Building Energy Performance Ratings

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California Energy Commission
Discussion Topics

- Performance Rating Disclosures (AB 1103)
- Rating Energy Assets
- Asset Rating and RCx
- Performance Ratings and Performance Improvements (AB 758)
Performance Rating Disclosure

Valuing the Energy Performance of Building Property

- AB 1103 (Saldana, 2007)
  - Commercial building energy consumption disclosure
  - Energy Star rating and data must be disclosed for whole buildings at time of sale, lease or financing
  - CEC developing regulations
  - Proposed implementation date of Jan 2011
Issues with AB 1103

“Whole Buildings”
• Misses the majority of tenant leased space

Operational Ratings
• Decision makers are concerned with property assets, not operational behavior
Rating Types

Operational

- 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
Rating Types

Asset

- Examples: RESNET and CEC Home Energy Rating Systems
- Rates the building, not the occupant
- Focus is on the physical building assets - the “brick and 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 median 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
Issues with AB 1103

“Whole Buildings”
• Misses the majority of tenant leased space

Operational Ratings
• Decision makers are concerned with property assets, not operational behavior

Ratings vs. Data
• Decision makers should have a relative performance index
• Majority of CA buildings cannot get an Energy Star rating
Commercial Building Energy Performance Disclosure

In conformance with California Code of Regulations, Title 20, Article 9 (2010)

Energy STAR Portfolio Manager
Commercial Building
Energy Performance Disclosure
(U.S. EPA will design this box)

Energy Use Index
Raw: 157
Weather Normalized: 142
1,000 Btu per square foot per year

Building Name: Mort’s 02957753
Address: 1919 Pentane St.
City: Lodi
Zip Code: 95241
Building ID Code: 0090372955
Certificate Issue Date: January 3, 2011
Building Type: Retail Store

Gross Floor Space (square feet): 7,324
Annual Electricity Usage (kWhr): 43,564
Annual Natural Gas Usage (therms): 12,344,732
Other Annual Energy Usage: None
Renewable Energy Production (kWhr): None
Percent of Electricity from Renewables (%): 0

The Energy Performance scores were determined for this building based on recorded energy consumption, the square footage of the buildings and the following default or actual building characteristic data:

<table>
<thead>
<tr>
<th>Default</th>
<th>Building Data</th>
<th>Building Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weekly operating hours</td>
<td>Number of workers of main shift</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of personal computers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of cash registers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of walk-in refrigerator/freezer units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of open and closed refrigeration/freezer units</td>
</tr>
<tr>
<td></td>
<td>Percent of floor area that is cooled in 10% increments (10%, 20%, 30%, etc)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent of floor area that is heated in 10% increments (10%, 20%, 30%, etc)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exterior entrance to the public (yes or no)</td>
<td></td>
</tr>
</tbody>
</table>

I, ___________________________ on this date ___________________________
Do hereby attest and affirm that all the information or selections that appear on this disclosure were entered by me and accurately represent the building identified to the best of my knowledge.

Signed: ________________________________
CA Rating: Scale

Peer Group vs. Technical Potential

Technical scale with zero net energy

Stock Median

1  10  20  30  40  50  60  70  80  90  100

Statistical scale based on population sample

Get Zero on the Scale!
UK Performance Ratings

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

- **A** 0-25
- **B** 26-50
- **C** 51-75
- **D** 76-100

100 would be typical

Less energy efficient

- **E** 101-125
- **F** 126-150
- **G** Over 150

Total CO₂ Emissions
This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO₂.

- Mar 2005: 300
- Apr 2006: 250
- Apr 2007: 200

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

- Apr 2007: 108
- Apr 2006: 133
- Mar 2005: 153
## CA Commercial Building Stock Medians

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Occupancy Type</th>
<th>Median EUI (kBtu/sf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Daycare or Preschool</td>
<td>66</td>
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<tr>
<td></td>
<td>Elementary School</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Middle / Secondary School</td>
<td>119</td>
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<tr>
<td></td>
<td>Vocational or Trade School</td>
<td>83</td>
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<tr>
<td>Grocery / Convenience Store</td>
<td>Convenience Store</td>
<td>923</td>
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<td></td>
<td>Liquor Store</td>
<td>456</td>
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<tr>
<td></td>
<td>Small General Grocery</td>
<td>483</td>
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<tr>
<td></td>
<td>Specialty / Ethnic / Other Grocery</td>
<td>457</td>
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<tr>
<td></td>
<td>Supermarkets</td>
<td>544</td>
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<tr>
<td>Health Care</td>
<td>Clinic / Outpatient Care</td>
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<tr>
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<td>Hospital</td>
<td>484</td>
</tr>
<tr>
<td></td>
<td>Medical / Dental Lab</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>Medical / Dental Office</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td>Nursing Home</td>
<td>221</td>
</tr>
<tr>
<td>Lab / Technical</td>
<td>Data Processing / Computer Center</td>
<td>611</td>
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<td></td>
<td>Lab / R&amp;D Facility</td>
<td>571</td>
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<tr>
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<td>Software Development</td>
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<tr>
<td>Lodging</td>
<td>Hotel</td>
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<td></td>
<td>Resort</td>
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<td>Office / Bank</td>
<td>Insurance / Real Estate</td>
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<td></td>
<td>Office / Bank</td>
<td>186</td>
</tr>
<tr>
<td>Category</td>
<td>Subcategories</td>
<td>Stock Medians</td>
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<tr>
<td>------------------------</td>
<td>----------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Other</td>
<td>All Other</td>
<td>287</td>
</tr>
<tr>
<td></td>
<td>Assembly / Light Manufacturing</td>
<td>129</td>
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<tr>
<td></td>
<td>Police / Fire Stations</td>
<td>183</td>
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<tr>
<td>Public Assembly</td>
<td>Health / Fitness Center</td>
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<td></td>
<td>Library / Museum</td>
<td>174</td>
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<td></td>
<td>Movie Theaters</td>
<td>235</td>
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<tr>
<td></td>
<td>Other Recreational / Public Assembly</td>
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<tr>
<td></td>
<td>Religious</td>
<td>66</td>
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<tr>
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<td>Theater / Perf. Arts / Community Ctr.</td>
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<tr>
<td>Restaurant</td>
<td>Bar / Tavern / Nightclub</td>
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<tr>
<td></td>
<td>Fast Food or Self Service</td>
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<tr>
<td></td>
<td>Specialty / Novelty / Other Restaurant</td>
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<tr>
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<td>Table Service</td>
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<tr>
<td>Retail</td>
<td>Auto Sales</td>
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<tr>
<td></td>
<td>Department / Variety Store</td>
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<tr>
<td></td>
<td>Enclosed Mall</td>
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<tr>
<td></td>
<td>Other Retail Store</td>
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<tr>
<td></td>
<td>Retail Warehouse / Clubs</td>
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<tr>
<td></td>
<td>Strip Mall</td>
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<tr>
<td>Service</td>
<td>Gas Station / Auto Repair</td>
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<td>Gas Station with Convenience Store</td>
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<td>Other Services or Repair Shop</td>
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<tr>
<td>Warehouse</td>
<td>Conditioned Warehouse</td>
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<tr>
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<td>Refrigerated Warehouse</td>
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<tr>
<td></td>
<td>Unconditioned Warehouse</td>
<td>51</td>
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</tbody>
</table>
CA Rating for AB 1103

California Commercial Building Energy Performance Disclosure

Toward Zero Energy Use

Rated Building
Rating Energy Assets

Field Assessment
- Collect info necessary to construct simulation model
- Identify assets & operational characteristics
- Preliminary recommendations?

Building Model
- Normalize weather & operational characteristics
- Estimate annual energy use and/or cost (TDV for CA)
- Generate rating
Energy System Benchmarks include both Asset and Operational components

Figure 3 The Tree Diagram description of a building’s annual energy use

A. Total energy use per m² (primary or CO₂ equivalent)

B. Lighting kWh/m²
   - C. Lighting W/m²
     - E. Light level Lux
     - F. Efficiency (W/m²)/1000
   - D. Effective hours/yr
     - G. Hours of use
     - H. Management factor

B. Ventilation kWh/m²
   - C. Ventilation W/m²
     - E. Vent rate (l/s)/m²
     - F. Efficiency W/(l/s)
   - D. Effective hours/yr
     - G. Hours of use
     - H. Management factor

Asset
Use, Control and Management
Asset
Use, Control and Management

EPLLabel: a graduated response procedure for producing a building energy certificate based on an operational rating
R. Cohen, Energy for Sustainable Development, robert@esd.co.uk
W. Bordass William Bordass Associates, BillBordass@aol.com
J. Field Target Energy Services, jfield@terg.co.uk
Rating Field Assessment vs. RCx

**Field Assessment**
- Collect info necessary to construct simulation model
- Identify assets & operational characteristics
- Preliminary recommendations?

**RCx Screening**
- Identify assets & operational characteristics

**RCx Investigation**
- Develop recommendations
New Energy Policy for Old Buildings

AB 758 (Skinner, 2009)

- Calls for a comprehensive program to achieve energy savings in CA’s existing building stock
- CEC must develop and implement program, in collaboration with all stakeholders
New Energy Policy for Old Buildings

AB 758 (Skinner, 2009)

• Program components will include:
  - Workforce Development
  - Public Awareness Campaign
  - Financing Options
  - Rating systems (e.g. HERS)
  - Labeling Programs
  - Audits & Commissioning Investigations
  - Retrofits & Retro-commissioning

• ~$120M ARRA SEP green job training, financing and retrofit programs will serve as pilots
Ratings → Improvements

Potential Rating Requirements
- HERS rating disclosed at time of sale or other trigger points
- Commercial asset rating disclosures within financial transactions
  - Including tenant leased spaces
- Performance labels for all public buildings

Potential Efficiency Improvement Requirements
- At time of financial transaction or other trigger points
- At date certain, depending on rating
Side by Side Ratings
Operational & Asset

Energy Certificate

Building Energy Performance

<table>
<thead>
<tr>
<th>Certificate type</th>
<th>Building Type</th>
<th>Whole or part of building</th>
<th>As built:</th>
<th>In use:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULL</td>
<td>Office</td>
<td>Whole building</td>
<td>Asset Rating</td>
<td>Operational Rating</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Very energy efficient

- A
- B
- C
- D
- E
- F
- G

Not energy efficient

Asset rating method:
- UK National Standard 2004
- Operational rating method:
  - EN 15251:2007 (Occupancy level)
  - EN 15316:2005 (Equipment heat gain level)
  - EN 15316:2007 (Ventilation requirements)
  - EN 15316:2007 (Natural ventilation)
  - EN 15316:2007 (Windows level)

GB 2004

Further information can be found in the Energy Log Book.
Public Awareness
(not in Energy Units)

Santa Barbara

Lightblueline.org
“Drawing the line against climate change”
The End.

mbrook@energy.state.ca.us

www.energy.ca.gov