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

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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
ENERGY STAR Score for Buildings

Fuel Efficiency

MPG

Statement of Energy Performance

ENERGY STAR Score
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

- Bank Branch
- barracks*
- Medical Offices*
- Hotels
- Residence Hall/Dormitory*
- Retail Stores
- Distribution Centers
- Warehouses
- Data Centers
- Hospitals
- Senior Care Communities
- Wastewater Treatment Plants*
- Wholesale club/ Supercenters
- Courthouses
- Worship Facilities
- Financial Offices
- K-12 Schools
- Office Buildings
- Hospitals
- Senior Care Communities
- Wastewater Treatment Plants*
- Multifamily Housing

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

Score based on CBECS data
Score based on other survey data

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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 of floor space
  - 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

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

![Bar chart showing market growth by sector](chart)

- Food Sales
- Public Assembly
- Food Service
- Warehouse
- Office

Number of Buildings (Thousands)

- 2003 CBECS
- 2012 CBECS
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?

• 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 ft^2
    • 285,400 ft^2 on average
  – 8 thousand buildings that are over 500,000 ft^2
    • 887,200 ft^2 on average

U.S. Energy Information Administration, 2012
Commercial Buildings Energy Consumption Survey
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 ft\(^2\)
  – 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
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(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](http://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