



2012 CBECS Preliminary Data and Updates to the 1 – 100 ENERGY STAR Score

Alexandra Sullivan, EPA

October 28, 2014

Agenda



- Overview
 - ENERGY STAR scores
 - EPA milestone activities
- 2012 CBECS Characteristics Data
 - Preliminary market trends
 - Considerations for analysis
- EPA's Technical Development Process
 - Items under review
 - Opportunities for feedback
- Questions



Overview

ENERGY STAR Score Objectives



- Reduce greenhouse gas emissions from energy use in buildings
 - Relies on actual, measured energy bill data
- Evaluate whole building energy use
 - Accounts for combined effects of technology, operation, maintenance, and usage patterns
 - Recognizes that these factors all affect each other and the bottom line measured energy consumption
- Motivate organizations to develop a strategic approach to energy management
- Provide a comparative, national benchmark
 - Adjusts for weather and certain business choices (e.g. hours of operation) for fair comparisons
 - Ranks performance relative to existing buildings in the market
- Identify best performers in the market, like the ENERGY STAR on products, so consumers and businesses can make smart choices

Importance of CBECS Data to ENERGY STAR Scores



- Many of the 1 – 100 ENERGY STAR scores are based on CBECS data
 - Is random and nationally representative
 - Includes measured whole building energy data
 - Captures data on numerous operational characteristics
 - Is conducted on a regular basis to capture changes in the market over time
- New CBECS data expected in late 2015
 - EPA will begin review of data when available
 - Updates posted at <https://www.energystar.gov/scoreupdates>

Property Types with ENERGY STAR Scores



Score based on CBECS data



Bank Branch



Barracks*



Financial Offices



K-12 Schools



Supermarkets



**Wholesale club/
Supercenters**



Medical Offices*



Hotels



**Residence
Hall/Dormitory***



Office Buildings



Courthouses



Worship Facilities



Retail Stores



**Distribution
Centers**



Warehouses

Score based on
other survey data



Data Centers



Hospitals



**Senior Care
Communities**



**Wastewater
Treatment Plants***



**Multifamily
Housing**



*These building types are not eligible for ENERGY STAR certification.

EIA CBECS Milestone Activities



- Publish building characteristics data
 - Preliminary estimates, released June 2014
 - Detailed tables, January-April 2015
 - Public use micro data, April 2015
- Publish consumption & expenditures data
 - Preliminary estimates, Summer 2015
 - Detailed tables, Fall 2015
 - Public use micro data, Winter 2015
- For more information, visit www.eia.gov/consumption/commercial

EPA Milestone Activities



- Biannual update webinars
 - May 2014, ENERGY STAR score development
 - October 2014, Discussion of 2012 CBECS characteristics data
 - May 2015, Deeper dive into 2012 CBECS characteristics data
 - October 2015, Update on score development process
- Ongoing solicitation of input
 - Progress and open questions shared in webinars
 - Provide your feedback at: www.energystar.gov/ScoreUpdates
 - From technical experts with working knowledge of the score development methodology
 - From ENERGY STAR Partners with experience with our methods and other rating approaches
- Data analysis and score development
 - Late 2015, preliminary analysis of data
 - Early 2016, begin score development with focus on 1-2 property types at a time, order to-be-determined
 - Explore scores for new property types if sample size allows



2012 CBECS Characteristic Data

CBECS Characteristic Data Overview

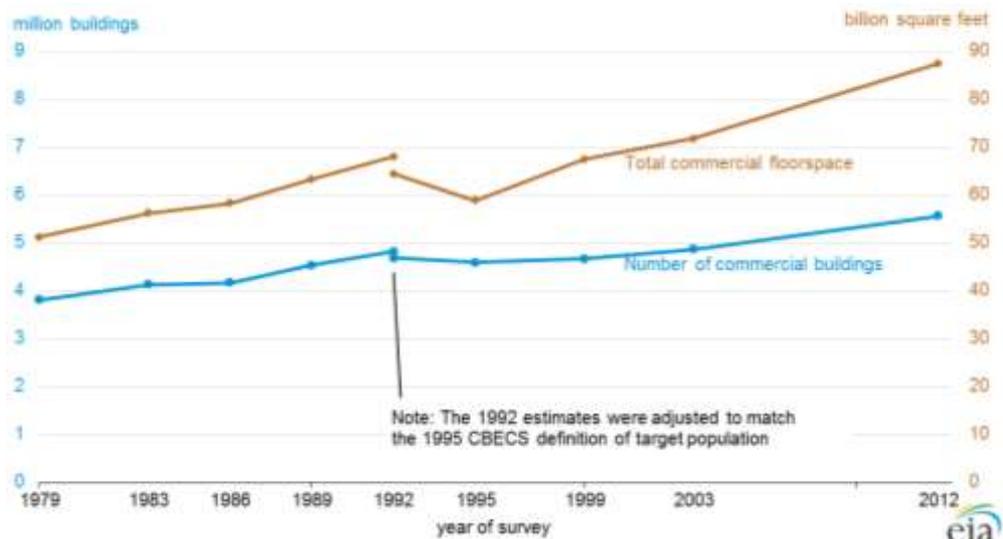


- Available now
 - Number and Square Footage of buildings by building type
 - Can allow us to assess change in overall market size, change in building size by sector
 - Visit EIA’s website for more graphs and CBECS 2003 to 2012 comparisons:
 - <http://www.eia.gov/consumption/commercial/reports/2012/preliminary/index.cfm>
- Coming soon (January-April 2015)
 - Detailed tables
 - Individual building data on characteristics like size, hours, workers, and PCs
 - EPA will analyze this data to look at market trends
 - Update planned for May 2015 webinar
 - The EIA January-April 2015 releases will not include energy or cost data

Overall Market Growth

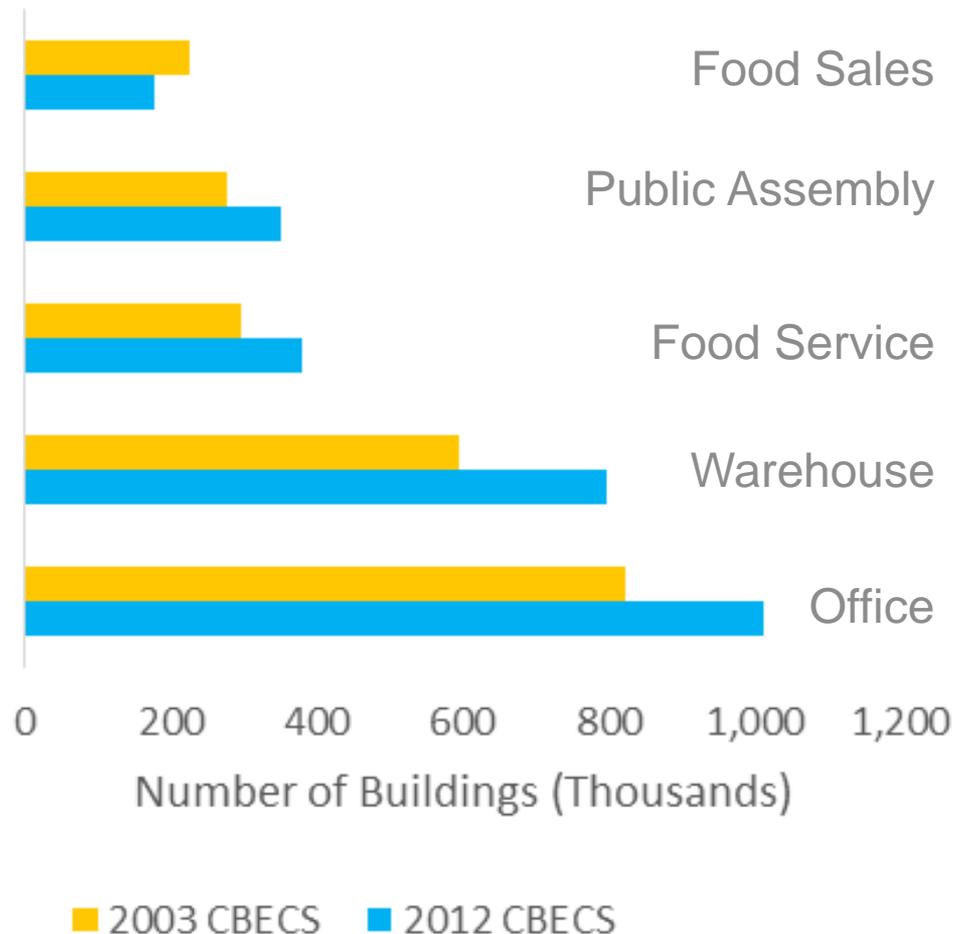


- Estimated 5.6 million commercial buildings in the US in 2012 comprising 87.4 billion square feet
 - 14% increase in number of buildings since 2003
 - 22% increase in floor space since 2003
- 2012 survey sample size was just over 6,700 observations
 - 28% larger than in 2003
 - EPA will explore the possibility of ENERGY STAR scores for new property types



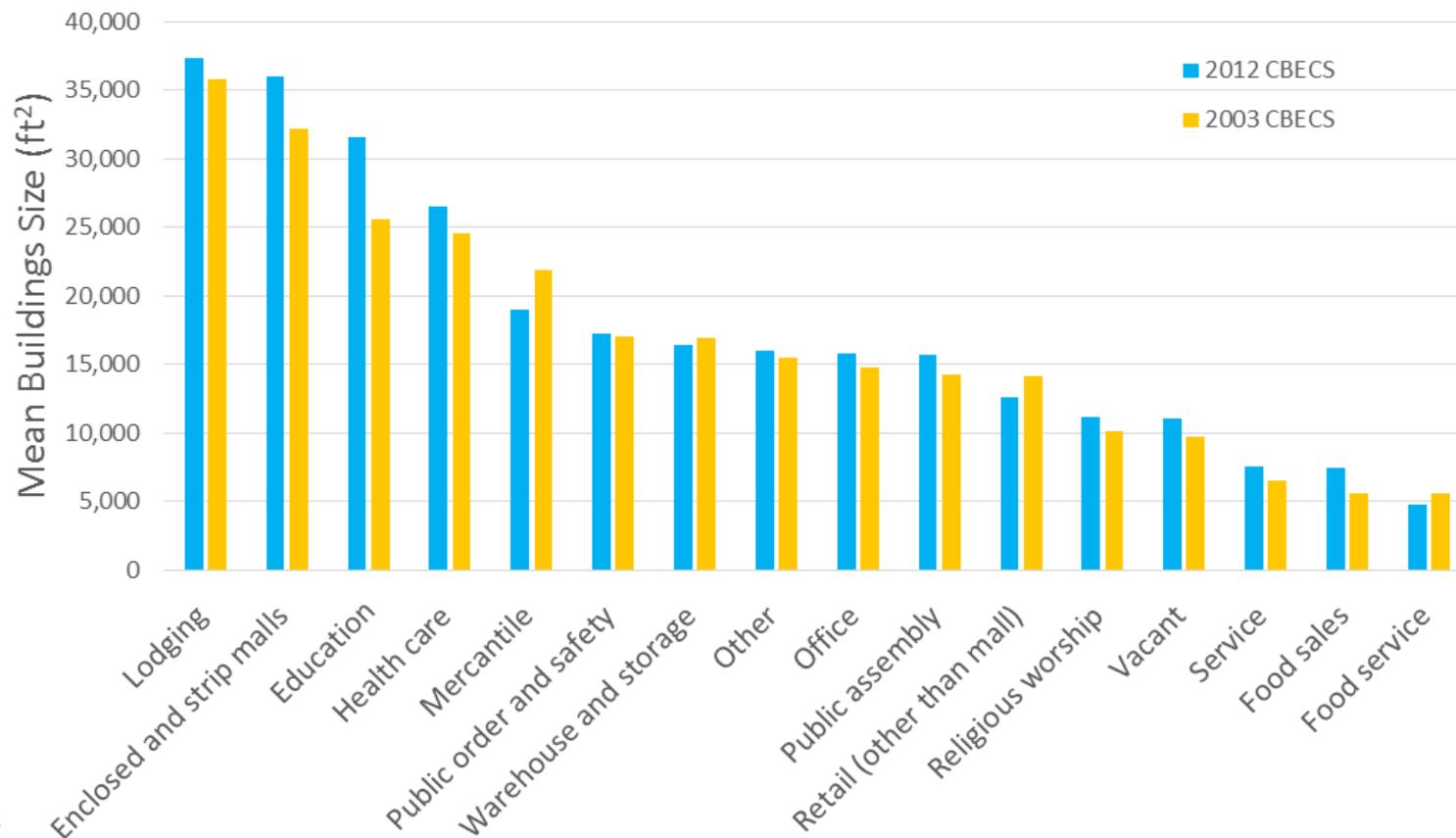
Market Growth by Sector

- Statistically significant growth in some sectors
 - Office
 - Warehouse
 - Public Assembly
- Statistically significant decrease in one sector!
 - Food Sales
- No statistically significant change for some sectors
 - Hospitals
 - Lodging
 - Education

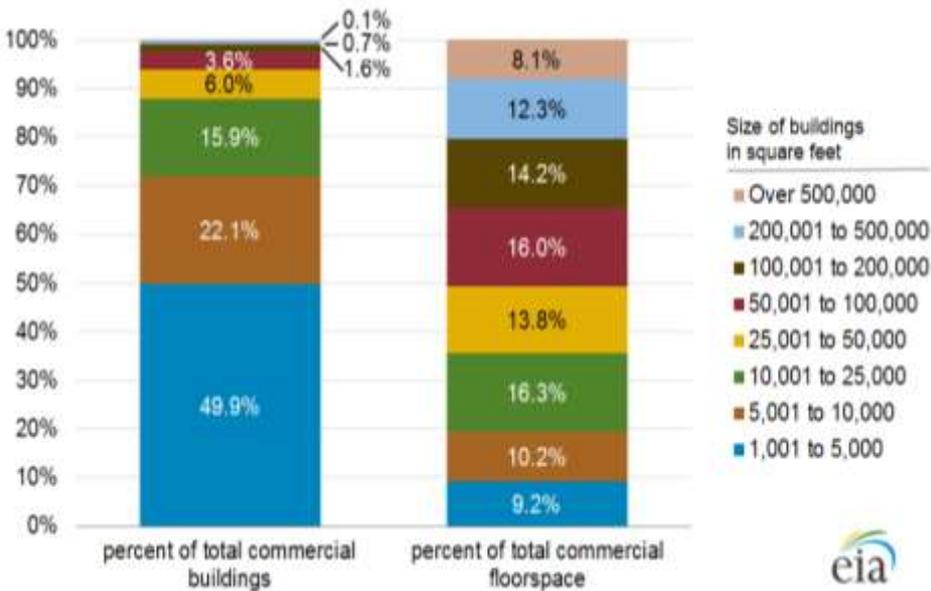


Change in Building Size by Sector

- The average building in the country is less than 20,000 square feet
 - Largest types are lodging, malls, and education
- Slightly larger than in 2003



Why Do Average Building Sizes Appear Low?



U.S. Energy Information Administration, 2012
Commercial Buildings Energy Consumption Survey

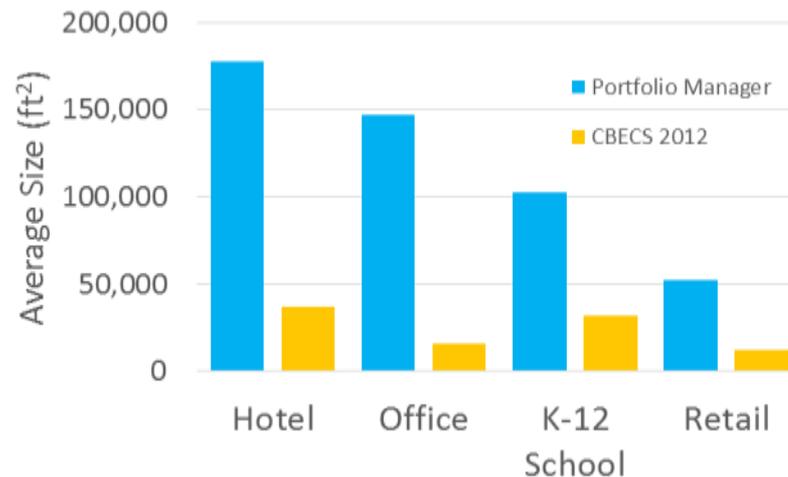


- There are 5.6 million commercial buildings in the U.S.
 - Vast majority are small, non-urban
- The smallest 50% of buildings account for only 10% of floor area
- The largest 0.8% of buildings accounts for over 20% of floor area
 - 38 thousand buildings that are between 200,000 and 500,000 ft²
 - **285,400 ft² on average**
 - 8 thousand buildings that are over 500,000ft²
 - **887,200 ft² on average**

What Is the Average Size of Buildings in Portfolio Manager?



- Buildings in Portfolio Manager are larger for all categories
 - Average Office in Portfolio Manager is nearly 150,000 ft²
 - Even the average School in Portfolio Manager is larger
- It is critical to EPA that the ENERGY STAR score is equitable for all sizes
 - Models developed with CBECS are always tested using Portfolio Manager data, too
 - EPA looks for equitable scores across the full range of sizes

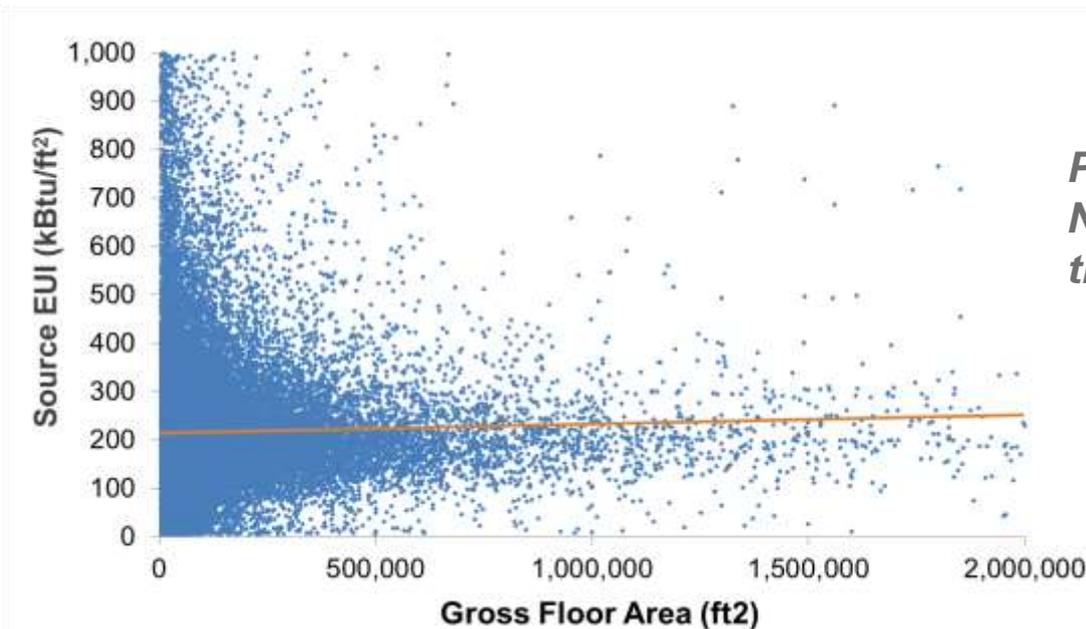


note: CBECS Hotel and K-12 specific data is not yet available, numbers represent Lodging and Education, respectively

How Does EPA Account for Building Size in Analysis?



- Review the relationship between size and EUI
 - Typically there is more variability in EUI for small buildings
 - Small buildings may be less uniform, for example they could be homes that were converted into other commercial uses
- This process may include reviewing graphs, correlations, and regressions



*Portfolio Manager Offices:
Note large range of EUI at
the smallest properties*

How Does EPA Account for Building Size in Analysis (ctd)?



- Determine if a minimum size cut-off is needed
 - Perform regressions on CBECS with different samples
 - All offices
 - Offices above 1,000 ft²; Offices above 2,000 ft²; Offices above 3,000 ft²; etc
 - Explore how results change
 - Statistical significance
 - Scores for different size ranges
 - Correlations for other factors like workers and computers
 - Most models have a minimum size requirement
 - 1,000 or 5,000 ft²
- Determine if there is a significant relationship between EUI and size
 - Our office model includes a specific size adjustment
 - Larger offices have higher EUI than smaller offices
- Test CBECS models with Portfolio Manager data
 - Because the Portfolio Manager data has more large buildings, we can use this sample as a test during development



EPA Technical Development Process

Technical Questions Under Review



- EPA is currently assessing technical topics related to score development including:
 - The use of CBECS as a data source
 - The most appropriate dependent variable to use in the model
 - EUI is the current dependent variable
 - Used $\ln(\text{energy})$ before score revisions with CBECS 2003 data
 - The most appropriate approach for combining different types of space use in one building (e.g., office, retail, and multifamily)
 - Currently we create one predicted energy for the whole building and then create a score lookup table weighted by the predicted energy
 - By this approach, the most energy intensive spaces are weighted most heavily so that the score will motivate efficiency in those spaces first
 - The best way to establish the distribution of energy use in the population

Technical Feedback Process

- EPA welcomes feedback from all of our partners
 - Do you have observations of the score from your portfolio?
 - Have you performed analysis on commercial building data?
 - Let us know what you think:
 - www.energystar.gov/BuildingsHelp
- EPA is soliciting additional input from technical experts
 - Academics who have analyzed CBECS, Portfolio Manager, and/or local data collected through mandatory benchmarking and disclosure
 - Consultants, energy service providers, and practitioners with practical experience using ENERGY STAR to assess building performance
- EPA will provide update on decisions related to our technical process during the biannual webinar updates
 - Come back in May to hear what we've learned

Thank You!



- Visit these websites for up-to-date information
 - EIA CBECS Webpage
www.eia.gov/consumption/commercial
 - EPA Score Update Process:
www.energystar.gov/ScoreUpdates
 - EPA Portfolio Manager Help:
www.energystar.gov/BuildingsHelp
- Join us in May 2015 for our next update
 - Analysis of CBECS data on building characteristics
 - Update on technical input received on our score development methodology