Appendix D

Comparison of CBECS, 1983 to 1992

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This appendix provides a thumbnail sketch of the CBECS[28] over surveys years, 1983, 1986, 1989 and 1992 to assist the user in interpreting the changes that have occurred in the CBECS between 1983 and 1992. This appendix is a direct result of an extensive user-needs study conducted in 1991 for the 1992 CBECS. Users commented that comparisons of CBECS reports were often difficult because of changes to the CBECS questionnaire content. This appendix facilitates the comparison of CBECS data by providing a survey-to-survey glance at energy-related building characteristics that are vital to providing data characteristics for commercial buildings in the United States.

The first survey of commercial buildings was in 1979 and resulted from public concern about foreign oil dependency during the energy crisis in the 1970's. The next commercial buildings survey was in 1983, and thereafter, the CBECS was conducted on a triennial basis. Since the 1983 CBECS was a revisit of the 1979 survey, this appendix begins with the major energy-related commercial building characteristics collected in 1983. Throughout the development of the CBECS energy policy and concerns changed; therefore, the survey of commercial buildings changed to meet these needs. Although comparisons of CBECS reports are difficult, each successive CBECS has evolved to better reflect the energy-related characteristics of U.S. commercial buildings during that survey. Many of these changes were the direct result of input from the users of the CBECS data for the user-needs study. Also, each CBECS reflects the EIA's commitment to obtain the most current energy-related characteristics for commercial buildings. Tables D1 through D5 present a comparison of how selected CBECS data were collected in 1983, 1986, 1989, and 1992. Tables D6 and D7 show new or expanded information for the 1992 CBECS.

Table D1. CBECS Survey Sample and Design, 1983 to 1992[a]

Survey Sample and Design	1983	1986	1989	1992
Sample Size (in scope)	8,479 total 6,773 from 1979 sample and updates 1,706 supplemental list sample	9,189 total 7,349 area sample 1,840 supplemental list sample	8,791 total 6,659 area sample 2,132 supplemental list sample	10,171 total 7,699 area sample 2,472 supplemental list sample Includes an oversample of 400 buildings and 150 office buildings
Target Population - Buildings	Subset of nonresidential buildings excluding buildings in which industrial or agricultural activities occupy more of the total floorspace than any other type of activity	Used primarily for commercial purpose 1,001 square feet or more Buildings 1,000 square feet or less were excluded from the published estimates.[b]	Same as 1986 Interviews were not conducted at buildings 1,000 square feet or less.	Same as 1986 Same as 1989
Target Population - Location	48 contiguous States and District of Columbia	50 States and District of Columbia	Same as 1986	Same as 1986
Data Collection Instruments	Computer Assisted Telephone Interview (CATI)	Personal interview	Same as 1986	Same as 1986
Supplemental Collections	None Collected	Census - collected data on expenditures and maintenance and repairs for construction improvement	Census - same as 1986 EPA - collected data on asbestos EIA - conducted a Facility Survey	Census - same as 1986

[a]For a discussion on the 1992 CBECS sample design, see Appendix B, How the Survey was Conducted.

[b]For a detailed discussion of the scope of the 1986 publication, see the *1986 Commercial Buildings Consumption and Expenditures*, DOE/EIA-0318(86), Energy Information Administration (Washington, DC: Government Printing Office, May 1989).

Source: Energy Information Administration, Office of Energy Markets and End Use, 1983, 1986, 1989, and 1992 Commercial Buildings Energy Consumption Surveys.

[28] Previous surveys were conducted in 1979, 1983, and 1986 under the name Nonresidential Buildings Energy Consumption Survey (NBECS); for consistency, all surveys will be referred to as CBECS in this appendix as well as throughout this report.

Building structure characteristics, such as, year constructed and building activity, and building use characteristics like ownership, hours of operation, and number of employees are all related to a commercial buildings energy consumption. Table D2 shows how the building's characteristics are updated in successive CBECS questionnaires to reflect changes in energy-related interests. The major energy-related commercial building characteristics are square footage, year constructed, and principal building activity. Since the number of occupants (establishments) and the building's operating hours are major contributing factors to energy consumption in commercial buildings, the questionnaire items that measure these characteristics are constantly being updated to reflect the changes in the commercial sector.

Table D2. Comparison of Building Use and Structure Characteristics, 1983 to 1992

Building Characteristics 1983 Baseline	1986	1989	1992
Principal Building Activity Categories			
Only asked of respondent Categories: 1. Assembly 2. Education 3. Food Sales/Service 4. Health Care 5. Lodging 6. Mercantile/Service 7. Office 8. Residential 9. Warehouse 10. Other 11. Vacant	Asked of respondent **and** interviewer observation; Categories: 1. Assembly 2. Education 3. Food Sales 4. Food Service 5. Health Care 6. Lodging - includes Skilled Nursing 7. Mercantile/Service 8. Office 9. Public Order and Safety 10. Warehouse 11. Other 12. Vacant	Same as 1986 Categories: 1. Assembly 2. Education 3. Food Sales 4. Food Services 5. Health Care 6. Lodging - includes Skilled Nursing 7. Mercantile/Service 8. Office 9. Parking Garage 10. Public Order and Safety 11. Warehouse 12. Other 13. Vacant	Same as 1986 Categories: 1. Education 2. Food Sales 3. Food Service 4. Health Care 5. Lodging - includes Skilled Nursing 6. Mercantile/Service 7. Office 8. Parking Garage 9. Public Assembly 10. Public Order and Safety 11. Religious Worship 12. Warehouse and Storage 13. Other 14. Vacant
Floorspace			
Actual square footage OR Square footage categories: 5,000 or Less 5,001 to 10,000 10,001 to 25,000 25,001 to 50,000 50,001 to 100,000 100,001 to 200,000 Over 200,000	Actual square footage OR Square footage categories: 5,000 or Less 5,001 to 10,000 10,001 to 25,000 25,001 to 50,000 50,001 to 100,000 100,001 to 200,000 200,001 to 500,000 Over 500,000	Actual square footage OR Square footage categories: 1,001 to 5,000 5,001 to 10,000 10,001 to 25,000 25,001 to 50,000 50,001 to 100,000 100,001 to 200,000 200,001 to 500,000 Over 500,000	Actual square footage OR Same categories as 1989.
Year Constructed			
Actual year constructed OR Year constructed categories: 1900 or Before 1901-1920 1921-1945 1946-1960 1961-1970 1971-1973 1974-1979 1980-1983	Actual year constructed OR Year constructed categories: 1900 or Before 1901-1920 1921-1945 1946-1960 1961-1970 1971-1973 1974-1979 1980-1983 1984-1986	Actual year constructed OR **Different categories:** 1899 or before 1900-1919 1920-1945 1946-1959 1960-1969 1970-1979 1980-1983 1984-1986 1987-1989	Actual year constructed OR Year constructed categories: 1899 or before 1900-1919 1920-1945 1946-1959 1960-1969 1970-1979 1980-1989 1990-1992

See footnotes at end of table.

Table D2. Comparison of Building Use and Structure Characteristics, 1983 to 1992 (Continued)

Building Characteristics - - 1983 Baseline	1986	1989	1992
Ownership/Occupancy			
Occupancy by an agency of the Federal, State, or local governments	Occupant of the building is the buildings' owner or the owner's business	Occupancy question expanded to include more ways establishments and businesses can occupy a building	1989 occupancy question and a new occupancy question collects: Federal government, State government, local government, private utility, or church
Ownership by an agency of the Federal, State, or local governments	Ownership by Federal, State, and/or local governments (yes, no for each)	Ownership by a government agency. If yes, choose only one; Federal, State, or local agency	Ownership by: Federal government, State government, local government, private utility, or church
Hours of Operation			
Number of hours building is "in operation" each day of the week for any activity	Number of usual operating hours for weekdays, Saturday, Sunday, and holidays when at least 50% of the building's floorspace was in full use OR Open 24 hours or not open	Number of usual operating hours for weekdays, Saturday, Sunday (does not ask for holidays) during the months the building is in use OR Open 24 hours or not open OR Hours vary	Number of normal operating hours for each day of the week (similar to 1983) when the building is in use OR Open 24 hours, not open, or hours vary by day OR Hours vary by season
Number of Employees			
Number of workers in the building (for a typical workday most of the year)	Number of workers in the building "most of the year?" (for all shifts on a typical workday during the year)	Number of workers in the building during the "main shift" during the months the building is in use (for main shift on a typical workday during the year)	Number of workers during the "main shift" when the building is use AND Number of workers across all shifts when the building is in use
Number of Floors			
Number of floors in the tallest section; includes basement, floors in parking garage and below ground level	Same as 1983.	Same as 1983.	Same as 1983 and a separate question collected number of floors below ground level
Predominant Exterior Wall Material Categories			
Not Collected	(Includes Frame) Masonry Over Wood Frame Masonry Frame Steel Frame Siding Over Wood Frame Masonry Frame Metal Panels Concrete Panels	Masonry Siding or Shingles Metal Panels Concrete Panels Window Glass	Same as 1989.
Predominant Roof Material Categories			
Not Collected	(Includes Surface Area) Built-Up Shingles (not wood) Metal Surfacing Synthetic or Rubber Slate or Tile Wood Shingles, Shakes or Other Wooden Materials	Built-Up Shingles (not wood) Metal Surfacing Synthetic or Rubber Slate or Tile Concrete Wooden Materials	Built-Up Shingles (not wood) Metal Surfacing Synthetic or Rubber Slate or Tile Concrete

Source: Energy Information Administration, Office of Energy Markets and End Use, 1983, 1986, 1989, and 1992 Commercial Buildings Energy Consumption Surveys.

One of the major objectives of CBECS is to collect information on the type of energy that is used in the commercial sector and the use of that energy. To meet this objective, CBECS has consistently collected data about the major energy sources and also about renewable energy sources. Very few buildings reported having a secondary water-heating fuel in the 1986 CBECS; therefore, the 1992 CBECS (as well as the 1989 CBECS) did not distinguish between primary and secondary water heating.

Table D3. Comparison of Energy Sources and End Uses, 1983 to 1992

Energy Sources and End Uses - 1983 Baseline	1986	1989	1992
Energy Source Categories			

Electricity
Natural Gas
Fuel Oil/Kerosene
Purchased Steam
Propane
Other
  Purchased Chilled Water
  Coal
  Purchased Hot Water
  Wood
  Solar
	Electricity
	Natural Gas
	Fuel Oil/Kerosene/Diesel
	District Steam or Hot Water
	District Chilled Water
	Propane
	Minor Fuels
	  Coal
	  LPG or Bottled Gas
	  Wood
	  Solar
		Electricity
		Natural Gas
		Fuel Oil/Diesel/Kerosene
		Bottled Gas/LPG/Propane
		District Heat
		District Chilled Water
		Other
		  Wood
		  Coal
		  Active Solar with Collector Panels
			Electricity
			Natural Gas
			Fuel Oil/Diesel/Kerosene
			Bottled Gas/LPG/Propane
			District Heat
			District Chilled Water
			Other
			  District Hot Water
			  Wood
			  Coal
			  Photovoltaic Cells (PVCs) that convert sunlight directly into energy
			  Solar thermal panels that use sunlight to heat fluids

End Use Categories			

Heating
Air Conditioning for Cooling
Water Heating
Cooking
Manufacturing
Electricity Generation
	Space Heating
	  Primary
	  Secondary
	Air conditioning for Cooling
	Water Heating
	  Primary
	  Secondary
	Cooking
	Manufacturing
	Electricity Generation
		Heating
		  Main
		  Secondary or Backup
		Air Conditioning for Cooling
		Water Heating
		Cooking
		Manufacturing
		Electricity Generation
			Heating
			  Main
			  Any Other
			Air Conditioning for Cooling
			Water Heating
			Cooking
			Manufacturing
			Electricity Generation

Source: Energy Information Administration, Office of Energy Markets and End Use, 1983, 1986, 1989, and 1992 Commercial Buildings Energy Consumption Surveys.

In the 1983 CBECS, several separate questions obtained the data for the heating equipment, heating distribution systems, and cooling equipment in the building. Beginning with the 1986 CBECS, the format was changed to group several categories under a single question. The 1986 CBECS grouped the heating and cooling equipment together; the 1989 CBECS grouped the heating equipment and heating distribution systems together and the cooling equipment and cooling distribution systems together; and the 1992 CBECS linked the equipment and the distribution systems in matrix form. Self-contained units usually serve more than one room and contain both heating equipment and fans. Although the 1983 CBECS collected these specifically as self-contained units, later CBECS defined these as packaged heating units. In 1989, heating panels were no longer a separate distribution category; instead, they were included in the individual space heaters category. In 1992, the category for evaporative coolers (swamp coolers) was collected after a 6-year hiatus.

Table D4. Comparison of Selected Equipment and Equipment-Related Practices, 1983 to 1992

Heating/Cooling - 1983 Baseline	1986	1989	1992
Heating Equipment Categories			
Furnaces/Boilers (inside/outside) Self-Contained Units Heat Pumps Passive Solar Heating	Boilers (inside) Warm-Air Furnaces Individual Space Heaters or Electric Baseboards Packaged Heating Units Air Source Heat Pump Receives District Heat	Boilers (inside) Furnaces Individual Space Heaters Packaged Heating Units Heat Pumps	Heat Pumps Furnaces Individual Space Heaters District Steam or Hot Water Boilers Packaged Heating Units
Cooling Equipment Categories			
Window Units Wall Units Central Systems Heat Pumps Well Water for Cooling	Central Cooling (chillers) Individual Air Conditioners (A/C) Packaged A/C Units Air Source Heat Pumps Receives District Chilled Water Swamp Coolers (Evaporative Coolers)	Central Cooling Individual A/C Packaged A/C Units Heat Pump for Cooling	Residential Type A/C Heat Pumps Individual Room A/C District Chilled Water Central Chillers Packaged A/C Units Swamp Coolers (Evaporative Coolers)
Heating Distribution/Circulation Categories			

Air Forced through Ducts
Baseboards
  Electric
  Hot Water
  Steam
Radiators/Convectors/Heating Panels in Wall/Floor/Ceiling
	Ducted-Forced Air
	  Heating Only
	  Heating and Cooling
	  Variable Air-Volume System Used
	Steam Radiators or Baseboards
	Hot Water Radiators or Baseboards
	Fan-Coil Units
	  Heating Only
	  Heating and Cooling
	Heating Panels
		Air Ducts
		Heating or Reheating Coils
		Fan-Coil Units
		Steam or Hot Water Radiators or Baseboards
			Radiators or Baseboards
			  Ducts for Heating
			  Heating Only
			  Heating and Cooling
			  Variable Air-Volume System Used
			  Fan-Coil Units for Heating
			  Heating Only
			  Heating and Cooling
			Individual Space Heaters

Percent of Floorspace Heated			
Percentage of total heated floorspace	Percentage total floorspace heated to at least 50 degrees Fahrenheit	Same as 1986.	Same as 1986
Percent of Floorspace Cooled			
Percentage of the total square footage cooled	Same as 1983.	Percentage total floorspace cooled by air conditioning equipment	Same as 1989.
Lighting Equipment			

Not Collected	Types of bulbs and percent of floorspace lit by:
	  Standard Fluorescent
	  Energy Efficient Fluorescent
	  Standard Incandescent
	  Fluorescent
	  Energy Efficient Incandescent
	  High-Intensity Discharge
		Types of Bulbs and Percent of Floorspace lit by:
		  Incandescent
		  Fluorescent
		  High-Intensity Discharge
			Types of Bulbs and Percent of Floorspace lit by:
			  Incandescent
			  Fluorescent other than Compact Fluorescent
			  Compact Fluorescent
			  High-Intensity Discharge

Equipment Related Practices			
Heating/cooling reduced during off-hours	Same as 1983.	Same as 1983.	Heating/Cooling, Hot Water and Lighting reduced during off hours

Source: Energy Information Administration, Office of Energy Markets and End Use, 1983, 1986, 1989, and 1992 Commercial Buildings Energy Consumption Surveys.

Conservation and energy management has become an increasingly important CBECS issue. Because energy-efficient equipment is critical to increased conservation in commercial buildings, the 1992 CBECS included more questions on lighting equipment and HVAC systems.

Table D5. Comparison of Selected Conservation Measures, 1983 to 1992

Conservation Measures - Baseline 1983	1986	1989	1992
Lighting			
Not Collected	Percent of floorspace lit: During operating hours During off hours Presence of: High-Efficiency Ballasts Daylighting Controls Occupancy Sensors/Timed Switches/Time Clocks "Delamping" program	Same as 1986 Presence of: High-Efficiency Ballasts	Same as 1986 Use of: Specular Reflectors Daylighting Controls Occupancy Sensors Time Clocks/Timed Switches Manual Dimmer Switches
Insulation and Weatherstripping Categories			
Roof or Ceiling Insulation Wall Insulation Tinted, reflective, insulated, or thermal pane (special glass) Presence of insulation, insulation added recently, more insulation to be added	Roof or Ceiling Insulation Wall Insulation Storm or Multiple Glazing Tinted, Reflective or Shading Glass or Film Exterior or Interior Shadings or Awnings Weatherstripping or Caulking Same as 1983	Same as 1986 Installed during building construction or added afterwards and when was feature added	Same as 1989 except deletes weatherstripping or caulking
Percent of Exterior Window Glass Categories			
Less than 25 25 to 49 50 to 74 75 or more	25 or Less 26 to 50 51 to 75 Over 75	Not Collected	25 or Less 26 to 50 51 to 75 76 to 100
Energy Audit			
Energy audit conducted in the past year? If yes, was the auditor a private contractor or a utility professional. Measures were taken in response to energy audit. Insulation added as a result of energy audit. If so, was cost savings a reason for addition.	Energy audit ever conducted? If yes, the year. If the year was 1986, the month.	Not Collected	Energy audit conducted since December 31, 1986? If yes, was the sponsor the government, utility or sponsored in-house.
Energy Management and Control System			
Heating or cooling system monitored or controlled by a computerized building automation system	Presence of a Computerized Energy Management and Control System	Energy Management and Control System for: Lighting Heating and Cooling	Energy Management and Control System for: Lighting Heating Cooling Domestic Hot Water
Maintenance and Control of Heating and Cooling			
Regular maintenance at least once a year Heating and/or Cooling Monitored or Controlled by Employee	Same as 1983. Same as 1983.	Regular maintenance program as of July 1989. Same as 1983; if yes, "with thermostat?"	Regularly scheduled maintenance and repair program Not Collected
Heating, Ventilation, and Air Conditioning			
Not Collected	Variable Air-Volume System Waste Heat Recovery	Not Collected	Variable Air-Volume System Economizer Cycle

Source: Energy Information Administration, Office of Energy Markets and End Use, 1983, 1986, 1989, and 1992 Commercial Buildings Energy Consumption Surveys.

In the 1992 CBECS, both new and expanded data on energy-related characteristics were collected on: lighting, equipment (personal computers, refrigeration, and water-heating), building shape, energy-related space functions, Demand-Side Management (DSM) participation, and gas transported for the account of others.[29] Questions were added on gas transported for the account of others (transported gas) to explain some of the differences between supply data and consumption data. Collecting information on the person with the day-to-day responsibility for the heating and cooling system was intended to obtain information about the types of buildings that used a building energy manager. These data are reported in Appendix A, "Detailed Tables," under the row category "Energy Management Practices." (For detailed information on the new or expanded energy-related characteristics, see Appendix B, "How the Survey Was Conducted," and *User-Needs for the 1992 Commercial Buildings Energy Consumption Survey* (DOE/EIA-0555(92)/4, September 1992)).

Table D6. New Energy-Related Building Characteristics, 1992

New Energy-Related Characteristics			
Demand-Side Management (DSM)	**Day-to-Day Responsibility**	**Energy-Related Space Functions**	**Principal Facility Activity**
Type of DSM Program Sponsor of Program Type of Assistance	Building Owner/Manager Custodian or Maintenance Engineer Dedicated Building Energy Manager Cleaning or Maintenance Contractor Repair Service Called	Commercial Food Preparation Computer Room Rooms with Special Ventilation Activities with Large Amounts of Hot Water	Collected to provide finer breakdown for buildings on a multibuilding facility
Water-Heating Equipment	**Additional Operating Hours for Equipment**	**Gas Transported for the Account of Others**	**Number of Personal Computers/ Computer Terminals**
Centralized System Self-Heating Tank Heated by Space Equipment Decentralized Residential-Type Storage Tank Instantaneous Heater	Number of additional operating hours when heating and/or cooling or lighting are in use	Purchase of gas transported for the account of others, Supplier of gas, Costs of gas (Previously collected on the 1989 CBECS Supplier Survey)	Collects ranges that match the ranges for the number of employees to allow the data user to calculate the approximate ratio of equipment to worker

Source: Energy Information Administration, Office of Energy Markets and End Use, 1992 Commercial Buildings Energy Consumption Survey.

Table D7. Expanded Energy-Related Building Characteristics, 1992

Expanded Energy-Related Characteristics			
Special Energy Technologies	**Refrigeration**	**Heating, Ventilation, and Cooling**	**Lighting Conservation Features**
1992 Categories: thermal energy storage (TES) passive solar geothermal energy well water cooling waste incineration to produce energy wind generation	1992 collects how many cases or cabinets are "open" and "closed" and the approximate linear feet of these cases or cabinets	1992 collects description of overall heating and cooling system Collects the percent of floorspace heated/cooled by equipment types Links the distribution system to the equipment	1992 collects percent of floorspace lit by: Specular Reflectors Natural Lighting Controls Occupancy Sensors Time Clocks/Switches Manual Dimmer Switches
Similar categories first introduced in the 1983 CBECS	Limited refrigeration information collected in 1989	Similar characteristics collected in 1983 CBECS	Limited information collected in the 1983 survey and modified

Source: Energy Information Administration, Office of Energy Markets and End Use, 1992 Commercial Buildings Energy Consumption Survey.

[29]The companion volume, *Commercial Buildings Energy Consumption and Expenditures 1992* will contain data about gas transported for the account of others.