CBECS 2012: Update on EPA's Schedule and Methodology

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Agenda

- CBECS 2012 Survey
  - Overview
  - Energy Data
- EPA Analysis Plans
  - Timeline
  - Objectives
- Major Findings from Office Model
  - New Data Center Estimate
- Major Findings from Retail Store and Supermarket Model
- Change in ENERGY STAR Scores
  - What To Expect
- Source Energy
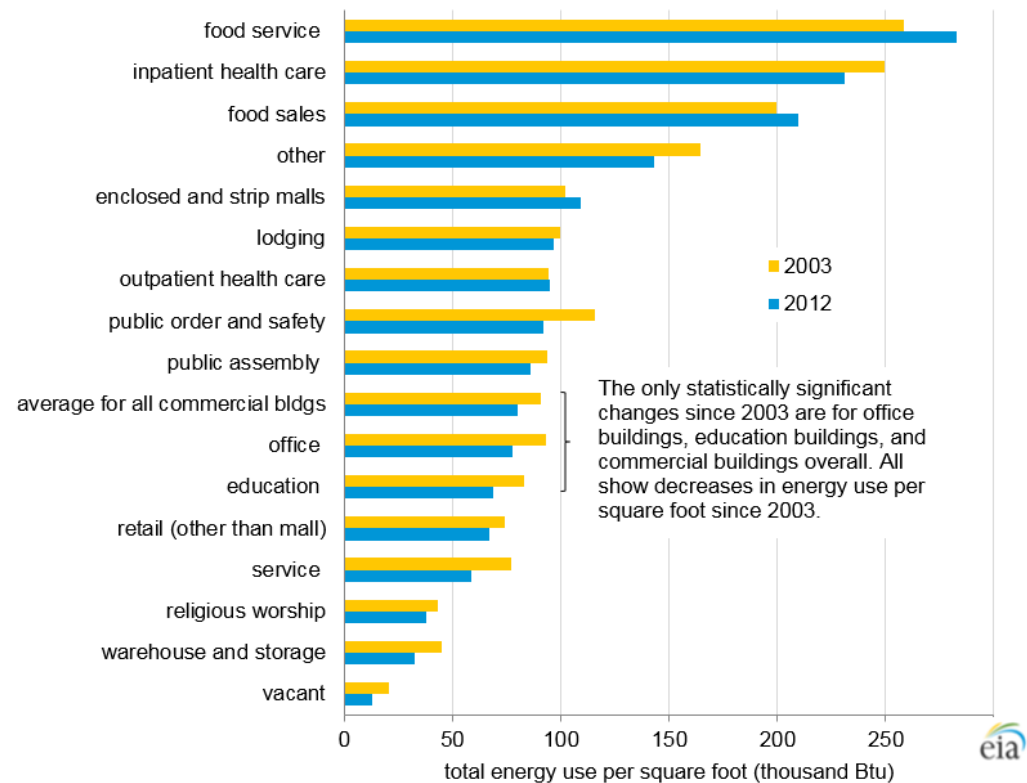 - Update for Renewable Electricity
- Next Steps

CBECS 2012 Overview

- **2012 survey sample size is over 6,700 observations**
  - 29% larger than 2003 survey

- **Estimate 5.6 million commercial buildings representing 87 billion ft^2**
  - 14% increase in the number of buildings since 2003
  - 22% increase in floor space since 2003

- **EIA Data**
  - 2012 public use microdata available: http://www.eia.gov/consumption/commercial/
  - EIA has published energy comparisons for 2003 and 2012

	Top Market Sectors
1	**Office** 16.0 Billion ft2
2	**Warehouse** 13.0 Billion ft2
3	**Education** 12.2 Billion ft2
4	**Mercantile** (Retail & Mall) 11.3 Billion ft2
5	**Lodging** 5.8 Billion ft2

CBECS 2012: Energy Use by Sector

- EIA has published a 2003 to 2012 comparison chart

- Only two sectors show statistically significant changes in energy use
  - Office
  - Education

- Note these are overall figures
  - Not normalized for changes in operation

The only statistically significant changes since 2003 are for office buildings, education buildings, and commercial buildings overall. All show decreases in energy use per square foot since 2003.

total energy use per square foot (thousand Btu)

Source: U.S. Energy Information Administration, Commercial Buildings Energy Consumption Survey.

EPA's Analysis Plans

EPA Schedule for Score Revisions

- **Perform detailed analysis** (~18 months)
  - Started May 2016
  - Analyze energy performance by property type
  - Explore new variables captured by CBECS
  - Determine appropriate changes to regression models used for score calculations

- **Order of Analysis**
  - Office & Retail / Supermarket
  - Hotel & K-12 School
  - Warehouse & Worship Facility

- **Program new scores into Portfolio Manager** (~6 months)
  - Documentation / extensive testing

- **Release new scores to the public** (*2018*)

Objectives of Analysis

- Leverage the most recent market data
  - This will show us if buildings are becoming more or less efficient
  - If the market is getting more efficient, then it may become harder to qualify for ENERGY STAR

- Re-assess key drivers of energy use
  - Have the relationships between existing variables (e.g. computers) and energy intensity changed in the last 10 years?
  - Are there new variables in CBECS that we should be adjusting for going forward?

What should you expect?

- **Expect some changes**
  - Median energy use for each property type
  - Correlations between energy use and key activities (hours, workers, computers)
  - Variables included in EPA's model
  - *The scores of your properties!*

- **EPA's basic approach is not changing**
  - Provide a national level benchmark
  - Use source energy to provide equitable scores for all fuel mixes
  - Leverage ordinary least squares (OLS) regressions to assess factors that impact energy consumption
  - Incorporate variables that capture weather and business activity
  - Exclude from analysis terms about technology, in order to reward technology that saves energy

Major Findings from Office Model

Adjustments in Current Office Model Based on 2003 CBECS	Kept?	Adjustments in New Office Model Based on 2012 CBECS
Building Size	✓	Building Size
Number of Personal Computers	✓	Number of Personal Computers
Number of Workers	✓	Number of Workers
Hours of Operation per Week	✓	Hours of Operation per Week
Whether or not the building is a Bank Branch	✓	Whether or not the building is a Bank Branch
Weather and Climate (using Heating and Cooling Degree Days)	Δ	Weather and Climate **(Only Using Cooling Degree Days)**
Percent of the Building that is Heated and Cooled	Δ	**Only Percent of the Building that is Cooled**

Major Findings from Office Model

- **New Office Model Based on 2012 CBECS**

  - Adjusts for very similar characteristics as previous model

  - May use different functional forms (interactions, natural log, etc…)

  - No adjustment for heating degree days and percent heated in new model (not significant)

  - Model coefficients based off new updated 2012 data

Major Findings from Office Model

Why isn't heating degree days (HDD) in the model?

- HDD and CDD are both indicators of climate
- EPA evaluated numerous model permutations with different climate variables:
  - HDD and CDD
  - HDD only
  - CDD only = *best, statistically significant result*
  - Total Degree Days (DD)
- HDD is not observed to have a strong positive correlation with energy
  - Offices with greater HDD actually use slightly *less* energy on average in CBECS 2012
- HDD and CDD are strongly correlated with each other
  - Separate terms for each are not always needed for accurate climate adjustments
  - Buildings with higher CDD have lower HDD and vice versa

ENERGY STAR. The simple choice for energy efficiency.

Office EUI and HDD

- Source EUI does not show a statistically significant trend with respect to HDD
- If anything there appears to be a slight negative correlation

EUI vs HDD CBECS 2012
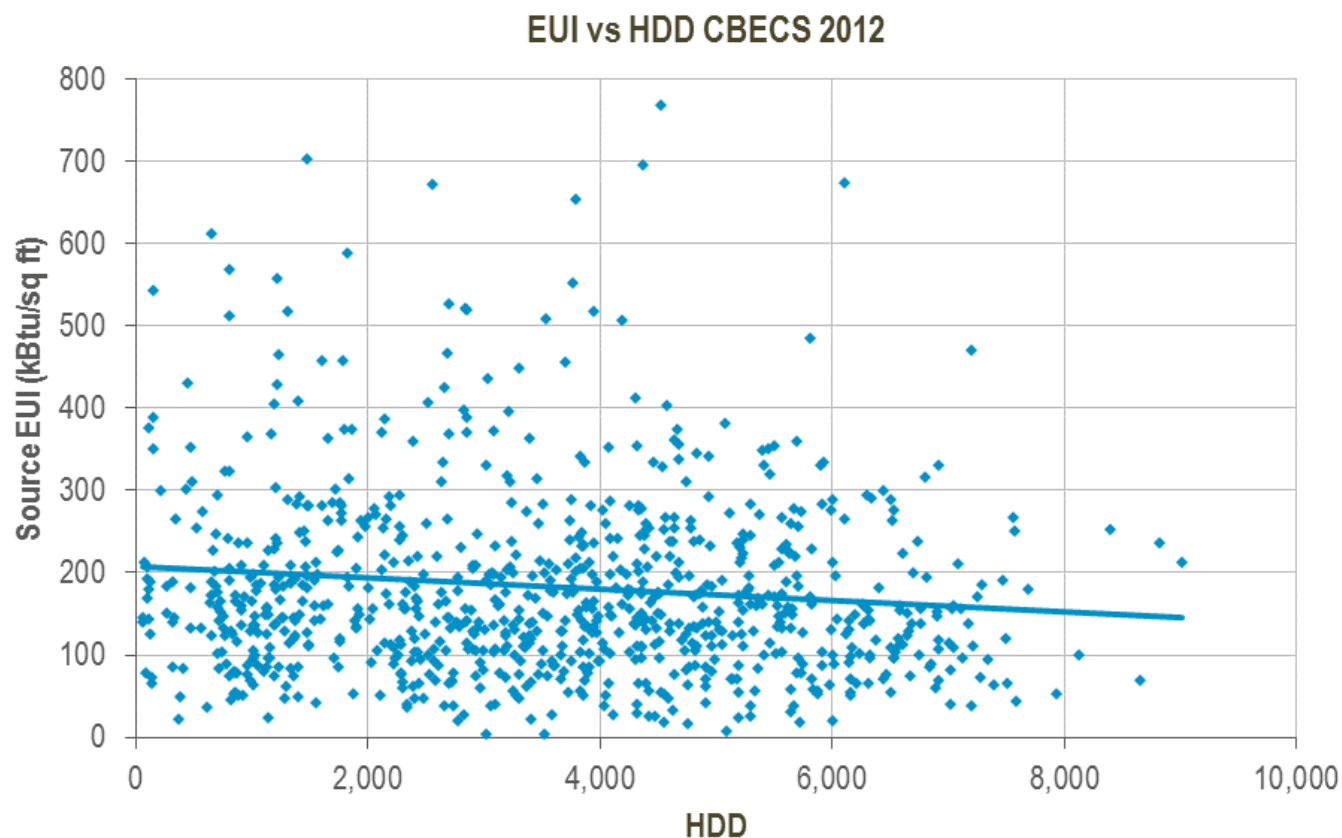
Office Model Data Center Estimate

New! Allow two options for scoring data centers!

1. Recommended Option - property managers continue to measure IT energy.
   – Includes full adjustment for measured IT Energy
   – Industry best practice

2. Use Portfolio Manager provided estimate for data center EUI
   – Designed for data centers where it is not practical to measure IT Energy
   – Allow the data center EUI adjustment for data centers that are up to 5% of the total floor area of the building
   – Provide data center energy estimate of 2,000 kBtu/ft^2, which is conservative – doesn't over credit

Retail Store and Supermarket

- Retail Store and Supermarket will be scored using the same dataset and base model

    – Allows for larger dataset – higher confidence in model coefficients

    – Supermarket property types will use the same model as retail store, but with two additional adjustments to differentiate
        - adjustment for supermarket (Y/N)
        - Supermarket specific adjustment for number of workers

    – Extensive testing done to ensure equitable scores

Retail Store Score

Adjustments in Current Retail Store Model Based on 2003 CBECS	Kept?	Adjustments in New Retail Store / Supermarket Model Based on 2012 CBECS
Number of Workers	✓	Number of Workers
Hours of Operation per Week	✓	Hours of Operation per Week
Number of Walk-in Refrigeration Units	✓	Number of Open, Closed, and Walk-in Refrigeration units (Combined term now)
Number of Open and Closed Refrigeration Cases		
Weather and Climate (HDD and CDD)	✓	Weather and Climate (HDD and CDD)
Percent of the Building that is Heated and Cooled	✓	Percent of the Building that is Heated and Cooled
Building Size	✗	N/A
Number of Personal Computers	✗	N/A
Number of Cash Registers	✗	N/A

Retail Store Score

- ## Adjustments in New Model Based on 2012 CBECS (not final)

  - No longer adjusts for Building Size, Number of Personal Computers, Number of Cash Registers

  - May use different functional forms (interactions, natural log, etc…)

  - Simpler model with fewer variables

  - Model coefficients based off new updated 2012 data

Supermarket Score

Adjustments in Current Supermarket Model Based on 2003 CBECS	Kept?	Adjustments in New Retail Store / Supermarket Model Based on 2012 CBECS
Number of Workers	✓	Number of Workers
Hours of Operation per Week	✓	Hours of Operation per Week
Weather and Climate (HDD and CDD)	✓	Weather and Climate (HDD and CDD)
Percent of the Building that is Heated and Cooled	✓	Percent of the Building that is Heated and Cooled
Number of Walk-in Refrigeration Units	Δ	Number of Open, Closed, and Walk-in Refrigeration units
Building Size	✗	N/A
Whether or not there is Energy Used for Cooking	✗	N/A
N/A	New	Supermarket (Yes/No)
N/A	New	Supermarket specific adjustment for number of workers

Supermarket Score

- Adjustments in New Model Based on 2012 CBECS (not final)

  – No longer adjusts for Building Size or whether there is energy used for cooking

  – New model adjusts for open, closed, and walk-in refrigeration

  – Use Supermarket (Yes/No) adjustment and Supermarket specific adjustment for number of workers to differentiate from retail stores

  – May use different functional forms (interactions, natural log, etc…)

  – Model coefficients based off new updated 2012 data

Will my baseline score change?

- ***Yes, this is likely.***

- When we update the methodology the new calculation is applied to all time periods

- Therefore, you will still see changes from your baseline to current
  – Even if your scores go down, you will still see your improvement between the baseline and the current

- Allows comparisons between the current and baseline to reflect efficiency improvements
  – When comparing both periods, will only see the difference that is a result of your own activities, not EPA's methodology
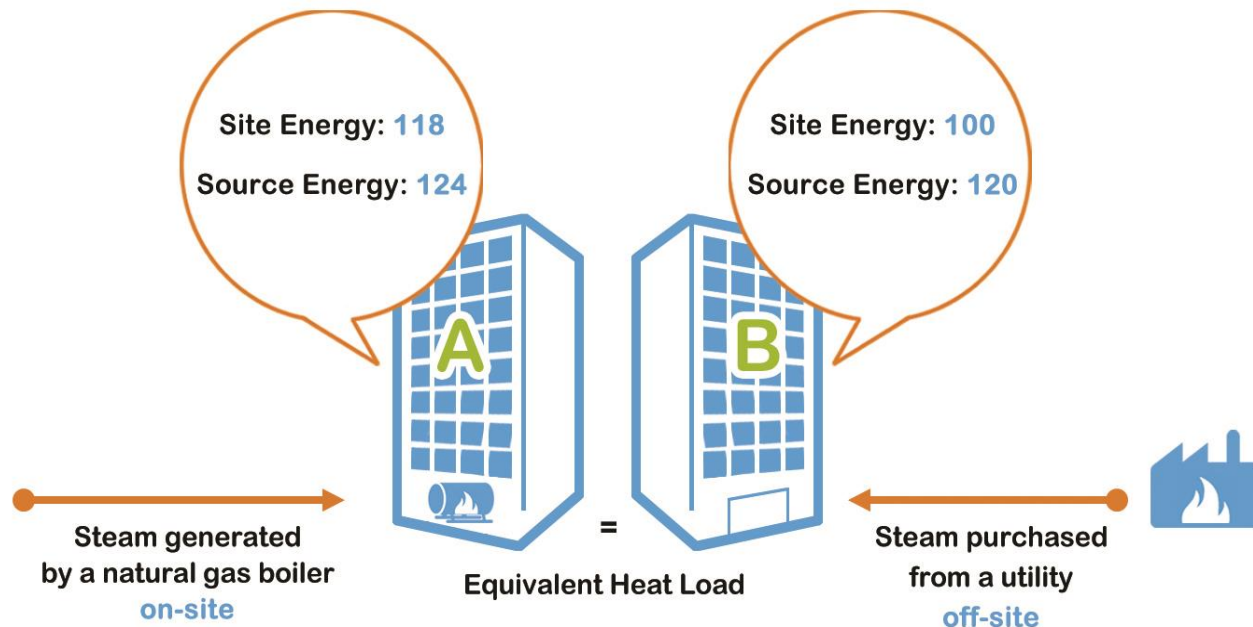
Keep Calm and Continue Benchmarking

- **There is time**
  - Changes are not anticipated until 2018

- **We will keep you informed**
  - We will give ample notice of an exact date

- **We will <u>not</u> rescind prior certifications**
  - All of your certified properties will still be on our registry
  - If you have top performers that are not certified, now is a good time to pursue certification

- **We will coordinate with cities and other partners**
  - We will review the implications of changes
  - We will prepare organizations that use Portfolio Manager for implications of changes to the scores

Source Energy

- Ensure that no individual building receives a credit (or penalty) based on the efficiency of its provider.

- Places primary and secondary energy on an equal footing

Site Energy results in Building B appearing more efficient.
Source Energy provides an equitable comparison.

Site Energy: 118
Source Energy: 124

Site Energy: 100
Source Energy: 120

A

B

Steam generated by a natural gas boiler on-site

=

Equivalent Heat Load

Steam purchased from a utility off-site

Update to Source Factor

- **EPA will still use one national electric factor**

- **The electric factor will be lower**
  - This new lower factor will be incorporated into our CBECS regression analysis and National Median calculation
  - This new lower factor will be applied to your buildings in Portfolio Manager

- **Medians for 2012 will be lower**
  - Compared to the numbers you see in Portfolio Manager today, both your actual energy use and the national median will be lower

- **Portfolio Manager will not change until 2018**
  - These changes will be implemented in 2018
  - All models will be re-estimated (including property types that do not use CBECS)
  - The changes to the factors affect both the underlying algorithm and the source energy calculation for your property

Summary

- EPA is performing extensive analysis of the CBECS 2012 data

- We anticipate releasing all updates to Portfolio Manager in 2018
  – Single release date for all property types

- Score changes are likely

- You will have plenty of notice of the exact date before anything changes in Portfolio Manager

- You are invited to participate in regular webinars to offer your opinion

Next Steps

- Be on the lookout for our next webinar for the latest updates pertinent to all sectors.
  - Updates approximately every 6 months until Portfolio Manager launch
  - Next Session: Mid 2017 (date TBD)
    - https://esbuildings.webex.com/

- Be on the lookout for our next K-12 School and Hotel webinars
  - Next sessions in January (dates TBD)
    - https://esbuildings.webex.com/

- If you see something, say something
  - Feel free to reach out with suggestions or questions at any time: www.energystar.gov/BuildingsHelp

- EPA will be hard at work with regression analysis for the next year ☺

Questions & Discussion