

Arup**Energy**

WCBID

Wilshire_EES

Wilshire Center BID
Benchmarking Database

Arup**Energy**

WCBID

Wilshire_EES

Wilshire Center BID

March 2010

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

Arup North America Ltd
12777 West Jefferson Boulevard, Suite 200, Los Angeles, California 90066
Tel +1 310 578-4400 Fax +1 310 577-7011
www.arup.com

Job number 210379

Contents

	Page
1 Purpose	1
2 Benchmarking Exercise	1
2.1 Process	1
2.2 Building Usage Categories	3
2.3 Reference Benchmarking Database's	4
3 Energy Performance Goals	5
3.1 Summation of WCBID Assessment	5
3.2 Future Considerations: Statistical Rating Scale vs. Technical Rating Scale	7

1 Purpose

The Wilshire Center Business Improvement District (WCBID) has pledged, through the Cool District Program, to reduce their Green House Gas (GHG) emissions by 2% each year until an 80% reduction from their 2010 GHG emissions are met. A large portion of the GHG reduction will come from the reduction of energy used by the Districts building stock. The WCBID is made up of over 1100 retail, office, restaurant, lodging, and residential buildings. Arup and the WCBID have worked together to establish a benchmarking database, which will help to establish energy reduction targets for the building stock of the District.

2 Benchmarking Exercise

2.1 Process

Arup has taken a high level approach to benchmarking the building stock of the District. Generalized¹ methods have been taken to find the Energy-Use Indices (EUI) of each building in the portfolio. The EUI will be used to rank the buildings against a similar robust building database. Below are the steps that were taken in the benchmarking exercise.

1. Characterization of the Building Portfolio

To have a better understanding of the diversity of buildings, we took a street level tour of Wilshire Boulevard, and several blocks of the residential sector. We noted typical characteristics. EUI adjustments were made for different building types based on their characteristics, age and envelope conditions. With all of the gathered building information we assigned an appropriate building usage category and the percent of area for each specific building.

2. Benchmarking to Define Energy Performance

A representative sample of historical energy use data (gas & electric) was gathered for each building usage category. With the estimated EUI established we benchmarked the buildings in the WCBID portfolio against an appropriate building energy use database.

3. Sampling: Validation of Estimates and Identification of Opportunities

Next we used information gathered from the preliminary assessments to rationalize our input assumptions and identify opportunities for improved energy performance.

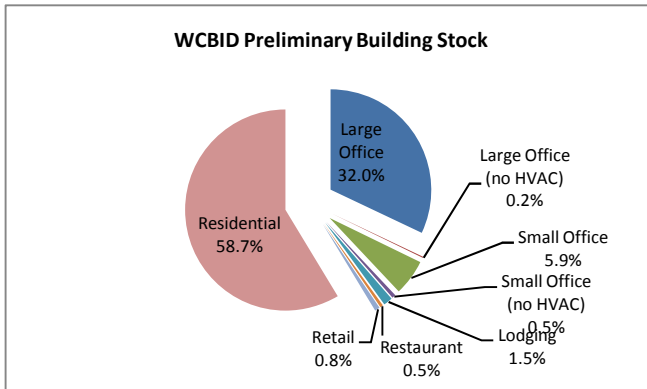
4. Energy and Carbon Reduction Goal Estimates

With the buildings now benchmarked we assigned a reasonable energy reduction target for the WCBID to correspond to the carbon reduction goals of the WCBID.

This process is summarized and displayed graphically in the following section and more details identified throughout the report.

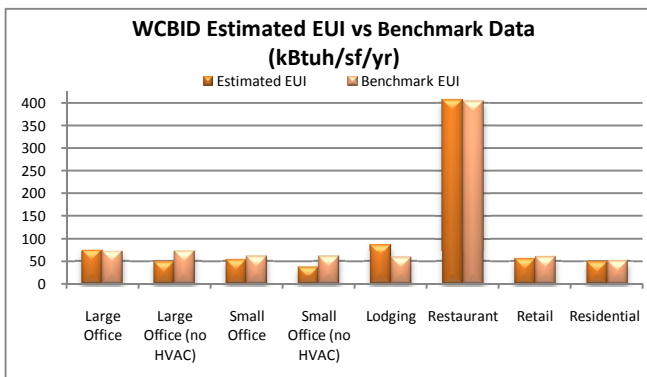
¹ Utility data was gathered for the buildings selected to receive preliminary surveys. This data was added to the WCBID Benchmarking Database to create actual EUI's for those specific buildings.

2.1.1 Graphical Illustration of the Process



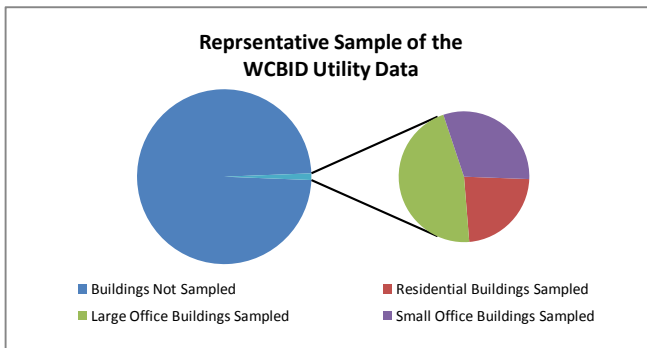
1. Characterization of the Building Portfolio

To have a better understanding of the diversity of buildings, we took a street level tour of Wilshire Boulevard, and several blocks of the residential sector. We noted typical characteristics. EUI adjustments were made for different building types based on their characteristics, age and envelope conditions. With all of the gathered building information we assigned an appropriate building usage category and the percent of area for each specific building.



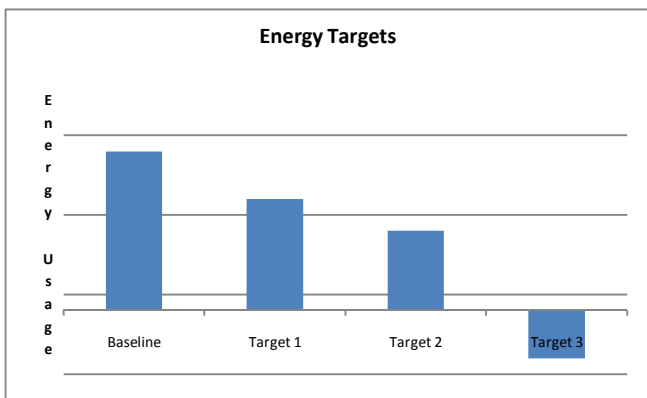
2. Benchmarking to Define Energy Performance

A representative sample of historical energy use data (gas & electric) was gathered for each building usage category. With the estimated EUI established we benchmarked the buildings in the WCBID portfolio against an appropriate building energy use database.



3. Sampling: Validation of Estimates and Identification of Opportunities

Next we used information gathered from the preliminary assessments to rationalize our input assumptions and identify opportunities for improved energy performance.



4. Energy and Carbon Reduction Goal Estimates

With the buildings now benchmarked we assigned a reasonable energy reduction target for the WCBID to correspond to the carbon reduction goals of the WCBID.

Target 1 = Low Hanging Fruit

Target 2 = Hi Capital Expenditures (Cap Ex)

Target 3 = Net Zero

2.2 Building Usage Categories

There are seven building usage categories that were identified for the WCBID:

- Large Office²
- Large Office (no HVAC)
- Small Office³
- Small Office (no HVAC)
- Lodging
- Restaurant
- Retail
- Residential

Although there are other types of building usage categories throughout the district, these categories represent the bulk of the building stock. An example of characterizing a buildings' usage, from an outside examination is below.

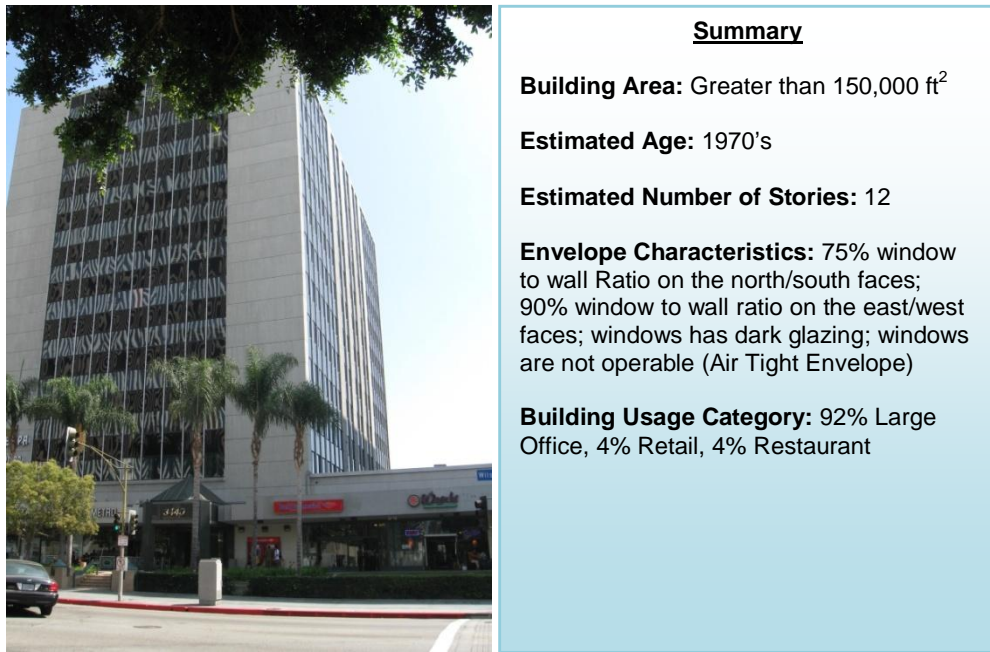


Figure 1 Example Picture from Wilshire Boulevard Walk

As an example of our approach, the building in Figure 1 appears to be over 12 stories. Using the address, the WCBID database identifies the building is over 150,000ft², placing it into the Large Office category. Based on visual observations, the building appears to have been built in the 1970's, with a fairly air-tight envelope. We will assume the existence of a functioning HVAC system (heating, ventilation, and cooling). The first floor appears to have retail and restaurant space which makes up about 8% of the building floor area. Therefore this building cannot be characterized as 100% "Large Office". An appropriate usage characterization for this building would be: 92% Large Office, 4% Retail and 4% Restaurant.

² The California End Use Survey refers to a "Large Office" as an office building equal to or greater than 50,000ft².

³ The California End Use Survey refers to a "Small Office" as an office building less than 50,000ft².

2.3 Reference Benchmarking Database's

We used two databases to benchmark the building portfolio of the WCBID; the Housing and Urban Development (HUD) Residential Energy Use Benchmarking Tool for residential spaces, and the California End Use Survey (CEUS) for all other usage types. Using both databases we were able to find the Average EUI⁴ for each building usage category.

A preliminary ranking system was integrated into the WCBID Benchmarking database. Buildings are ranked by a score between 0 – 100, where a score of 50 represents a buildings performance lying in the 50th percentile of the reference benchmarking database. A score of 75 represents a building performance lying in the top 25th percentile of the reference benchmarking database. The energy performance goal of the WCBID is to have all buildings have a score of at least 75, based on the 2010 benchmarked baseline. Achieving the 75 performance goal will move the WCBID closer to becoming a Cool District.

2.3.1 Energy Star Benchmarking Database Tool

The US EPA's Energy Star Program has a commonly used benchmarking tool called Portfolio Manager. Portfolio Manager is used to benchmark commercial buildings, and also used to determine if the facility qualifies for an "Energy Star" label. Portfolio Manager uses the Commercial Buildings Energy Consumption Survey (CBECS) 2003 for their building database. Portfolio Manager uses several parameters to determine a normalized EUI from the CBECS data. The major parameters needed for normalization are: building type, building area, number of occupants, number of computers, zip code/city.

Listed below are a few reasons why we opted not to use Energy Star to benchmark the WCBID's building stock:

- i. The CEUS is a California survey, so the average EUI per building type gives a better representation of the moderate temperature of Los Angeles.
- ii. Portfolio Manager normalizes regional data based on census regions that may include several cities or states, which are not specific to Los Angeles moderate temperatures. The census division for Los Angeles covers a large chunk of the southwest. Los Angeles climate, compared to the majority of the census division is much milder, resulting in lower actual EUIs.
- iii. The normalization equation used to normalize the CBECS data is weighted heavily on two major factors, the number of workers and the number of computers in the facility. There is a separate equation for each census division, which identifies the impact of regional climate and regional building practices.
- iv. The CUES EUI data for Los Angeles's specific climate zone is noticeably different than the EUI's from the CBECS data. Comparing Los Angeles energy scores to those in say Phoenix, AZ (same census zone) is not very appropriate and can lead to a misrepresentation of building energy performance, see Figure 2.

⁴ An Average EUI will yield a ranking score of 50.

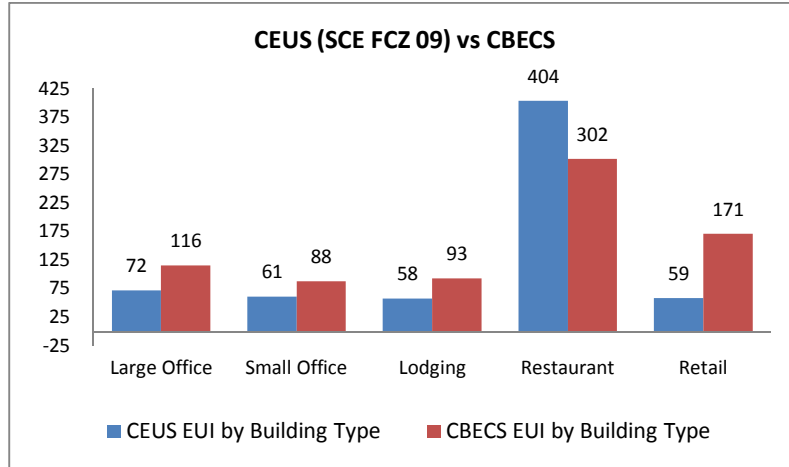


Figure 2 EUI Comparison of CEUS data vs. CBECS Data

3 Energy Performance Goals

3.1 Summation of WCBID Assessment

In Figure 3 you will find the energy efficiency targets for the WCBID based on a benchmark ranking scores of 75 and 90 out of 100. Based on preliminary benchmarking analysis, the WCBID can reduce their energy usage on average by 30% through energy efficiency projects. Also the WCBID on average can further reduce their energy usage with high capital expenditures, which can reduce energy usage by at least 50% from the base case estimate. This can yield an estimated carbon reduction of 106,000 tonnes. In Figure 4⁵ you will see a graph which gives a simplistic view of the WCBID carbon reduction throughout the next 40 years.

WCBID Preliminary Building Energy Usage and Site Carbon Pollution Assessment			
	Current Conditions	Early (Low Hanging Fruit) Benchmark Target of 75	Later (Hi Cap Ex) Benchmark Target of 90
WCBID Gross Building Area	36,972,059 ft ²	36,972,059 ft ²	36,972,059 ft ²
Total Energy Used by the BID (Gas & Electricity)	2,140,000 MMBtu	1,540,000 MMBtu	1,150,000 MMBtu
WCBID Energy Use Index	58 kBtu/ft ²	42 kBtu/ft ²	31 kBtu/ft ²
Total Electrical Cost Paid by the BID Building Owner	\$55,620,000 \$/yr	\$42,140,000 \$/yr	\$42,140,000 \$/yr
Total Gas Cost Paid by the BID Building Owner	\$5,740,000 \$/yr	\$3,520,000 \$/yr	\$3,520,000 \$/yr
Total Energy Cost Paid by the BID Building Owner	\$61,360,000 \$/yr	\$45,660,000 \$/yr	\$45,660,000 \$/yr
Total Building Stock Site CO ₂ Emissions	261,000 tonnes	194,000 tonnes	146,000 tonnes
District Energy Cost per Square Foot	\$1.66 \$/ft ² /yr	\$1.23 \$/ft ² /yr	\$1.23 \$/ft ² /yr
WCBID Minimum Energy Reduction From Current Conditions Based on a Benchmark Target Scores of 75 and then 90	0%	30%	50%
Total WCBID Carbon Pollution Reduction	- Tonnes of CO₂	67,000 Tonnes of CO₂	115,000 Tonnes of CO₂

Figure 3 Summary of energy Targets for WCBID

⁵ The table in Figure 4 is exclusively representative of the carbon pollution reduction from energy related projects. Carbon reduction from transportation related items are not taken into account. The site carbon reduction figures does not take into account any changes that will accrue as LADWP moves to a cleaner generation mix.

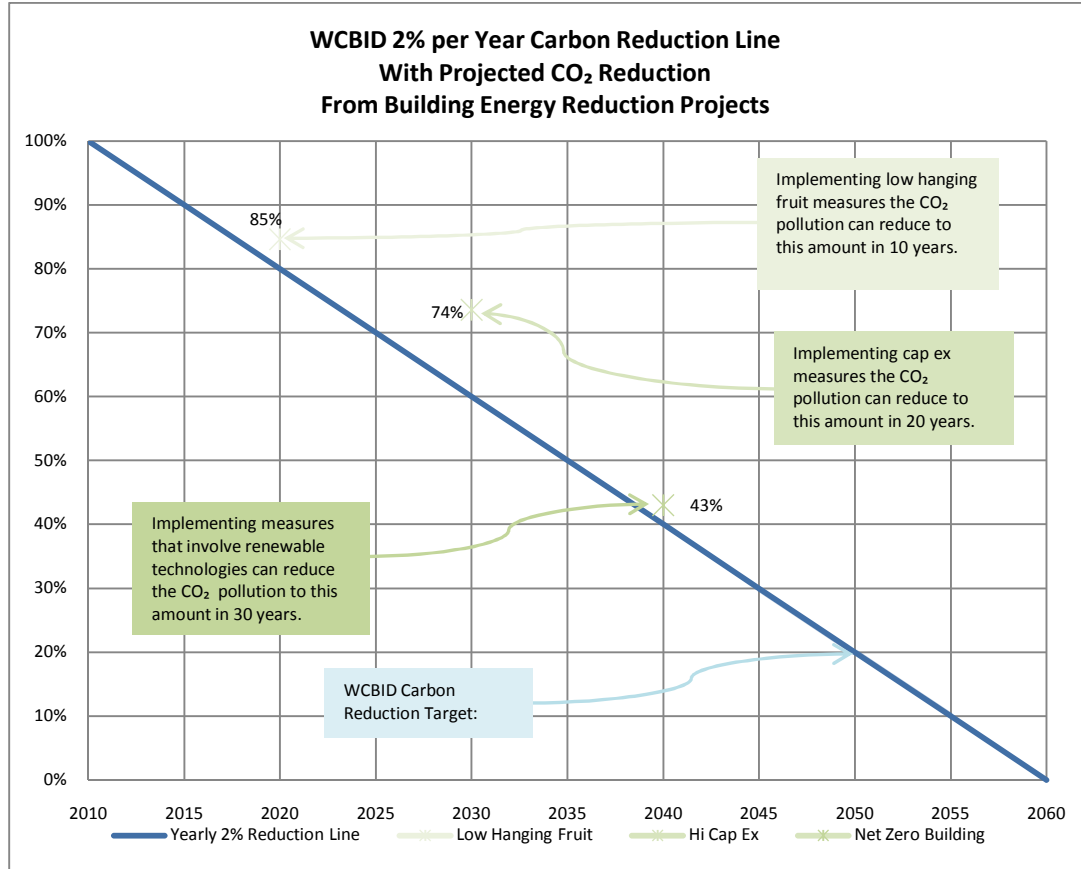


Figure 4 WCBID Carbon Reduction Plan as it coincides to the Energy Targets set by Arup⁶

⁶ It is assumed that 60% of the carbon pollution from the WCBID is from Commercial and Residential building systems.

3.2 Future Considerations: Statistical Rating Scale vs. Technical Rating Scale

As owners begin to take on energy supply projects which include renewable energy or fuel switching technologies, the relevance of a statistical rating scale⁷ will decrease. Figure 5 has an example of a typical statistical scale where 100 represents the top performing building in a sample population, and 50 represents the average building (50th percentile) in a sample population. Also in Figure 5 you will find an additional scale which represents a technical rating⁸ scale, where 100 represents an average performing building (50th percentile) and 0 represents the performance of a net zero building⁹. Looking at the two scales you will notice that when a statistical scale has reached its top performance, the technical scale still has the capability to track better performing buildings. For example, if a high efficiency building were to add a significant amount of photovoltaic or solar thermal to offset utility usage, the building would surpass the 100th percentile of a statistical scale, but the same building might have fell short of a net zero rating in a technical scale. These occurrences will become more frequent as the WCBID begin to have higher efficiency buildings. In the future a more appropriate scale of performance should be considered to track the performance of the WCBID building stock. This can help to set new targets for reaching the districts goals of an 80% carbon reduction from the 2008 carbon emission figures.

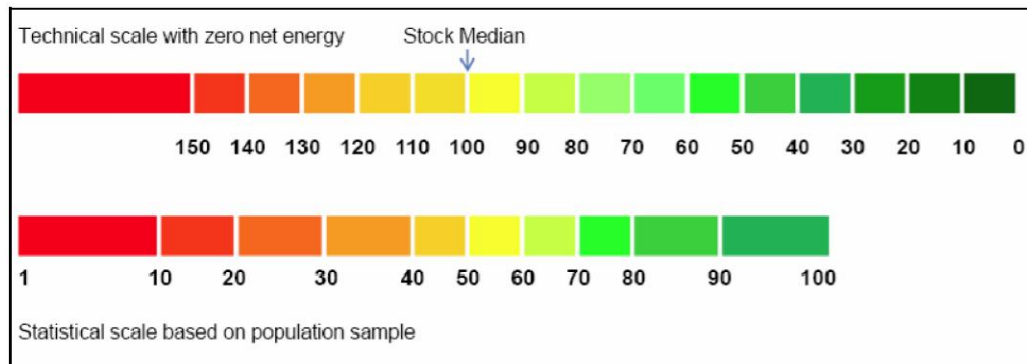


Figure 5 ABEL Implementation Report – June 9, 2009 Final Draft “Figure 3 – Comparison of Technical and Statistical Scales”

⁷ A Statistical Rating Scale uses an existing building population sample to set a ranking score between 0 - 100 based on that population. This is the typical benchmarking technique used by most national and local building databases.

⁸ A Technical Rating System uses stock median, code level of performance or energy policy to set the low to high end of the energy scale. For example a net zero building would be the best you could achieve in a technical scale.

⁹ In general, a net-zero energy building produces as much energy as it uses over the course of a year. Net-zero energy buildings are very energy efficient. The remaining low energy needs are typically met with on-site renewable energy.

(http://www1.eere.energy.gov/buildings/commercial_initiative/zero_energy_definitions.html)