efficiency to be valued as other building assets are valued within a real estate transaction
- Evaluate only the building energy components that are pertinent to the financial transaction



## Types of Performance Rating

### Operational Rating

- Example: U.S. EPA's Energy Star Portfolio Manager
- Rating based on actual energy usage, adjusted for weather
- No inherent requirement for field verification
- Ratings typically adjusted based on levels of service
- Good for use in existing building energy efficiency incentive programs
- Good for managing building portfolios over time



## Types of Performance Rating

### Asset Rating

- Examples: RESNET and CEC Home Energy Rating Systems
- Rates the building, not the occupant
- Focus is on the physical building assets - the “brick & mortar” - plus permanent energy systems
- Differences in operational behavior are ignored
- Rating is derived from a model-based estimate of energy usage, compared to a stock model or building code baseline
- Field verification is a requirement
- Good for valuing building performance within a financial transaction
- Good for energy efficiency code compliance and beyond code new construction incentive programs



# Performance Rating Systems

RATING SYSTEM	ASSET	OPERATIONAL
Energy Star – Portfolio Manager (U.S. EPA)		✓
★ CA Com Bldg Rating System (CEC)		✓
★ COMNET (Energy Foundation)	✓	
★ ABEL - Advanced Building Energy Label (ASHRAE)	✓	✓

★ Currently under development



## Performance Rating System web sites

RATING SYSTEM	WEB SITE
Energy Star – Portfolio Manager (U.S. EPA)	<a href="https://www.energystar.gov/istar/pmpam/">https://www.energystar.gov/istar/pmpam/</a>
CA Com Bldg Rating System (CEC)	<a href="http://www.gosolarcalifornia.org/cepbenchmarking/">http://www.gosolarcalifornia.org/cepbenchmarking/</a>
COMNET (Energy Foundation)	
ABEL - Advanced Building Energy Label (ASHRAE)	<a href="http://buildingeq.com/">http://buildingeq.com/</a>



## Recommendation on Rating Type

- Intent of AB 1103 suggests that asset ratings should be considered
- AB 1103 specifies an operational rating via the U. S. EPA's Energy Star Portfolio Manager
- An operational rating alone is not ideal, but an asset rating system for commercial buildings does not yet exist
- Operational ratings provide value in most cases & sometimes are preferred by decision makers
- ASHRAE and COMNET are currently working on a national asset rating system to complement Energy Star's operational rating
- It may be appropriate to revisit the regulations drafted for AB 1103 after a commercial bldg asset rating system is established



# Side by Side Asset & Operational Ratings

## Energy Certificate

Building Energy Performance >		As built:	In use:		
Certificate type	FULL	<b>Asset Rating</b>	<b>Operational Rating</b>		
Building Type	Office				
Whole or part of building	Whole building				
<i>Very energy efficient</i>					
<b>A</b>					
<b>B</b>					
<b>C</b>					
<b>D</b>					
<b>E</b>					
<b>F</b>					
<b>G</b>					
<i>Not energy efficient</i>		<b>Calculated</b>	<b>Actual</b>		
Asset rating method:	UK National Standard 2004				
Operational rating method:	UK Office Tailored Benchmarks 2002				
Units used:	kg CO <sub>2</sub> per sq m of net area per annum >			<b>48</b>	<b>83</b>
Occupancy level	Square metres net lettable area per person			14	12
Equipment heat gain level	Watts per square metre net			12	12
Weekly occupancy hours	Hours per week			55	58
Heating performance ratings				ABCDEFG	ABCDEFG
HVAC performance ratings (cooling, fans and pumps)				ABCDEFG	ABCDEFG
Lighting performance ratings				ABCDEFG	ABCDEFG
Management rating (for in-use performance only)			ABCDEF <del>G</del>		
Internal Environmental Quality			Not assessed		
Risk level			Not assessed		
Further information can be found in the Energy Log Book					
<b>GB 2004</b>		 Directive 2002/91/EC			



## Why do we need a California Rating for AB 1103?

Energy Star Portfolio Manager does not provide a 1-100 rating for all CA commercial buildings.

Buildings not ratable are:

- Less than 5,000 sf
- Bldg types or space uses not covered by EPA's Portfolio Manager



## Why do we need a California Rating for AB 1103?

Characteristic of California Buildings in CEUS 2003 Database	CEUS Total	Buildings that cannot get an Energy Star rating		
		< 5,000 sq ft (1,000 sq ft for banks) # %	Remainder with no rating tool # %	TOTAL # %
Number of buildings	525,736	358,166 68%	82,059 16%	440,225 84%
Number of building types (space types)	62	N / A	32 52%	32 52%
Floor area (million sf)	4,539	706 16%	1,462 32%	2,167 48%
Energy use (billion Btu)	329,659	74,355 23%	108,887 33%	183,242 56%



## Benefits of a CA Rating System

- Allows all CA buildings to get rated
- Compares CA buildings to each other
- Complements the Energy Star rating
- Sets a foundation for future energy performance rating & labeling initiatives
- Can display the CA energy policy goal of Zero Net Energy



## What should the CA Rating look like?

- Rating scale
- Presentation style
- Display components

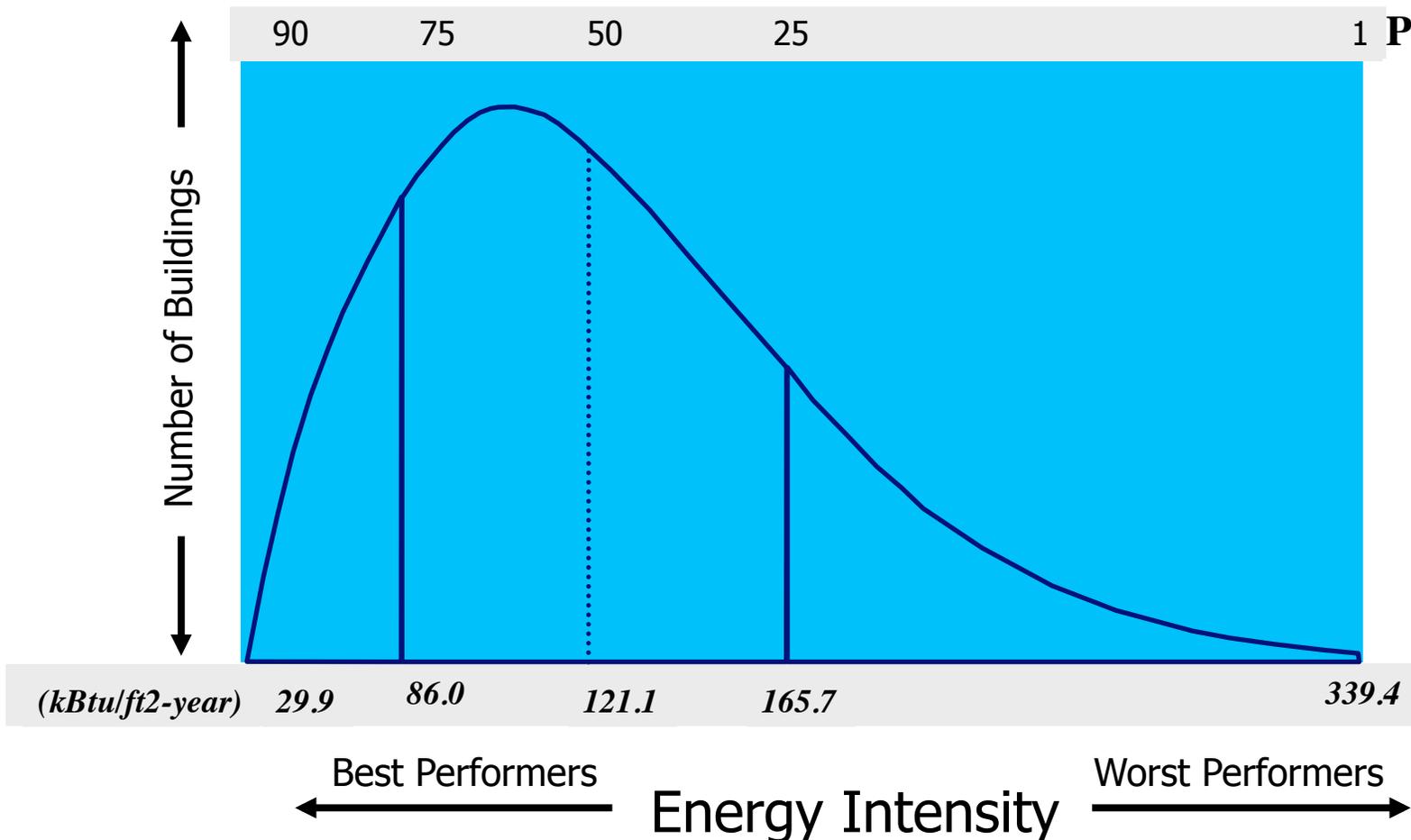


# Performance Rating Scales

## Peer Group Comparison

ENERGY STAR®

1 Performance Rating



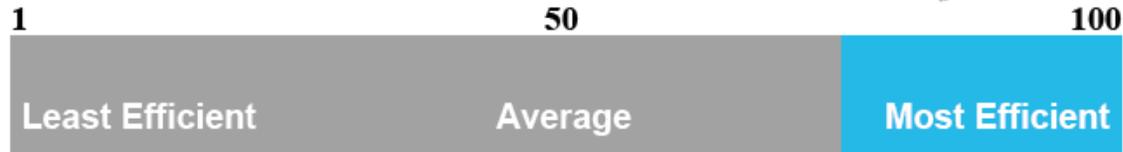


# Performance Rating Scales

## EPA's Energy Star Rating

This building's score

84



This building uses 207 kBtu per square foot per year.\*

\*Based on source energy intensity for the 12 month period ending August 2007

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.



# Performance Rating Scales

Mapped to Technical Potential or Policy Goal

Energy certificate	Building Energy Performance	As built calculated
	Space to make reference to the energy certification procedure used	
	Very energy efficient Not energy efficient	C
	Space to include additional information on the indicator and building energy use	130 kWh/(m <sup>2</sup> ·a)
Administrative information: address of the building conditioned area date of validity certifier name and signature...		

Zero net energy  
(or zero net carbon etc)

Current regulation **Rr**

Stock median **Rs**

For DEC, the UK has adopted a simpler linear scale using a **Benchmark Ratio = 100 \* EP / Rs**

where **EP** = Energy Performance (kg CO<sub>2</sub>/m<sup>2</sup> in the UK) calibrated in equal intervals, so A = 0 to 25, B = 25 to 50, etc.. The Ratio is reported for your building and the regulation level.

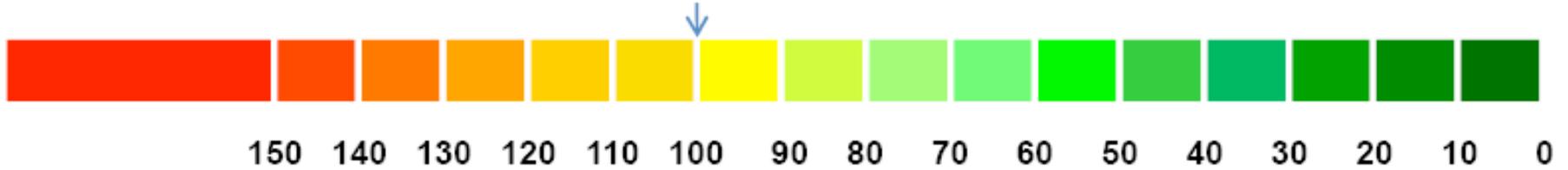


# Performance Rating Scales

## Peer Group vs. Technical Potential

Technical scale with zero net energy

Stock Median



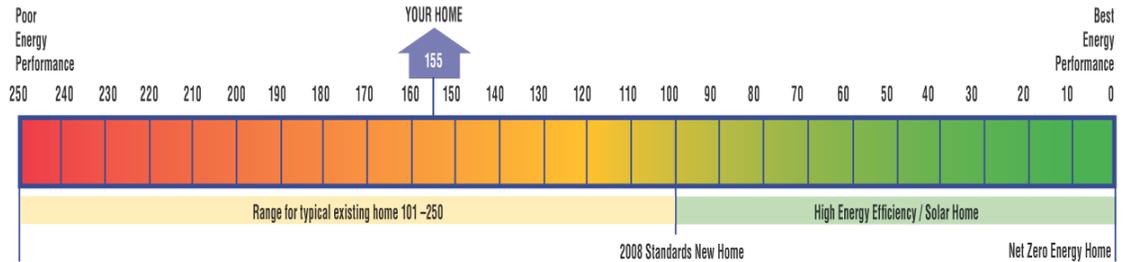
Statistical scale based on population sample



# CALIFORNIA ENERGY COMMISSION

## Home Energy Rating Systems Residential Asset Ratings

### California Home Energy Rating Certificate



<p>Information goes here on compliance with other programs:</p>	<p><b>Energy Impact</b></p> <p><b>Greenhouse Gas Emissions</b> Carbon Dioxide xxx tons/year</p> <p><b>Energy Consumption</b> Electricity (kWh/year) Cooling --- Lights --- Appliances --- Total ---</p> <p>Natural Gas (therms/year) Space Heating --- Water Heating --- Total ---</p> <p><b>Operating Cost (\$/year)</b> Electricity --- Gas --- Total ---</p> <p><b>Renewable Energy Production</b> None</p>	<p><b>Site Information</b></p> <p><b>Address</b> 123 Jones Street Anywhere, California 9410x</p> <p><b>General Information</b> Conditioned Floor Area 2,200 ft<sup>2</sup> Bedrooms 4 House Type Single Family Foundation Type Slab-on-Grade</p>	<p><b>Official Home Energy Rating</b> in conformance with the requirements of the California Energy Commission <a href="http://www.energy.ca.gov">www.energy.ca.gov</a></p> <p><b>HERS Provider:</b> Acme Energy Rated Homes 934 Energy Efficient Way Power Junction, California <a href="http://www.AcmeEnergyRatedHomes.com">www.AcmeEnergyRatedHomes.com</a></p> <p><b>Rating Information</b> Rating Number xxxx-yyyy Certified Rater EEH, Inc. Stockton, CA Rating Date: January dd, yyyy</p>
	<p>Qualifying Information Goes Here:</p>	<p><b>Energy Efficiency Features</b></p> <p><b>Insulation</b> Ceiling R-30 Wall R-11 Floor over crawlspace None Slab Edge None</p> <p><b>Windows</b> Frame Aluminum Glazing Double</p> <p><b>Heating System</b> Gas furnace, 0.80 AFUE Unsealed air distribution ducts</p> <p><b>Cooling System</b> None</p> <p><b>Water Heating System</b> Gas storage type, 0.52 EF</p>	
<p>HERS Provider and/or Sponsor</p> <p>Co-Branding Logos Go Here:</p>			<p>Rater Signature _____</p> <p>Date _____</p>

U.S. Department of Energy  
**EnergySmart Home Scale**<sup>SM</sup>

Estimated annual energy usage:  
Electric (kWh) 7728  
Natural gas (Therms) 237

Estimated average monthly energy bill\*:  
\$104

Conditioned floor area (sq. ft.): 3,312

**YOUR HOME**  
65

Poor Energy Performance

Best Energy Performance

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0

Typical existing home

Typical new home

Builders Challenge (70 or lower)\*\*

Net Zero Energy Home

123 Main Street, Gainesville, FL 32601  
Rated by Home Performance, Inc.  
Rating conducted June 8, 2007

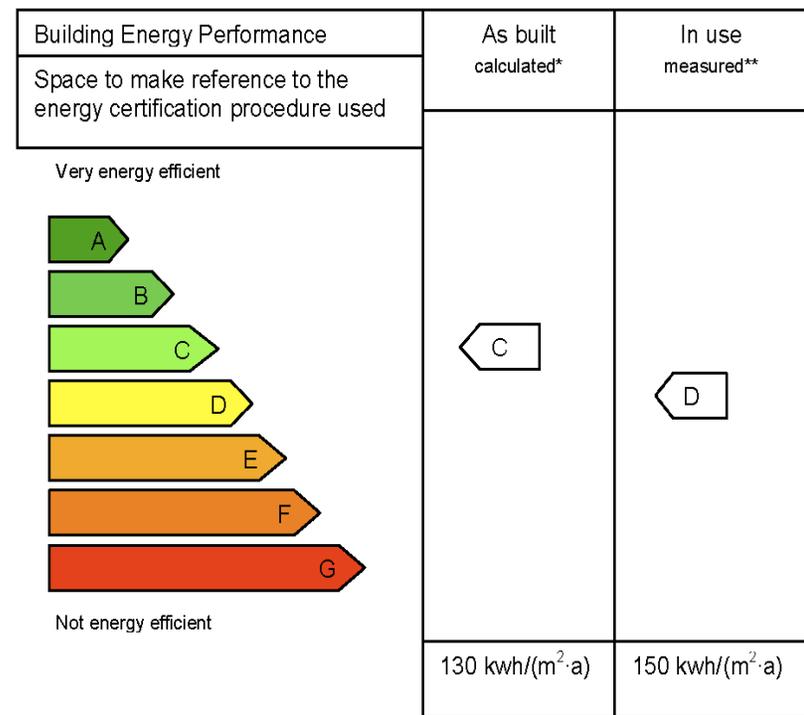
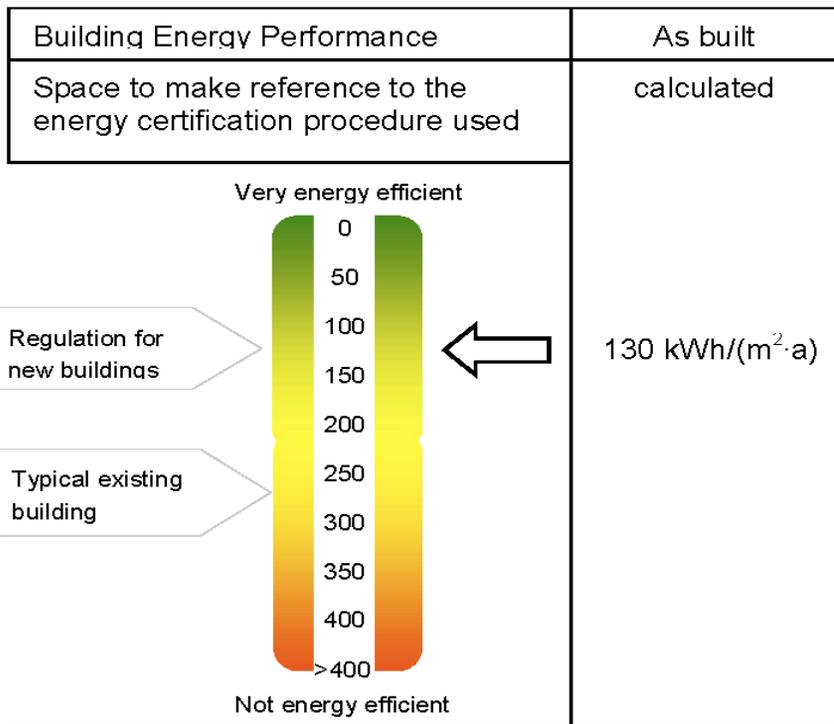
\*Actual energy use may vary.  
\*\*Plus Builders Challenge Quality Criteria.  
Visit [www.buildingamerica.gov/challenge](http://www.buildingamerica.gov/challenge) for tips to maximize savings.



# Presentation of energy performance: Suggestions in CEN Standard EN 15217

**SPEEDOMETER**  
Absolute values

or **RAINBOW, A-to-G**  
Relative values



*The Rainbow is most widely used,  
it is familiar from domestic appliances in the European Union*



# ASHRAE's Building EQ Label

**A-**  
AS DESIGNED

Building EQ™

- Net-Zero Energy A+
- High Performance A
- AS DESIGNED ▶ Very Good A-
- Good B
- Fair C
- Poor D
- Unsatisfactory F

**ASHRAE**  
Building EQ™ administered by ASHRAE.  
www.buildingEQ.com

**BUILDING ENERGY QUOTIENT™**

The Building Energy Quotient™ indicates how much energy this building uses per square foot. The letter rating indicates how this building compares to a typical building and how close the building is to its technical potential—the closer to net-zero energy or A+, the better.

As Designed: Indicates the estimated energy consumption of this building as designed.  
In Operation: Indicates the energy consumption of this building in actual use.

Date of Issue: June 15, 2009  
As Designed Date: June 1, 2009  
In Operation Date:  
Building Location:  
1791 Tullie Circle NE  
Atlanta, GA 30329 USA

<http://buildingeq.com>

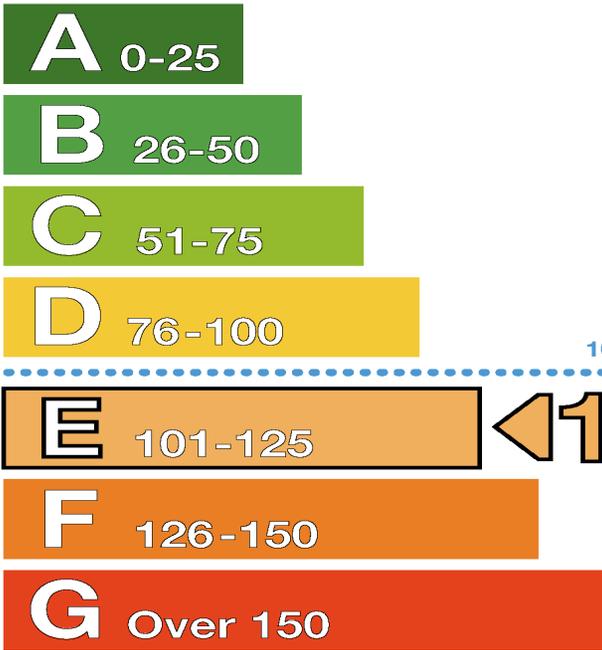


# Energy Performance Display Attributes for Consideration

## 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.

More energy efficient



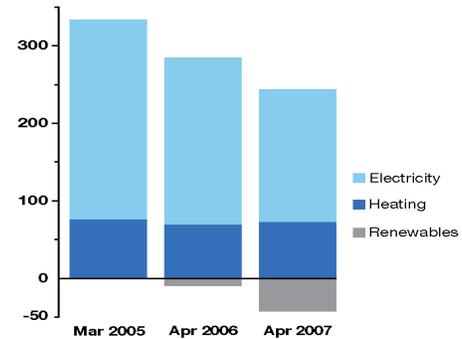
100 would be typical

◀ 108

Less energy efficient

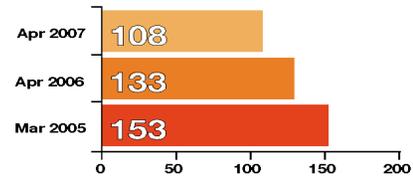
## Total CO<sub>2</sub> Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO<sub>2</sub>.



## Previous Operational Ratings

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





## What should the AB 1103 Energy Performance Disclosure include?

- Energy Star rating
- CA rating
- Building Ownership & Location
- Building Characteristics
- Energy Details





# EPA's Statement of Energy Performance



**STATEMENT OF ENERGY PERFORMANCE**  
**Test Office Florida**

Building ID: 1422264  
 For 12-month Period Ending: May 31, 2009<sup>1</sup>  
 Date SEP becomes ineligible: N/A

Date SEP Generated: August 03, 2009

<b>Facility</b> Test Office Florida 5000 Parkway Maitland, FL 32751	<b>Facility Owner</b> Sample Company 111 Main St Richmond, VA 23233	<b>Primary Contact for this Facility</b> John Doe 111 Main Street Richmond, VA 23233
--	--	---

Year Built: 1981  
 Gross Floor Area (ft<sup>2</sup>): 123,610

Energy Performance Rating<sup>2</sup> (1-100) 85

**Site Energy Use Summary<sup>3</sup>**

Electricity (kBtu)	8,842,596
Natural Gas (kBtu) <sup>4</sup>	0
Total Energy (kBtu)	8,842,596

**Energy Intensity<sup>5</sup>**

Site (kBtu/ft <sup>2</sup> /yr)	70
Source (kBtu/ft <sup>2</sup> /yr)	234

**Emissions (based on site energy use)**

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	1,522
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**Electric Distribution Utility**

Progress Energy Florida

**National Average Comparison**

National Average Site EUI	105
National Average Source EUI	352
% Difference from National Average Source EUI	-34%
Building Type	Office



Stamp of Certifying Professional  
 Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

**Meets Industry Standards<sup>6</sup> for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

**Certifying Professional**  
 John Doe  
 111 Main Street  
 Richmond, VA 23233

**Notes:**  
 1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.  
 2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.  
 3. Values represent energy consumption, annualized to a 12-month period.  
 4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.  
 5. Values represent energy intensity, annualized to a 12-month period.  
 6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.



# CA Energy Performance Certificate

## COMMERCIAL BUILDING Energy Performance



<p><b>California Energy Performance Rating</b></p> <p><b>156</b> kbtu/sf/yr</p>	<p><b>Building Name:</b>  <b>Building ID:</b> BUILDING ID CODE  <b>Issue Date:</b> DATE  <b>Building Type:</b> RETAIL STORE</p> <p>The score for this building was determined based on the information provided below.</p> <p>This data has been field verified on _____          by: _____          Name _____          Address _____          City, State, Zip Code _____          _____ Gross floor area (SF)</p>						
<p>California Median          CA - EUI Median Values:          208 kbtu/sf - yr          Percent of Median: 92%</p>	<table border="1"> <tr> <td><b>Energy Use Index</b></td> <td>(kbtu/sf-year)</td> </tr> <tr> <td>Raw</td> <td><b>171</b></td> </tr> <tr> <td>Weather normalized</td> <td><b>156</b></td> </tr> </table>	<b>Energy Use Index</b>	(kbtu/sf-year)	Raw	<b>171</b>	Weather normalized	<b>156</b>
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Raw	<b>171</b>						
Weather normalized	<b>156</b>						
<p>Default Used Data Entered</p> <p><input type="checkbox"/> Weekly operating hours</p> <p><input type="checkbox"/> Number of workers on main shift</p> <p><input type="checkbox"/> Number of personal computers</p> <p><input type="checkbox"/> Number of cash registers</p> <p><input type="checkbox"/> Number of walk-in refrigeration/freezer units</p> <p><input type="checkbox"/> Number of open &amp; closed refrigeration/freezer cases</p> <p><input type="checkbox"/> Percent of floor area that is cooled in 10% increments (10%, 20%, 30%, etc.)</p> <p><input type="checkbox"/> Percent of floor area that is heated in 10% increments (10%, 20%, 30%, etc.)</p>							

I, \_\_\_\_\_ on this date of \_\_\_\_\_, do hereby attest and certify that all the information or selections that appears on this certification were entered by me and accurately represent the building identified to the best of my knowledge.

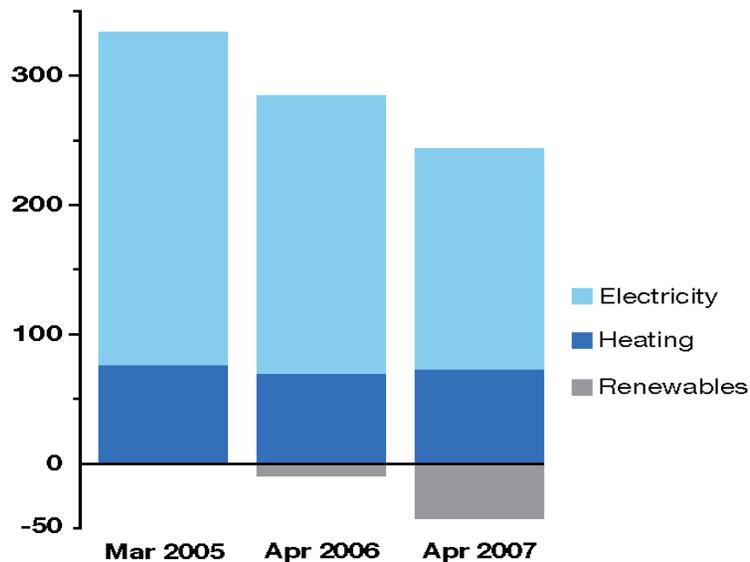
Signed: \_\_\_\_\_



# Energy Details in the AB 1103 Disclosure

## Total CO<sub>2</sub> Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO<sub>2</sub>.



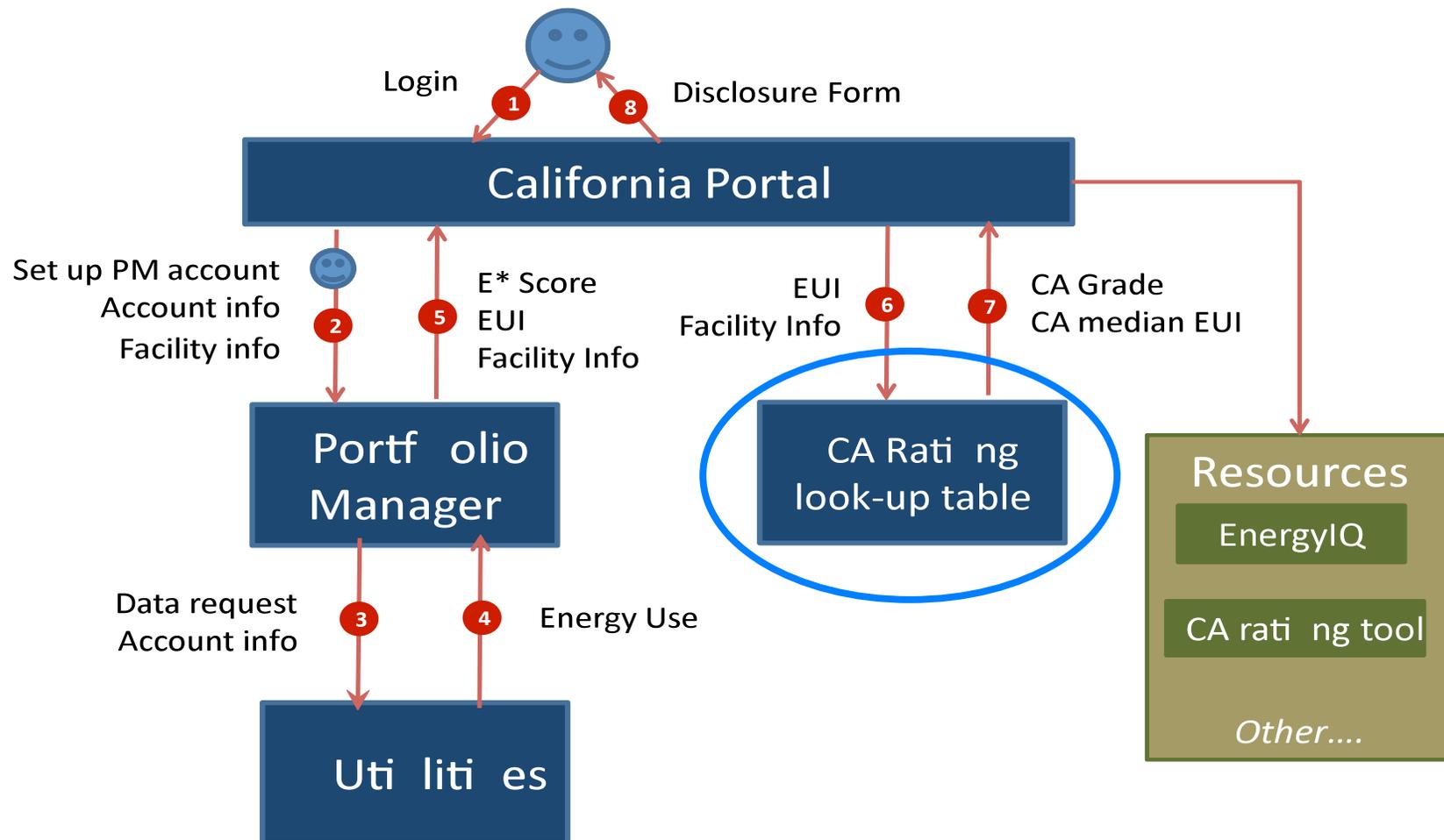
- Energy Use by Fuel Type
- Energy Generation
- Time Dependent Valuation
- GHG Emissions

## Previous Operational Ratings

This tells you how efficiently energy has



# The AB 1103 Disclosure Process





CA  
Commercial  
Buildings

CEUS  
Sample

2,561  
Survey  
Sites

Building Type	Occupancy Type	Median EUI (kBtu/sf)
Education	Daycare or Preschool	66
	Elementary School	92
	Middle / Secondary School	119
	Vocational or Trade School	83
Grocery / Convenience Store	Convenience Store	923
	Liquor Store	456
	Small General Grocery	483
	Specialty / Ethnic / Other Grocery	457
	Supermarkets	544
Health Care	Clinic / Outpatient Care	223
	Hospital	484
	Medical / Dental Lab	253
	Medical / Dental Office	158
	Nursing Home	221
Lab / Technical	Data Processing / Computer Center	611
	Lab / R&D Facility	571
	Software Development	248
Lodging	Hotel	176
	Motel	154
	Resort	276
Office / Bank	Insurance / Real Estate	149
	Office / Bank	186
Other	All Other	287
	Assembly / Light Manufacturing	129
	Police / Fire Stations	183



CA  
Commercial  
Buildings

CEUS  
Sample

2,561  
Survey  
Sites

Building Type	Occupancy Type	Median EUI (kBtu/sf)
Public Assembly	Health / Fitness Center	310
	Library / Museum	174
	Movie Theaters	235
	Other Recreational / Public Assembly	299
	Religious	66
	Theater / Perf. Arts / Community Ctr.	133
Restaurant	Bar / Tavern / Nightclub	367
	Fast Food or Self Service	1148
	Specialty / Novelty / Other Restaurant	712
	Table Service	749
Retail	Auto Sales	221
	Department / Variety Store	208
	Enclosed Mall	259
	Other Retail Store	148
	Retail Warehouse / Clubs	193
	Strip Mall	147
Service	Gas Station / Auto Repair	94
	Gas Station with Convenience Store	1162
	Other Services or Repair Shop	158
Warehouse	Conditioned Warehouse	98
	Refrigerated Warehouse	289
	Unconditioned Warehouse	51



## Calculating the CA Rating

$$\text{Performance Ratio} = \frac{\text{EUI}_{\text{Measured}}}{\text{EUI}_{\text{Median}}} \times 100$$

Performance Ratio Range	Rating
0 - 25	A
26 - 50	B
51 - 75	C
76 - 100	D
101 - 125	E
126 - 150	F
151 - 175+	G



# CA Energy Performance Certificate

## COMMERCIAL BUILDING Energy Performance



<p><b>California Energy Performance Rating</b></p> <p><b>156</b> kbtu/sf/yr</p>	<p><b>Building Name:</b>  <b>Building ID:</b> BUILDING ID CODE  <b>Issue Date:</b> DATE  <b>Building Type:</b> RETAIL STORE</p> <p>The score for this building was determined based on the information provided below.</p> <p>This data has been field verified on _____          by: _____          Name _____          Address _____          City, State, Zip Code _____          _____ Gross floor area (SF)</p>				
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Signed: \_\_\_\_\_



## Calculating the CA Rating

$$\text{Performance Ratio} = \frac{156}{208} \times 100 = 75$$

Performance Ratio Range	Rating
0 - 25	A
26 - 50	B
51 - 75	C
76 - 100	D
101 - 125	E
126 - 150	F
151 - 175+	G





# CALIFORNIA ENERGY COMMISSION

