

2018 CBECS Overview and Outline of Draft Questionnaire



May 2018



CBECS

Commercial Buildings
Energy Consumption Survey

CBECS provides unique information about U.S. commercial buildings

- The Commercial Buildings Energy Consumption Survey (CBECS) is the **only** independent, statistically representative source of national-level data on the *characteristics* and *energy use* of commercial buildings
- Mandated by Congress in 1977, a CBECS has been conducted every three to five years since 1979
- The 2012 CBECS final sample was 6,720 buildings, one of the largest sample sizes ever
- The 2018 CBECS sample size is planned to be comparable to 2012

What is a *commercial* *building?*



- Commercial
 - More than 50% of floorspace is devoted to activities that are neither residential, nor industrial, nor agricultural
- Building
 - A structure intended for human access that is totally enclosed by walls that extend from the foundation to the roof
- The survey covers all commercial buildings larger than 1,000 square feet, with a few specific exclusions

CBECS uses a two-phase interviewing process

• Phase I: Buildings Survey



- In-person or telephone interview conducted by a *trained interviewer*
- Computer-assisted survey instrument (since 1995)



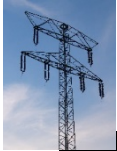
- Voluntary
- 2012 field period was ~8 months long
- Interviews averaged ~40 minutes

- Building size, age, and structural characteristics
- Building activity
- Ownership and occupancy
- Weekly operating hours
- Employees (main shift)
- Energy sources and their end uses
- Heating and cooling equipment
- Other energy-related equipment
- Specialized uses of space and equipment
- If available, annual energy use and cost data for the reference year (electricity, natural gas, fuel oil, and/or district heat)

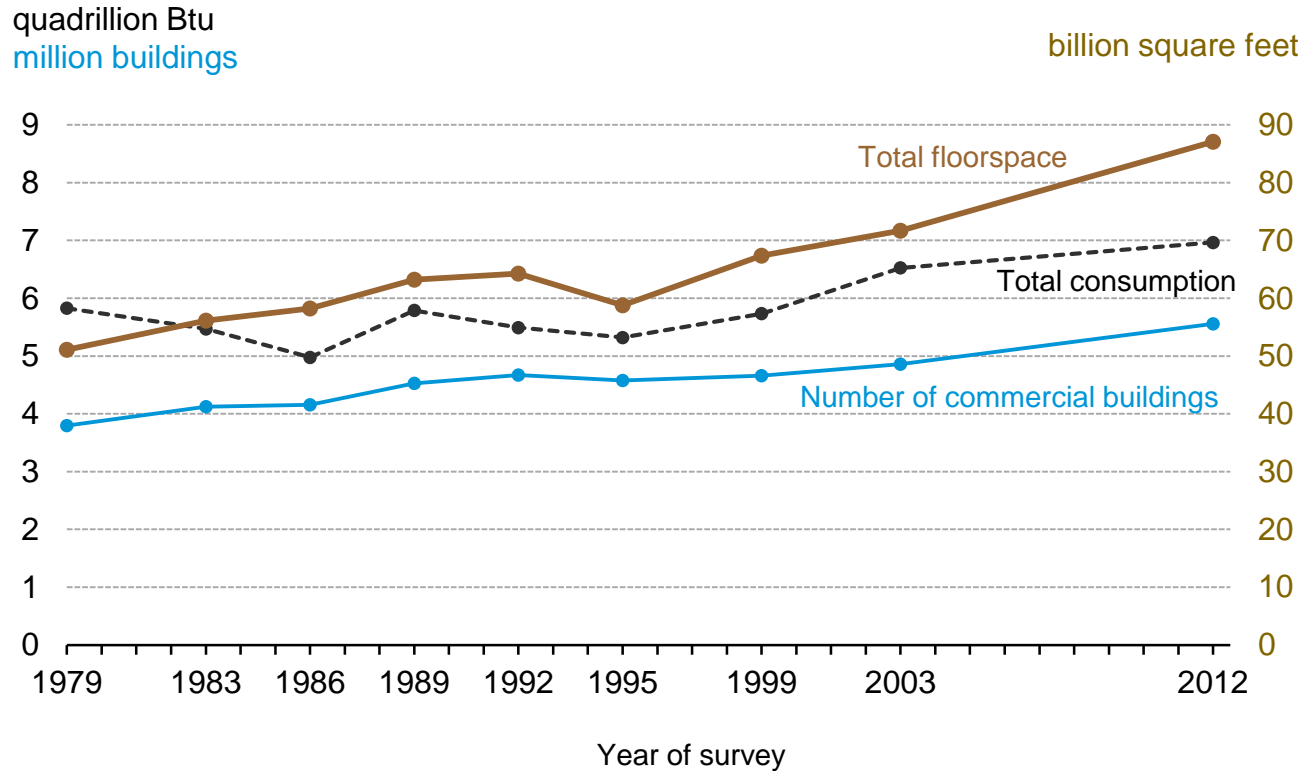
CBECS uses a two-phase interviewing process, cont.

- Phase II: Energy Suppliers Survey (ESS)

- Follow-up data collection with energy suppliers (electricity, natural gas, fuel oil, district heat) to collect monthly energy data
- Historically a mail survey; 2012 CBECS was mainly internet data collection
- Mandatory
- 2012 field period was ~8 months



Ultimate goal is to publish information on the U.S. commercial buildings stock and its energy use

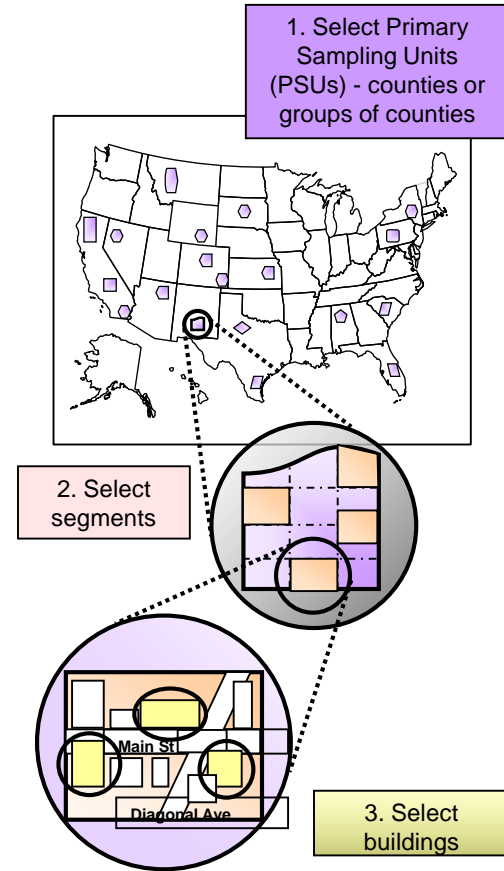


Percent change since 2003

- Number of buildings +14%
- Floorspace +22%
- Consumption +7%

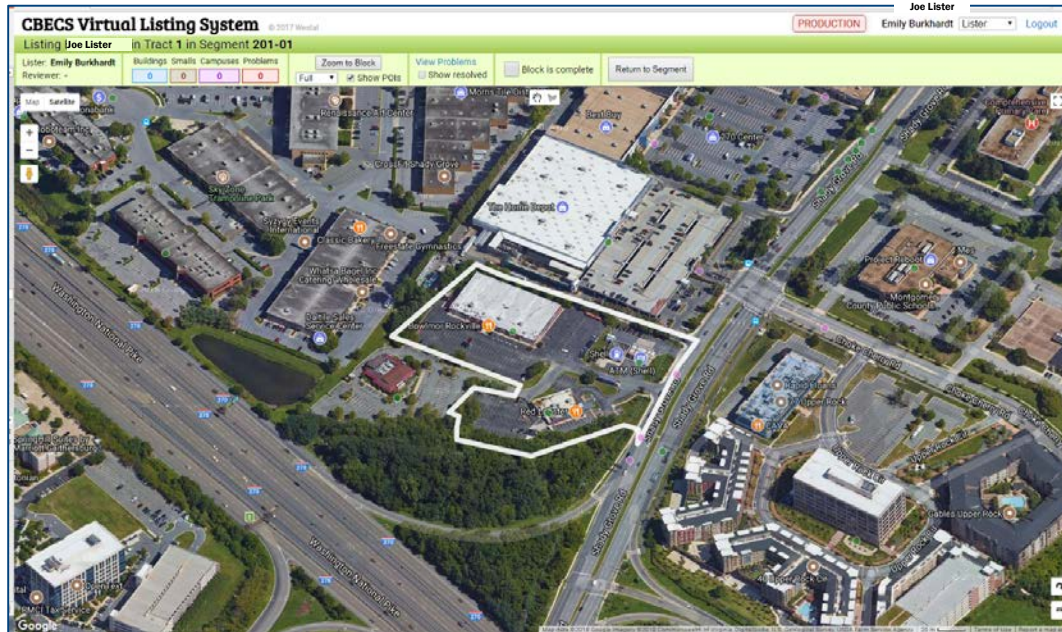
EIA builds the CBECS frame because there is no existing comprehensive list of buildings

- Area frame
 - Randomly select small, geographic areas
 - Within these areas, list and stratify all commercial buildings
 - Randomly select buildings within strata
- List frames
 - Supplemental lists ensure adequate representation of special buildings (e.g., hospitals, government buildings, college/universities, airports, or other large buildings)



What's new for the 2018 CBECS?

- *Virtual listing:* Area frame created using satellite imagery and GIS tools will replace traditional on-the-ground listing in many areas



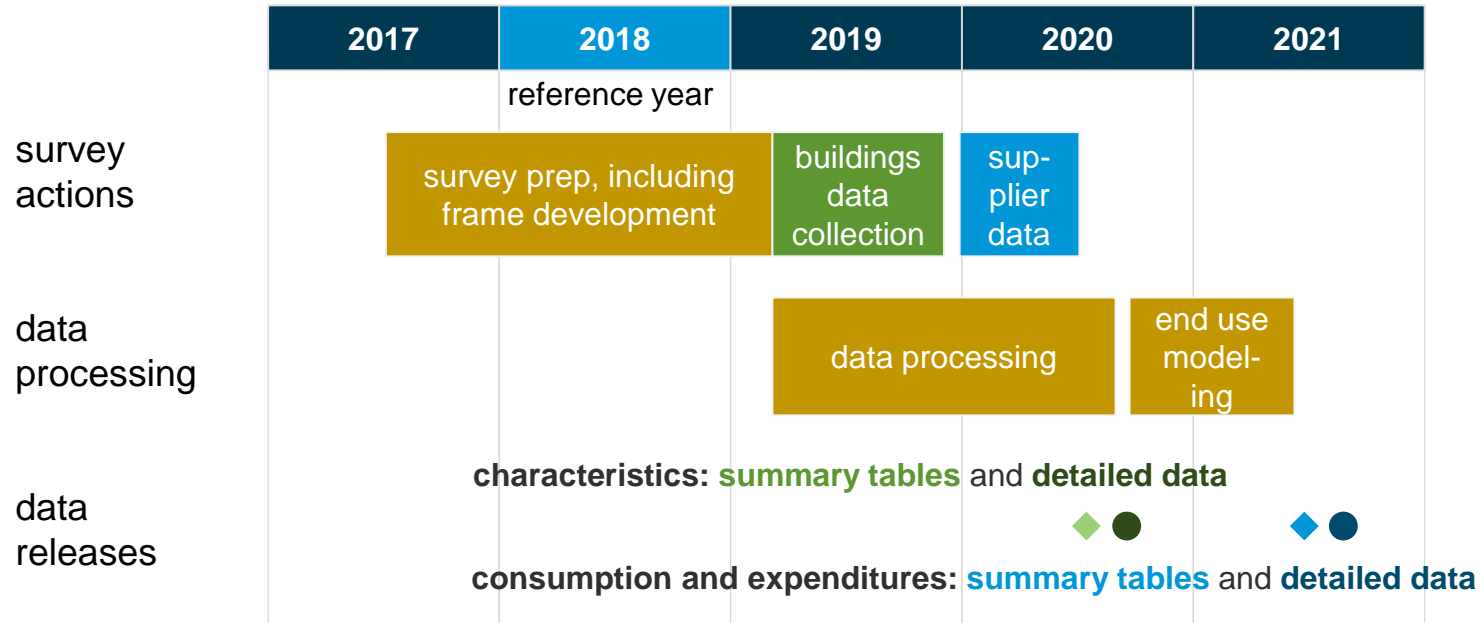
What's new for the 2018 CBECS? (cont.)

- Modernization of survey processes
 - Listing, screening, case management, etc. are being transitioned to applications on iPhones and tablets
- Option for web completion (self-administered) of the building questionnaire

Evolution of survey modes across CBECS survey years

Mode	1979	1983	1986	1989	1992	1995	1999	2003	2007	2012	2018
Paper and pencil (PAPI)	X	X	X	X	X						
Telephone (CATI)							X			X	X
In-person (CAPI)						X		X	X	X	X
Web											X

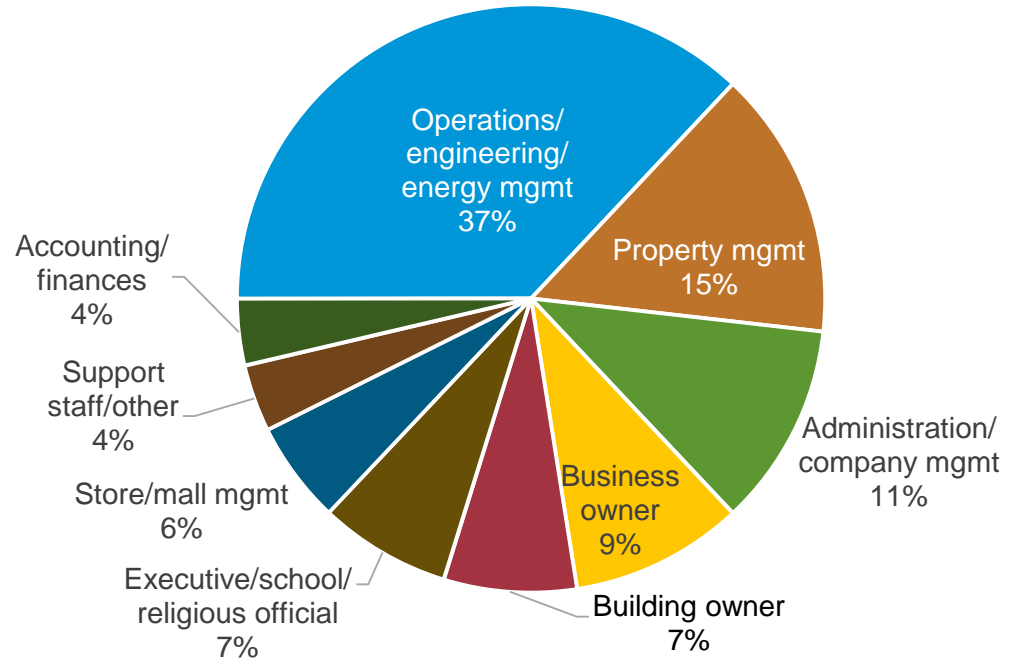
Planned timeline for the 2018 CBECS



Proposed questionnaire updates

As you review the questionnaire, keep in mind...

- CBECS respondents vary in their areas of expertise
- CBECS is administered to a respondent by *trained interviewers*; it is **not** an energy audit performed by an energy professional
- Therefore, writing CBECS questions requires a delicate balance: the questions need to be able to capture accurate, specific information *without being overly complex or technical*



2012 CBECS Respondent Roles

Building size, structural characteristics, and age

Keeping

(Question was in the 2012 CBECS and will be retained for the 2018 CBECS)

- Square footage
- Wall/roof construction materials
- Cool roof
- Roof pitch
- Building shape
- Percentage of exterior that is glass
- Number of floors, underground floors
- Floor-to-ceiling height
- Presence of an attic
- Elevators, escalators
- Year of construction
- Major recent renovations (updated reference year from 1990 to 2000: *Has any portion of this building undergone renovations since 2000?*) and what type(s)

Building size, structural characteristics, and age (cont.)



- 2012 cool roof question:

Is the roof of this building designed to reduce solar heat gain, also known as a "cool roof"?

- ◆ EXP: [Roofs with a highly reflective surface, a ballasted roof system, a vegetated roof system, or any combination of these technologies should be considered a "cool roof".]

- 1 Yes
- 2 No

- Proposed new 2018 cool roof question:

Please look at Show Card A4. Does the roof of this building have any of the following properties that allow it to reflect more sunlight or absorb less heat than a standard roof?

- ◆ ENTER all that apply

- 1 White or highly reflective coating or paint
- 2 Aluminum coating
- 3 Highly reflective tiles or shingles
- 4 Ballasted roof system
- 5 Vegetative roof
- 6 Other → [Please describe the other property of the roof of this building.]

Building size, structural characteristics, and age (cont.)

Removing	Question	Reason
<i>(Question was in the 2012 CBECS but will not be in the 2018 CBECS)</i>	Whether the square footage figures included any parking or common areas	Other editing of square footage added more value than these responses
	Whether the glass is equal on all sides of the building and, if not, whether the sides receiving direct sunlight have more or less glass than the other sides	Data quality concern

Building activity

Keeping

- Principal building activity
- Building activity subcategories (100+)
- Special measures of size (classroom seats, hospital beds, guest rooms, etc.)
- If part of a multibuilding campus/complex—campus activity, presence of central plant, central plant outputs, and whether the central plant is in the building

Adding

Number of buildings on the campus/complex

(New question for the 2018 CBECS)

Building activity (cont.)

Removing	Question	Reason
	Presence and location of open-plan office space	No indication of public use. Not published in tables or used in EIA models.
	Type of retail store	Sample sizes too small to publish results

Building ownership/occupancy, operating hours, employment

Keeping	<ul style="list-style-type: none">- Building ownership- Number of businesses- Owner occupied- Owner operator- Purchasing power- Number of months the building is in use- Percentage occupied (for office buildings, enclosed malls, outpatient health care, hotels, motels/inns, and retirement homes)- Open 24 hours a day, open on weekdays, and/or open on weekends- Weekly operating hours- Number of employees (main shift)
Adding	Number of tenants that lease space in the building

Building ownership/occupancy, operating hours, employment (cont.)

Removing	Question	Reason
	Annual number of events of public assembly buildings, annual meals served for restaurants	Few respondents were able to answer
	Seasonal use and <i>high season</i> questions	Data quality concern
	Whether fire station personnel are career or volunteer	No indication of public use. Not published in tables or used in EIA models.

Energy sources, uses, and equipment

Keeping

- Energy used for: heating, cooling, water heating, cooking, manufacturing, or electricity generation
- Energy sources used: electricity, natural gas, fuel oil/diesel/kerosene, propane/bottled gas/LPG, district steam, district hot water, district chilled water, wood, coal, solar, other
- Percentage heated and cooled
- Building automation system (BAS)
- Heating/cooling reduced during off hours and, if so, whether by programmable thermostat, manual thermostat, or shut down
- Economizer cycle, regular HVAC maintenance
- Energy sources for water heating, cooking, manufacturing
- Water heating equipment, booster water heaters
- Electricity generation technologies
- Amounts of propane and wood used (categorical)

Energy sources, uses, and equipment (cont.)

Adding

- If solar is an energy source, whether it is solar panels or solar thermal energy
- Space heating and cooling sources by equipment types (next slides)
- Which system the BAS controls (heating, cooling, lighting)
- Airflow control: whether the building has a variable air volume (VAV) system, a dedicated outdoor air system (DOAS), or demand controlled ventilation (DCV)
- “Smart” or internet-connected thermostat
- Energy sources used for each generation technology (other than solar panels or wind turbines)
- Whether any electric vehicle charging stations are associated with the building, either inside or outside
- Whether clothes dryers use natural gas (for dry cleaners/laundromats)

Energy sources, uses, and equipment (cont.)

Adding | Space heating equipment type by energy source

	EL	NG	FO	PR	ST	HW	WO	CO	OT
Furnace	X	X	X	X			X	X	X
Packaged unit	X	X		X					X
Boiler	X	X	X	X				X	X
Heat pump	X	X		X					
Individual space heater ...	X	X	X	X			X		X
Fireplace		X		X			X		
Other [specify]	X	X	X	X			X	X	X
<i>Distribution for district steam/hot water/boiler:</i>									
<i>Central air handlers</i>					X	X			
<i>Fan coil units</i>					X	X			
<i>Duct reheat coils</i>	X				X	X			
<i>Radiator</i>					X	X			
<i>Other</i>					X	X			

- Follow-ups for boiler heat distribution, heat pump heating type, percentage heated by each equipment/source combination, main equipment

Energy sources, uses, and equipment (cont.)

Adding Cooling equipment type by energy source

	EL	NG	FO	PR	ST	CW	OT
Residential-type central A/C	X						
Packaged A/C unit	X						
Central chiller	X	X	X	X	X		
Heat pump for cooling	X						
Individual room A/C	X						
Swamp cooler.....	X						
Other [specify].....	X	X	X	X	X		X
<i>Distribution for district chilled water/chiller:</i>							
<i>Fan coil units</i>						X	
<i>Central air handlers</i>						X	
<i>Chilled beam</i>						X	
<i>Other</i>						X	

- Follow-ups for chiller distribution, heat pump type, type of chiller, percentage cooled by each equipment/source combination, main equipment

Energy sources, uses, and equipment (cont.)

Removing	Question	Reason
	Type of furnace	Data quality concerns
	Type of packaged heating/cooling, packaged heating components	
	Heat pump heating/cooling system type	
	Type of individual heater	
	Heater chiller	
	Heating/cooling ventilation equipment	
	Type of economizer cycle	
	Instant hot water	
	How electricity/natural gas are purchased (local utility, independent power producer, non-local utility, broker)	
	Advanced metering infrastructure (AMI)	

Miscellaneous equipment

Keeping

- Commercial food preparation space types and square footage follow-up for some
- Activities requiring large amounts of hot water
- Linens laundered onsite
- Space in hotels/motels for conferences or social events and estimate of floorspace percentage
- Medical equipment (and numbers of X-ray, CT scan, MRI, linear accelerators)
- Percentage used for outpatient care (for inpatient health buildings)
- Operating rooms for outpatient surgery (for outpatient health bldgs)
- Laboratory equipment, machine equipment, sterilizers/autoclaves
- Indoor heated pool, indoor ice rink
- Refrigeration and/or freezer types
- Refrigeration waste heat recovery system

Miscellaneous equipment (cont.)

Keeping

- Computers, laptops, servers, multiple monitors, printers
- Separate computer areas (and square footage of data centers, trading floors)
- Interactive whiteboards, TV or video displays, cash registers, photocopiers
- Percentage lit during usual business hours and during off hours
- Lighting types(s) and percentage lit by each
- Percentage exterior lighted
- Lighted parking area, number of parking spaces
- Window glass type
- Daylighting features
- Percentage of building that receives enough outside light so the lights do not need to be turned on

Miscellaneous equipment (cont.)



Updated

Question kept from 2012 CBECS:

Is there an indoor or outdoor parking area associated with the building that is lighted with fixtures powered through the building's electrical service?

- 1 Yes
- 2 No

If Yes, the following question is proposed for the 2018 CBECS:

Is this lighted parking area part of the building, such as an indoor parking level, is it separate, such as an outdoor parking lot or parking garage, or does this building have both of these types of lighted parking areas?

- 1 Part of the building (indoor)
- 2 Outdoor parking (lot or garage)
- 3 Both indoor and outdoor parking

What is the vehicle capacity of this lighted parking area, that is, the number of parking spaces?

Miscellaneous equipment (cont.)



- Revisions to data center questions

- Quantifying the number of servers: the 2018 CBECS will give respondents the choice to provide either the number of *servers* or the number of *server racks*
- Separate computer area question now includes a category for *server closets*, to differentiate between server closets and data centers
- New question for buildings that report having a data center, to help identify false positives:

Still thinking about the data center space in this building, please look at Show Card E7. Which of these characteristics describe the data center?

◆ ENTER all that apply

- 1 Raised floor
- 2 Separate cooling system
- 3 Humidity control
- 4 Uninterruptible power supply (UPS)
- 5 Controlled access
- 6 None of these

Miscellaneous equipment (cont.)

Questions on computing and office equipment have been revised. The draft questionnaire collects the presence and number of:



- Computing equipment
 - Desktop computers
 - Laptop computers
 - Tablets (if charged in building)
 - Servers
- Other equipment
 - Large floor-standing office devices (any combination of printer/copier/scanner/FAX machine)
 - Smaller desktop office devices (any combination of printer/copier/scanner/FAX machine)
 - Interactive whiteboards
 - Televisions or video displays
 - Point-of-sales devices or cash registers

Miscellaneous equipment (cont.)

Removing	Question	Reason
	Space in fire stations for non-fire station activities, living quarters in fire stations	No indication of public use. Not published in tables or used in EIA models.
	Flat-screen monitors (presence and prevalence)	Have become ubiquitous
	Square footage of trading floors	Not publishable due to confidentiality concerns
	Standalone FAX machines	Have become rare

Energy consumption and expenditures

Keeping

- Electricity, natural gas, fuel oil, district steam and district hot water
- Annual usage from building respondents
- Annual/monthly usage from energy suppliers

Water consumption and green building certification

Removing	Question	Reason
	Total water consumed and all related questions	Low response, low quality data, no mandate to pursue from water suppliers, no funding source for additional data collection
	Green building certification	Low validity of responses from building respondents

- Green building certification information can be added using record matching.

Tenant billing and metering

- Questions added to scope the ability to collect data for a future tenant data collection, as set forth by the *Energy Efficiency Improvement Act of 2015*
- Electricity and natural gas billing arrangements and metering
 - Included in tenants' rent; tenants separately billed; or combination of these arrangements
 - Are there meters dedicated to tracking some or all of the electricity/natural gas used within individual tenant spaces? (These meters may be installed by the utility, the building's management, or someone else.)
 - If electricity metering is reported, for which uses? Lighting; Plug load; Heating; Water heating; Cooling; Data center; Other
- Access to the metered electricity/natural gas data
 - Who has access? Tenant; Landlord; Someone else

How to provide feedback

How to provide feedback

- Email your suggestions to the Survey Manager:

Joelle.Michaels@eia.gov

- Respond to the Federal Register Notice (FRN). A link to the draft questionnaires and the FRN can be found here:

<https://www.eia.gov/survey/#eia-871>