Introduction to the technical notes

Purpose

The U.S. Energy Information Administration (EIA) develops, maintains, and operates the State Energy Data System (SEDS). The goal of SEDS is to provide historical time series of energy production, consumption, prices, expenditures, indicators, and carbon dioxide emissions from energy consumption by state that are defined as consistently as possible over time and across sectors. SEDS provides these estimates for Members of Congress, federal and state agencies, the general public, and as inputs for EIA's energy models.

The report

SEDS provides annual energy price and expenditure estimates for all energy sources by major economic sectors for the 50 states, District of Columbia, and United States. These data are available on the EIA website at https://www.eia.gov/state/seds/seds-data-complete.php. Companion tables with state-level consumption data can also be found at the same website. In addition, SEDS publishes the most recent year of data tables for state-level production, consumption, price, expenditure, indicator, and carbon dioxide emissions from energy consumption estimates by energy source as they are updated at https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US.

Due to page-size constraints, most of the PDF time series tables show estimates for only selected years. However, SEDS estimates price and expenditure data for 1970 forward and publishes the data in the HTML tables and CSV, XLSX, and ZIP data files on EIA's website. The documentation in this report covers the estimates for all years.

In the published SEDS tables, all estimates with revisions since the last SEDS report that are large enough to be seen are preceded with an "R."

Price estimates

All SEDS price estimates are in current dollars per million Btu (British thermal units) to facilitate comparison across energy sources. EIA uses gross heat content values to convert prices in physical units to prices in million Btu. See Appendix B of the SEDS consumption technical notes at https://www.eia.gov/state/seds/sep_use/notes/use_b.pdf. There is no adjustment for general inflation over time.

Sections 2 through 6 of the technical notes describe how SEDS develops the price estimates, including sources, methods, and conversion factors.

Reliable data for state-level prices rarely exist, especially as consistent series over a long period. SEDS applies estimates and assumptions to fill data gaps and maintain consistent definitions in the data series over time. SEDS incorporates the most consistent series and procedures possible for these estimates and assumptions. However, users should recognize the limitations imposed on the system due to changing and inadequate data sources. SEDS selects its sources and methods based on the availability, applicability as indicators, continuity over time, and consistency among the various energy commodities. The original source documents (cited in this documentation) include the collection of methods, imputation, or adjustment techniques, and errors associated with the individual processes. Due to the many collection forms and procedures associated with these reports, it is not possible to develop a meaningful numerical estimate of the statistical errors of the material published in the SEDS price and expenditure tables.

It is also important to note that, even within a state, a single average price may have limited meaning because it represents a consumption-weighted average over a whole state. For example, urban and rural electricity prices can vary significantly, and prices in one region of a state may differ from those in another because of access to less expensive hydroelectricity. Differences within a state may also be greater than differences among adjacent states. Thus, the principal value of the estimates in these tables lies in general comparisons among the states, interstate comparisons for a given year, and the analysis of trends over time.

Estimation methods

Most sources report fuel prices in physical units. SEDS uses the appropriate EIA conversion factors to create the Btu prices. SEDS only uses estimated prices when specific state-level prices are not available for a given energy source and sector. In some cases, SEDS assigns prices for energy consumed in one sector in a state to another sector in the same state. Examples include: industrial steam coal prices assigned to the commercial and transportation sectors' steam coal use;

industrial lubricants prices assigned to transportation lubricants uses; and transportation motor gasoline prices assigned to commercial and industrial use of motor gasoline.

In addition, there are a few cases where state-level prices could not be identified for any economic sector for a given energy source for some or all years. In these instances, SEDS uses a national-level price for all states, as described in these technical notes. For example, SEDS assigns a national-level price to all states for: transportation use of aviation gasoline; industrial and transportation use of lubricants; and industrial use of some other petroleum products.

Finally, within a given energy source and sector where price data are usually available, there are some cases of missing prices for certain years. SEDS uses two general approaches to estimate prices in cases where consumption occurs but no price is directly available from the data sources. The first approach is to assign an adjacent state price, a simple average of adjacent states' prices, or the price of the region (such as Census division, Census region, or Petroleum Administration for Defense district or subdistrict) that the state is located. The second approach is to apply the growth rate of the price of another state, the corresponding region, or the United States to the state's previous year price, if it is available.

SEDS uses three state groupings—U.S. Census regions and divisions, federal regions, and Petroleum Administration for Defense districts—as shown in Figures TN1, TN2, and TN3, on the following pages. SEDS identifies states by their two-letter postal code abbreviations shown in the map legends. Throughout the technical notes, the term "state" includes the District of Columbia.

Expenditure estimates

All SEDS expenditure estimates are in millions of current dollars. There is no adjustment for general inflation over time. All expenditures are consumer expenditures; that is, they represent estimates of money spent directly by consumers to purchase energy, generally including taxes (see box on page 4).

SEDS calculates expenditure estimates as the product of SEDS Btu consumption estimates at the most detailed level and the corresponding price estimates. SEDS adjusts the Btu consumption estimates for the expenditure calculations to remove process fuels and intermediate products (such as refinery fuels and biofuels blended into petroleum products) that are not purchased directly by end users to avoid double counting.

SEDS excludes electricity exported to Canada and Mexico from the expenditure calculations. SEDS removes use of hydroelectric, geothermal, wind, and solar energy sources from SEDS expenditure calculations because there are no direct fuel costs for those energy sources. SEDS also removes consumption of wood and waste that were obtained at no cost.

See Section 7 of the technical notes for further explanation of the adjusted consumption for expenditure estimates at: https://www.eia.gov/state/seds/sep_prices/notes/pr_consum_adjust.pdf.

In the SEDS tables with primary energy, electricity, and total energy expenditure estimates, SEDS displays energy expenditures for the electric power sector as negative values to indicate that they are subtracted from primary energy expenditures to remove double-counting in the calculation of total energy expenditures.

Energy-consuming sectors

SEDS estimates price and expenditure estimates for five energy-consuming sectors:

- **Residential sector:** An energy-consuming sector that consists of living quarters for private households. Common uses of energy associated with this sector include: space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters.
- **Commercial sector:** An energy-consuming sector that consists of service-providing facilities and equipment of: businesses; federal, state, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include: space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. *Note*: This sector includes generators that produce electricity and/or useful thermal output primarily to support commercial activities.
- **Industrial sector:** An energy-consuming sector that consists of all facilities and equipment used for producing, processing,

or assembling goods. The industrial sector encompasses the following types of activity: manufacturing (NAICS codes 31-33); agriculture, forestry, fishing and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23). Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. *Note:* This sector includes generators that produce electricity and/or useful thermal output primarily to support industrial activities.

- **Transportation sector:** An energy-consuming sector that consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts) are classified in the sector of their primary use. In this report, natural gas used in the operation of natural gas pipelines is included in the transportation sector.
- **Electric power sector:** An energy-consuming sector that consists of electricity-only and combined-heat-and-power plants within the NAICS (North American Industry Classification System) 22 category whose primary business is to sell electricity, or electricity and heat, to the public. *Note:* This sector includes electric utilities and independent power producers.

The first four energy-consuming sectors—residential, commercial, industrial, and transportation sectors—are also called end-use sectors.

Sector definition discrepancies and other price issues

Although end-use allocations of energy consumption and expenditures follow those guidelines as closely as possible, some data sources collect information using different classifications. For example, electric utilities often classify commercial and industrial users by the quantity of electricity purchases rather than by the business activity of the purchaser. Agricultural use of natural gas is collected and reported in the commercial sector through 1995 and in the industrial sector for 1996 forward. Because agricultural use of natural gas cannot be identified separately, the discrepancy cannot be reconciled. Another example is master-metered condominiums, apartments, and buildings with a combination of residential and commercial units. In many cases, billing and metering practices cause residential energy usage of electricity, natural gas, or fuel oil to be included in the commercial sector. In those cases, there is no basis for separating residential from commercial use. Readers are advised to consult the SEDS consumption technical notes for specific assumptions regarding the consumption estimates.

Except where specified, it is generally not possible to describe the SEDS price estimates as entirely “wholesale” or “retail.” The prices paid in each consuming sector are usually a combination of both sets of prices, depending on a number of closely interrelated factors. Almost all residential sector prices are close to retail prices, reflecting the relatively small quantities of individual purchases and the increased costs of extensive, multilayered distribution systems. Similarly, in the transportation sector more consumers pay the same retail-like price for motor gasoline, regardless of volume purchased or location of purchase. Conversely, residual fuel oil prices in the transportation sector are certainly more wholesale-like as a result of large deliveries to bulk facilities in major ports. In the same manner, most large industrial and many large commercial expenditures can be thought of as near wholesale, frequently involving direct access to a producer or bulk distribution facility for very large quantities. Many smaller industrial and commercial facilities pay something much closer to retail prices as a result of the small quantities involved and their institutional distance from primary suppliers. Notable exceptions to these relationships include natural gas and electricity suppliers, which typically establish fixed rates for each of several classes of service, depending on representative quantities, service factors, and distribution expenses.

Taxes in the price and expenditure data

The goal of SEDS state energy price is to provide estimates that include all taxes, but data sources often do not treat taxes uniformly. When the source data include taxes, SEDS includes them in the price and expenditure estimates. When the source doesn't include taxes, but SEDS can separately estimate them, SEDS includes them, with some exceptions listed below. In many cases, states and localities provide tax exemptions for various activities or groups of end users. SEDS does not include these complex exemptions into the state energy prices. EIA continues to analyze these cases to improve its estimates. A comprehensive and detailed study of taxes in EIA data is available in the report *End-Use Taxes: Current EIA Practices,* DOE/EIA-0583 (Washington, DC, August 1994). The report is available from EIA's Internet site at https://www.eia.gov/finance/archive/0583.pdf.

The status of tax data in the price and expenditure tables is summarized below and described more fully in the sections for each energy source and sector.

Energy sources consumed by the end-use sectors

Coal. All steam coal and coking coal prices include taxes in all years. Appropriately, coal imports and exports in the industrial sector do not include end-user taxes.

Natural gas. Natural gas prices are intended to include all federal, state, and local taxes, surcharges, and adjustments billed to consumers. Although the EIA data collection form states that taxes are to be included in the reported gross revenues, it is most likely that respondents would not consider sales taxes as part of their companies' gross revenues, and some may not be reporting them. As a result, consumer sales taxes may not be covered in full. For more information see *End-Use Taxes: Current EIA Practices*, page 23 of 134 in the PDF file, https://www.eia.gov/finance/archive/0583.pdf.

Petroleum. Prices of motor gasoline, diesel fuel, and propane used for transportation include excise and other per-gallon taxes. Due to the lack of uniformity in application, SEDS does not include state general sales taxes and local fuel and sales taxes. Other hydrocarbon gas liquids, distillate fuel oil, kerosene, and residual fuel oil prices include sales taxes in all years. Jet fuel, aviation gasoline, asphalt and road oil, lubricants, industrial petroleum coke, and other petroleum products (such as petrochemical feedstocks, special naphthas, and waxes) do not include taxes.

Wood and waste. Wood and waste prices for the residential, commercial, and industrial sectors include taxes.

Electricity. SEDS assumes that taxes paid directly by the electric power sector (rather than end users) are part of the operating costs and passed on to the end users as part of the price. Sales and other use taxes are included in the prices.

Fuels consumed by the electric power sector

Coal, natural gas, petroleum coke, nuclear, and wood and waste prices include all taxes, transportation, and handling costs. There are no direct fuel costs (or taxes) for hydroelectric, geothermal, solar, or wind energy. Capital, operation, and maintenance costs and related taxes associated with these energy sources are included indirectly because electricity prices reflect their presence in the rate base.

Figure TN1. U.S. Census regions and divisions

Region 1 Northeast	Region 2 Midwest		Region 3 South		Region 4 West	
Division 1 (New England)	**Division 3 (East North Central)**	**Division 4 (West North Central)**	**Division 5 (South Atlantic)**	**Division 6 (East South Central)**	**Division 8 (Mountain)**	**Division 9 (Pacific)**
Connecticut (CT)	Illinois (IL)	Iowa (IA)	Delaware(DE)	Alabama (AL)	Arizona (AZ)	Alaska (AK)
Maine (ME)	Indiana (IN)	Kansas (KS)	District of Columbia (DC)	Kentucky (KY)	Colorado (CO)	California (CA)
Massachusetts (MA)	Michigan (MI)	Minnesota (MN)	Florida (FL)	Mississippi (MS)	Idaho (ID)	Hawaii (HI)
New Hampshire (NH)	Ohio (OH)	Missouri (MO)	Georgia (GA)	Tennessee (TN)	Montana (MT)	Oregon (OR)
Rhode Island (RI)	Wisconsin (WI)	Nebraska (NE)	Maryland (MD)		Nevada (NV)	Washington (WA)
Vermont (VT)		North Dakota (ND)	North Carolina (NC)	**Division 7 (West South Central)**	New Mexico (NM)	
Division 2 (Middle Atlantic)		South Dakota (SD)	South Carolina (SC)		Utah (UT)	
			Virginia (VA)	Arkansas (AR)	Wyoming (WY)	
New Jersey (NJ)			West Virginia (WV)	Louisiana (LA)		
New York (NY)				Oklahoma (OK)		
Pennsylvania (PA)				Texas (TX)		

Figure TN2. Federal regions

Region 1
New England

Connecticut (CT)
Maine (ME)
Massachusetts (MA)
New Hampshire (NH)
Rhode Island (RI)
Vermont (VT)

Region 2
New York/New Jersey

New Jersey (NJ)
New York (NY)

Region 3
Mid Atlantic

Delaware (DE)
District of Columbia (DC)
Maryland (MD)
Pennsylvania (PA)
Virginia (VA)
West Virginia (WV)

Region 4
South Atlantic

Alabama (AL)
Florida (FL)
Georgia (GA)
Kentucky (KY)
Mississippi (MS)
North Carolina (NC)
South Carolina (SC)
Tennessee (TN)

Region 5
Midwest

Illinois (IL)
Indiana (IN)
Michigan (MI)
Minnesota (MN)
Ohio (OH)
Wisconsin (WI)

Region 6
Southwest

Arkansas (AR)
Louisiana (LA)
New Mexico (NM)
Oklahoma (OK)
Texas (TX)

Region 7
Central

Iowa (IA)
Kansas (KS)
Missouri (MO)
Nebraska (NE)

Region 8
North Central

Colorado (CO)
Montana (MT)
North Dakota (ND)
South Dakota (SD)
Utah (UT)
Wyoming (WY)

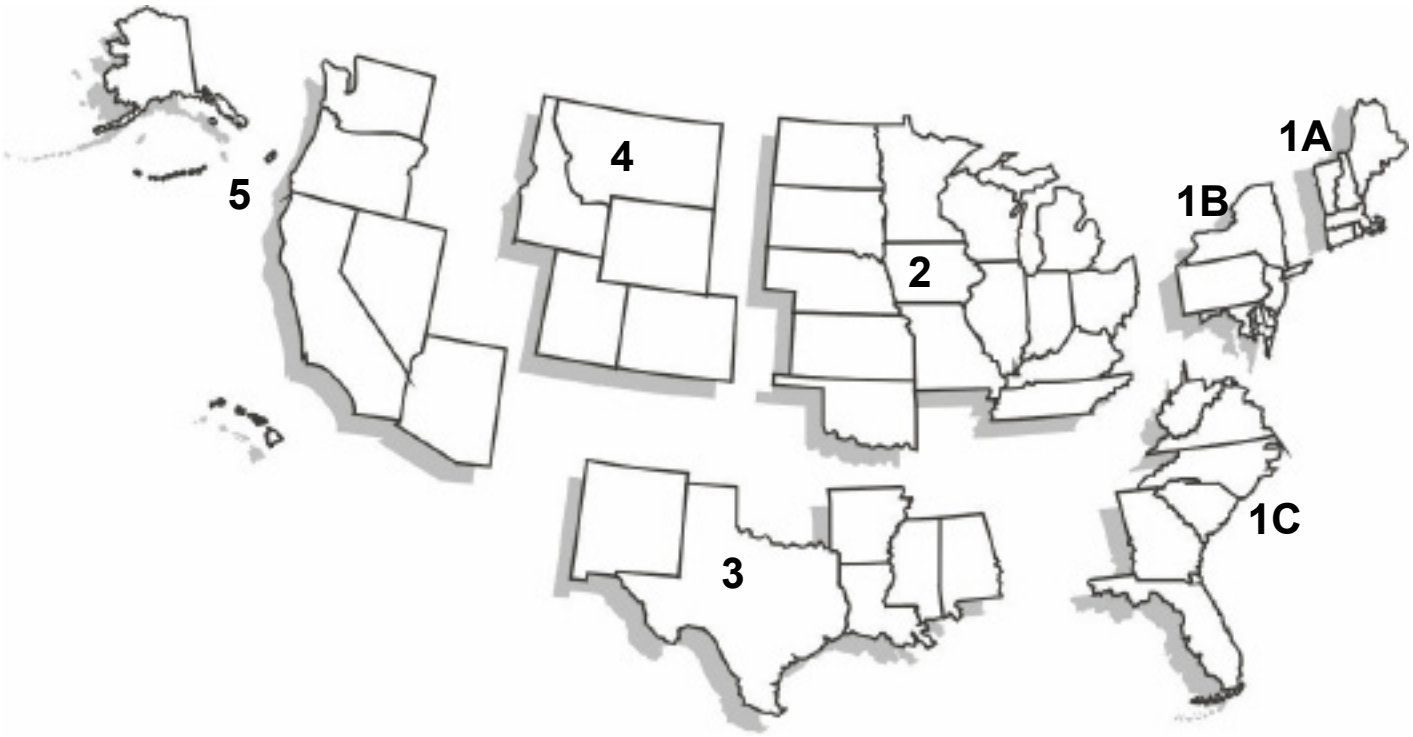
Region 9
West

Arizona (AZ)
California (CA)
Hawaii (HI)
Nevada (NV)

Region 10
Northwest

Alaska (AK)
Idaho (ID)
Oregon (OR)
Washington (WA)

Figure TN3. Petroleum Administration for Defense districts and subdistricts



Subdistrict 1A

Connecticut (CT)
Maine (ME)
Massachusetts (MA)
New Hampshire (NH)
Rhode Island (RI)
Vermont (VT)

Subdistrict 1B

Delaware (DE)
District of Columbia (DC)
Maryland (MD)
New Jersey (NJ)
New York (NY)
Pennsylvania (PA)

Subdistrict 1C

Florida (FL)
Georgia (GA)
North Carolina (NC)
South Carolina (SC)
Virginia (VA)
West Virginia (WV)

District 2

Illinois (IL)
Indiana (IN)
Iowa (IA)
Kansas (KS)
Kentucky (KY)
Michigan (MI)
Minnesota (MN)
Missouri (MO)
Nebraska (NE)
North Dakota (ND)
Ohio (OH)
Oklahoma (OK)
South Dakota (SD)
Tennessee (TN)
Wisconsin (WI)

District 3

Alabama (AL)
Arkansas (AR)
Louisiana (LA)
Mississippi (MS)
New Mexico (NM)
Texas (TX)

District 4

Colorado (CO)
Idaho (ID)
Montana (MT)
Utah (UT)
Wyoming (WY)

District 5

Alaska (AK)
Arizona (AZ)
California (CA)
Hawaii (HI)
Nevada (NV)
Oregon (OR)
Washington (WA)