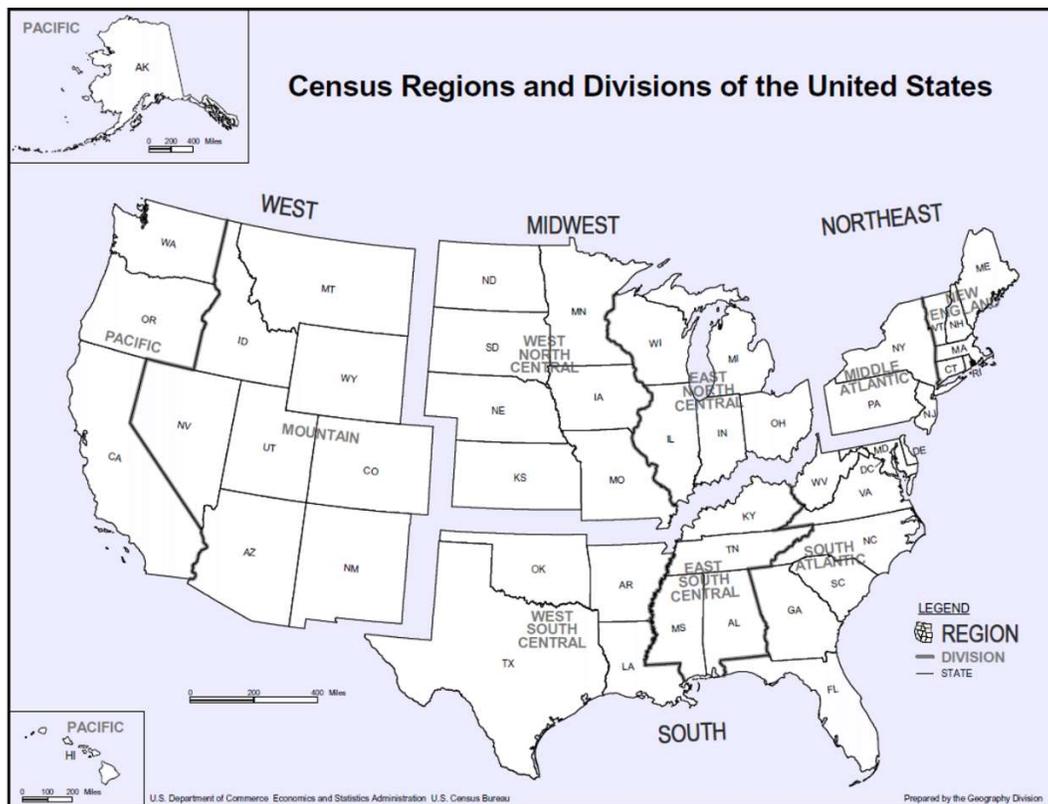


Regional Comparison of CBECS 2012 and SEDS Energies

Michael MacDonald
 Energy Performance Measurement Institute (EPMI)
 November 2020

This brief technical note compares Census division breakouts of total commercial sector delivered energy (no losses for generation or delivery) and total delivered electricity for two Energy Information Administration (EIA) datasets,¹ CBECS and SEDS, for the year 2012, the latest available year for CBECS energy data.

Census division is the smallest geographical breakout for CBECS data. SEDS data is available for each state, so the comparison is based on summing SEDS data to the level of Census division. The map below shows the division and regional makeup (regions are larger).



¹ CBECS, Commercial Buildings Energy Consumption Survey, <https://www.eia.gov/consumption/commercial/> — SEDS, The State Energy Data System, <https://www.eia.gov/state/seds/>

CBECS Energy

CBECS focuses on obtaining fairly detailed data on buildings in the commercial sector. With the large diversity of commercial buildings, this detail has been important for developing a better understanding of energy use in this sector. Although the detail is valuable, there are limitations to the CBECS results. The first limitation is that buildings less than 1,000 square feet in size are not covered, and the second limitation is that some fuels are not used as much and are harder to handle well in a sample of a few thousand buildings that represent the entire country.

In addition to these limitations, there is difficulty in dealing with large campuses — including federal government sites that have many buildings. Large campuses overall, including laboratory, corporate, health care, and educational sites, are difficult to handle well with the individual building as the survey target. CBECS has improved over the years to better handle the limitations, but complete coverage is difficult.

Data from other sources (including the “first” CBECS, or NBECS, data) indicate that buildings less than 1,000 sq ft account for about 2% of total energy use (although 15% or more of total buildings). In addition, the large campus issue also impacts fuel coverage to a degree. District heating systems energy is covered by CBECS, but measurement of district heating energy use can also be challenging, especially on large campuses with no building-level meters. District cooling systems are also challenging, and district cooling energy is not handled directly by CBECS. CBECS also does not estimate propane consumption directly, but EPMI has estimated that commercial sector propane use accounts for less than 0.1% of total delivered energy.

For the 2012 CBECS data, the delivered energy total is 84% of the SEDS total, which is much closer than the 1995 survey, which was 72%.

SEDS Data

SEDS is the EIA’s comprehensive repository of US state-level energy statistics, providing a time series of prices, energy production, consumption, and expenditures for the whole country and by state that are defined as consistently as possible over time and across sectors for analysis and forecasting purposes.

Some SEDS data are obtained directly from surveys conducted by EIA, but many data are estimated using other available information. SEDS focuses on covering energy use in total, which is challenging given the wide array of energy sources and means of distribution.

For the commercial sector, SEDS tracks fuel types as: coal, natural gas, five types of petroleum products, biomass, geothermal energy, and electricity. Hydroelectric power is a tabulated category, but direct use in commercial buildings is estimated to be so small as to be almost negligible nationally.

Comparison of Regional Delivered Energy and Electricity Use

A simple comparison of Census division totals of these two quantities is presented to indicate potential coverage issues for CBECS data.² The national CBECS total for delivered energy is 84% of the SEDS total for the year 2012, but the regional percentages range from 65% to 97%. For electricity, the CBECS national total is 94% of the SEDS total, but regional values calculate to be 71–112% of SEDS values.

² More extensive comparison of CBECS and SEDS can be found in: *Understanding Commercial and Service Sector Energy Use*, EPMI 2016. <https://epminst.us/commercial/Understanding%20commercial%20and%20service%20sector%20energy%20use.pdf>

The published tabular data for total delivered energy for CBECS is in Trillion Btu, but will be presented here in quads (quadrillion Btu, or 1,000 Trillion Btu). Conversely, CBECS published data for electricity are in Tera-Watt-h (TWh, billion kWh), but the microdata sums for each region will be presented instead in GWh (million kWh).

Compare US 2012 commercial delivered energy			
Census division	CBECS quads	CBECS % of SEDS	SEDS quads
New England	0.368	97%	0.380
Middle Atlantic	1.092	85%	1.279
East North Central	1.131	84%	1.347
West North Central	0.435	65%	0.664
South Atlantic	1.358	89%	1.518
East South Central	0.369	85%	0.433
West South Central	0.839	86%	0.973
Mountain	0.417	70%	0.596
Pacific	0.954	90%	1.060
US	6.963	84%	8.250

An examination of large federal complexes might provide some insight into these variations, but that was not attempted here. The variations for electricity, shown next, indicate that something more involved appears to be affecting the differences. Survey sampling issues and difficulty of coverage for less populated regions may be part of the cause.

Compare US 2012 commercial electricity use			
Census division	CBECS GWh	CBECS % of SEDS	SEDS GWh
New England	50,435	112%	44,864
Middle Atlantic	169,772	108%	157,278
East North Central	174,291	95%	183,333
West North Central	74,930	75%	99,544
South Atlantic	286,511	94%	303,320
East South Central	70,698	86%	82,290
West South Central	172,937	91%	189,413
Mountain	67,084	71%	94,114
Pacific	175,934	102%	172,949
US	1,242,592	94%	1,327,101

Conclusion

Continued comparison over several years of CBECS and SEDS data raises questions about reasonableness of some CBECS data. While the value of the detailed data is very high for many policy and building professional needs, the overall consistency at the geographical level appears problematic from this simple comparison. EPMI will continue to examine data sources considered useful for developing energy performance methods and metrics, and present potential issues found.