

U.S. Manufacturing Energy Consumption and Efficiency



For:

APEC-IEA Training Workshop on Energy Efficiency Indicators

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By:

Ian Mead, Director of Energy Demand and Integrated Statistics

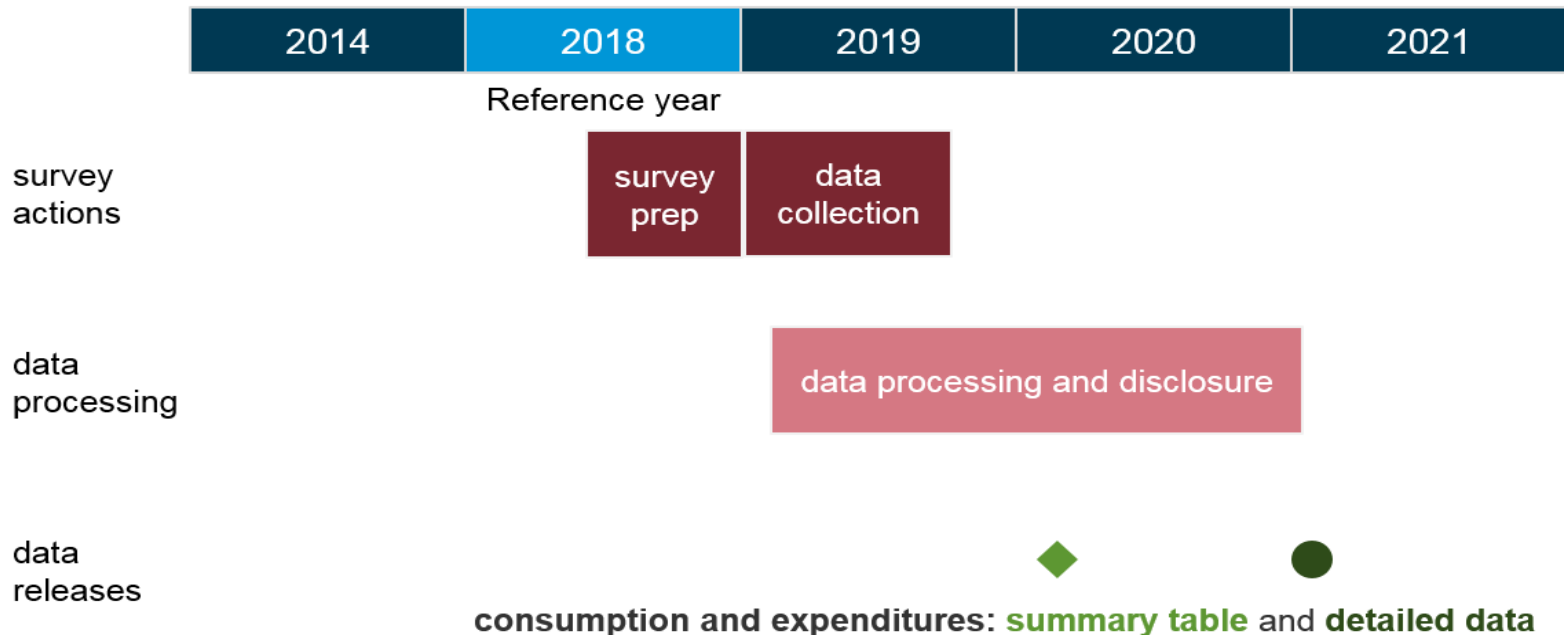
U.S. Energy Information Administration

Major consumption surveys serve as underlying benchmark for energy consumption and efficiency measures

- EIA's consumption survey consist of three separate collection programs
 - Commercial Building Energy Consumption Survey (CBECS)
 - Manufacturing Energy Consumption Survey (MECS)
 - Residential Energy Consumption Survey (RECS)
- Focus of talk is on intensity for manufacturing industries
 - Intensity often serves as a good proxy for efficiency
 - U.S. manufacturing's energy use is large relative to others sectors
 - Recently released a more detailed set of 2018 MECS statistics

EIA's consumption surveys are complex, long-term efforts

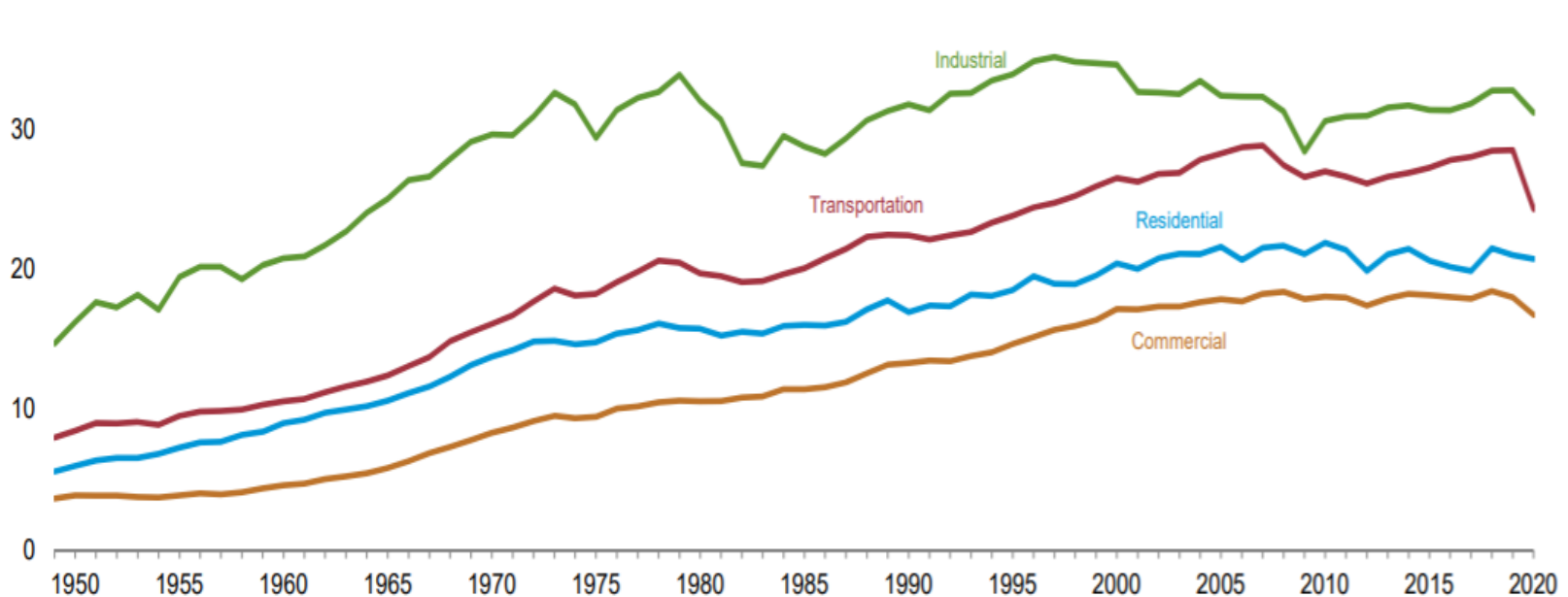
Timeline of EIA's 2018 Manufacturing Energy Consumption Survey



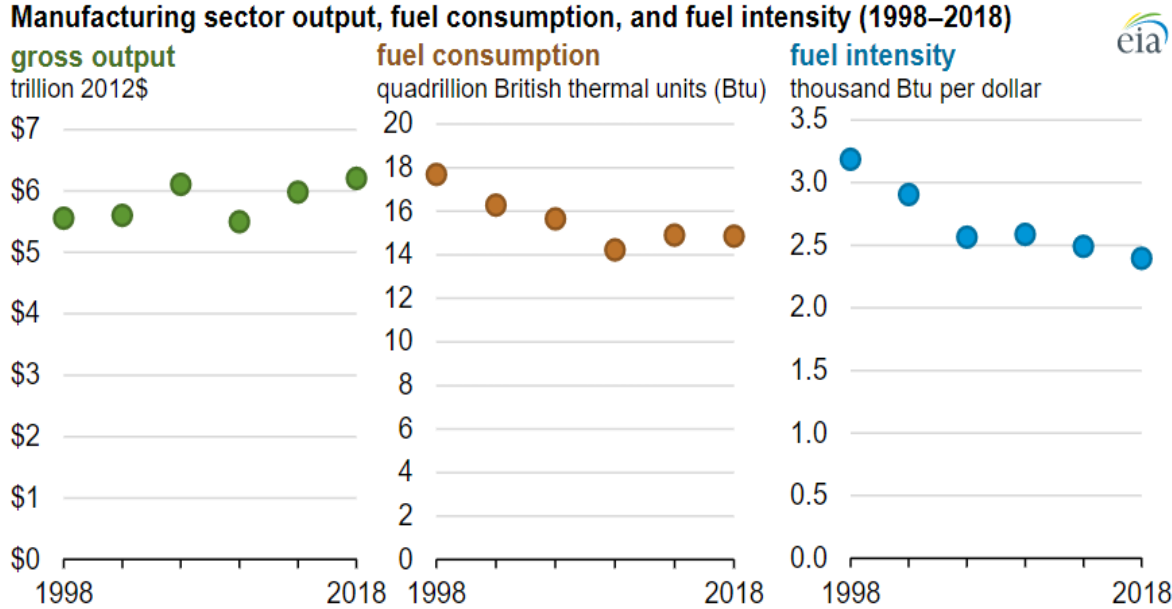
Industry is the largest U.S. energy consumer with manufacturing making up about three-quarters of the total

Total Consumption by End-Use Sector, 1949–2020

quadrillion Btu



MECS Measures Improvements in Manufacturing Efficiency

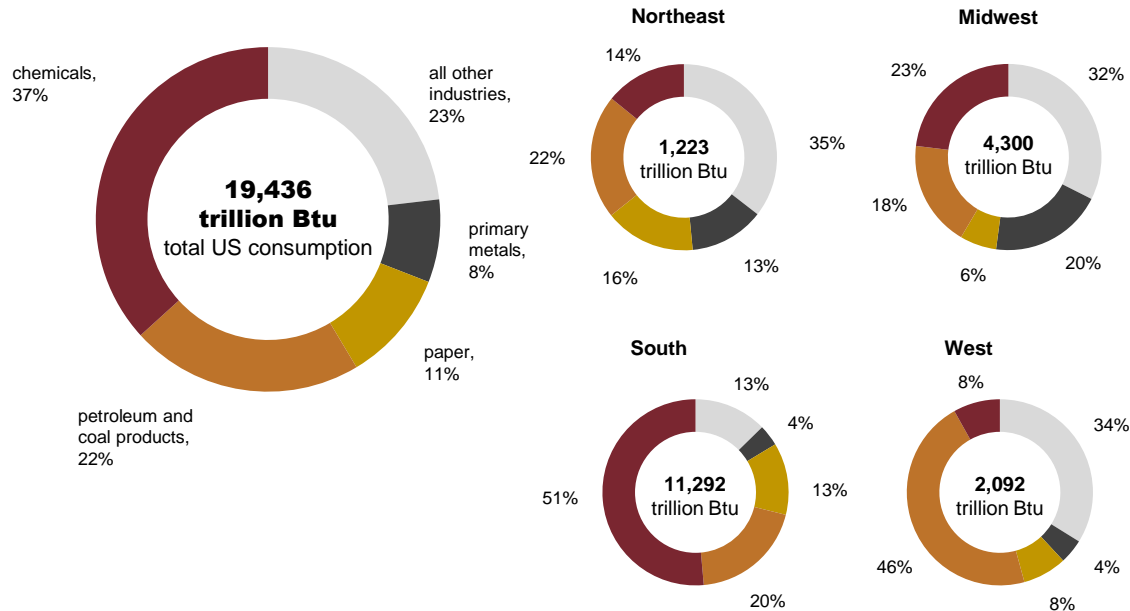


Source: U.S. Energy Information Administration, *Manufacturing Energy Consumption Survey*; Bureau of Economic Analysis, *Industry Economic Account Data: GDP by Industry*

- Gross output has increased since 1998 levels, but fuel consumption and total manufacturing employment have decreased. Between 1998 and 2018, manufacturing gross output grew by 12%, while fuel consumption decreased by 16%.
- Manufacturing fuel intensity—measured as fuel consumption divided by gross output—decreased by 25%. This decrease in fuel intensity suggests technological advancement, deployment of new efficient equipment, and changes in what is being manufactured in the U.S.

Four U.S. industries account for most of manufacturing consumption

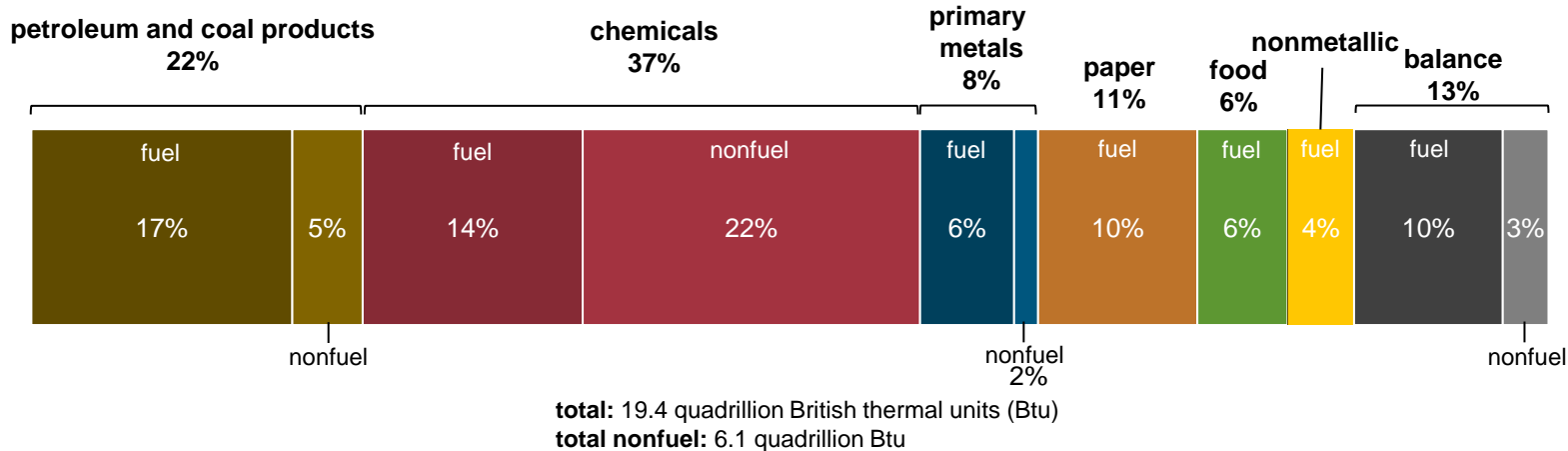
Proportion of total consumption by industry and region percentage



- The chemical, petroleum and coal products, paper, and primary metals industries make up 77% of manufacturing energy consumption.
- Manufacturing consumption is greatest in the South, and chemical manufacturing accounts for more than half (51%) of its energy consumption.

Nonfuel consumption is dominant in the U.S. chemicals industry

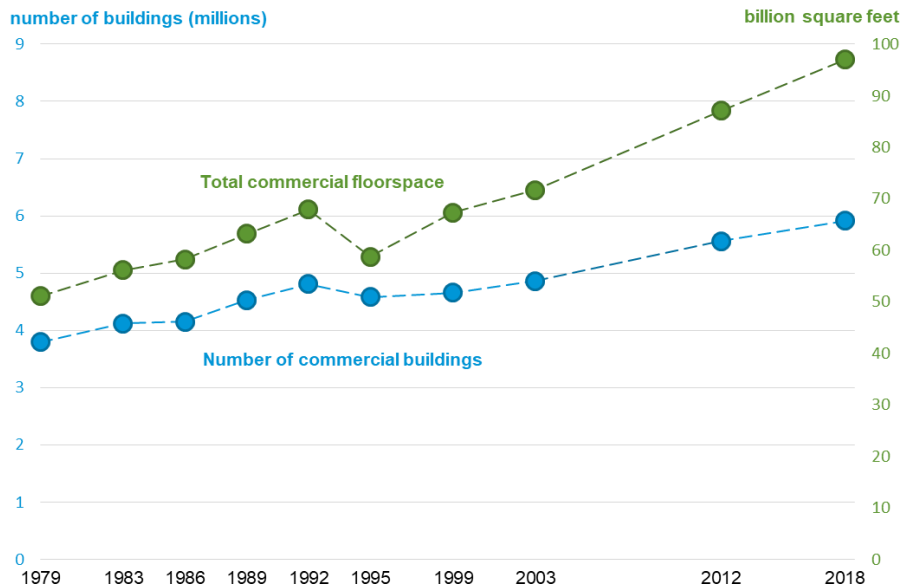
Manufacturing energy fuel and nonfuel (feedstock) consumption by industry, 2018
percentage



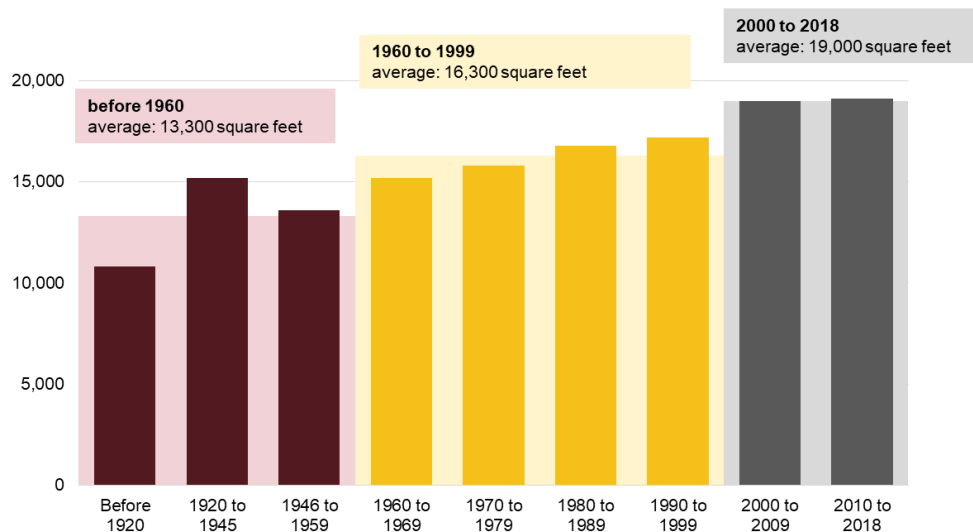
- Petroleum and coal products, chemicals, and primary metals account for more than 90% of feedstock use in manufacturing.
- Petroleum and coal products, chemicals, primary metals, paper, and food account for more than 84% of fuel used in manufacturing.

U.S. commercial buildings have become larger over the last 20 years

Number of commercial buildings and floorspace
number of buildings (millions) and billion square feet



Average building size by year of construction
square feet



U.S. homes built after 2000 are larger than those built in the 1960s with the same energy use

Average household site consumption by year built, 2015

million Btu per household

100

80

60

40

20

0

square feet per home

2,500

2,000

1,500

1,000

500

0

Before
1950

1950
to 1959

1960
to 1969

1970
to 1979

1980
to 1989

1990
to 1999

2000
to 2015

year home built

1,874

2,346

Source: EIA, 2015 Residential Energy Consumption Survey

Main takeaways

- Efficiency measures are often based on large, detailed consumption surveys
- Alternative measures often used for non-manufacturing sectors
 - No direct measure of output and depends on purpose
 - Floor space commonly used for commercial and residential
- Detailed industry data is often needed for greater understanding
 - Highlights importance of integration with other industry-level economic data
 - Energy consumption in U.S. manufacturing is concentrated in four industries