



## CHAPTER 25

# Direct Heat

## INTRODUCTION

For most of human history, fire was mankind's main source of energy. Today, much of the energy we use comes from what are considered secondary sources: the heat generated from burning combustible materials is used to generate energy, typically in the form of electricity or transportation fuels. In addition to these secondary sources, however, heat is still used as a direct source of energy. This chapter examines the direct use of burning materials to produce energy for heat and manufacturing.

## FUEL SOURCES AND USAGE

In 2005, 32.6 quadrillion British thermal units (Btu), or approximately 32 percent of all energy used nationwide, could be attributed to the burning of combustible materials to produce heat for direct use. The raw materials burned for direct uses include natural gas, liquefied petroleum gas (LPG), heating oil, kerosene, wood, biomass (waste products) and coal. In addition to these raw materials, geothermal energy, or heat produced from deep within the Earth's crust, also is used directly.<sup>1</sup>

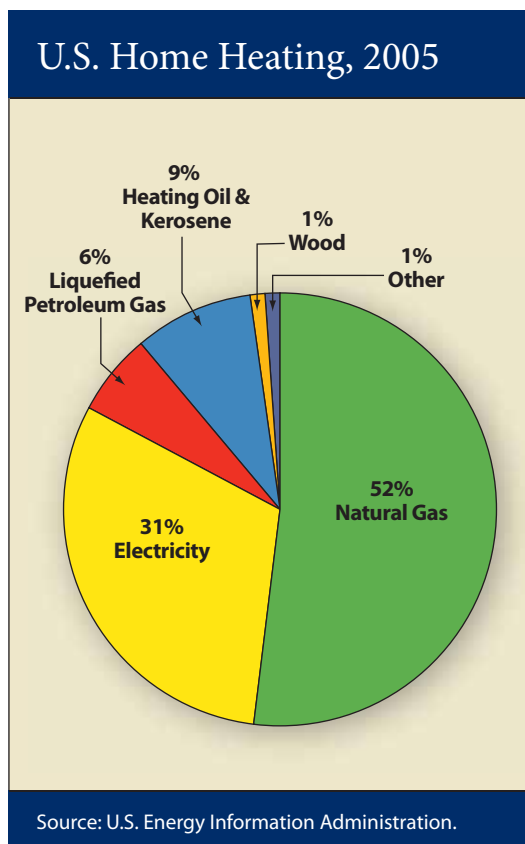
### Household and Commercial Buildings

In 2005, about 6.9 quadrillion Btu of direct-use energy was used to heat homes in the U.S.; another 4.1 quadrillion Btu were used to heat commercial buildings.<sup>2</sup>

According to the U.S. Energy Information Administration (EIA), 69 percent of the nation's 108 million households were heated by direct-use energy (natural gas, heating oil or propane); the remaining 31 percent of homes were heated by electricity (**Exhibit 25-1**).<sup>3</sup>

In 2005, Texans used about 237.4 trillion Btu of direct-use energy to heat homes and another 190.4 trillion Btu to heat commercial buildings.<sup>4</sup>

EXHIBIT 25-1

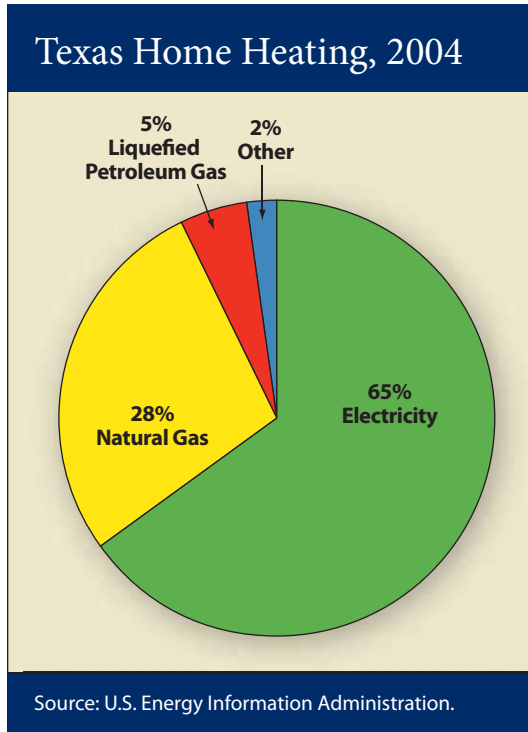


In the same year, according to EIA, 33 percent of Texas' 8 million-plus homes were heated by natural gas or LPG (primarily propane); 65 percent were heated by electricity; and the remaining 2 percent of homes were heated by other sources such as wood and solar and geothermal energy (**Exhibit 25-2**).<sup>5</sup>

Natural gas and LPG, which provide the majority of the state's direct-use energy, are regulated by the Federal Energy Regulatory Commission (FERC) at the national level and by the Railroad Commission of Texas (RRC) at the state level, as FERC's designee.<sup>6</sup>



EXHIBIT 25-2



### Manufacturing

The majority (68 percent nationally) of all direct-use energy is used in the industrial sector, to manufacture raw materials into finished products. Industries heat raw materials to the melting point to combine them with something else or simply to change them into a finished product. Products including chemicals, plastics, metals, food and glass all are made or changed through heating. In 2005, the nation used 21,653 trillion Btu of direct-use energy to turn raw materials into finished products.<sup>7</sup>

In 2002, the most recent data available for end uses or finished products, the industrial sector used 21,893 trillion Btu of direct-use energy to produce a wide variety of products (Exhibit 25-3).<sup>8</sup>

In Texas, the industrial sector used 4,756.2 trillion Btu of direct-use energy in 2005. This energy came primarily from the combustion of natural gas and petroleum (Exhibit 25-4).<sup>9</sup>

EXHIBIT 25-3

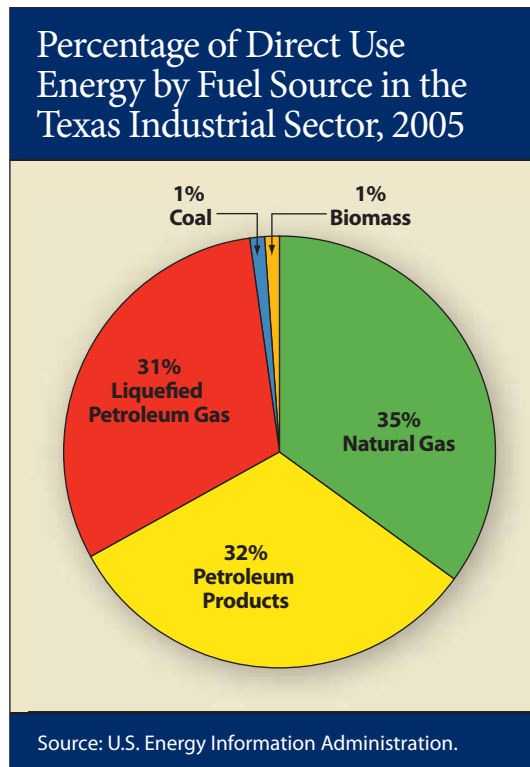
### End Uses for Direct-Use Energy In the Manufacturing/Industrial Sector 2002

End Use	Amount of Direct Energy Use in Trillion Btus	Percentage of Total Direct Energy Use
Food, Beverage and Tobacco Products	1,728	7.9%
Textile Mills and Products	469	2.1
Wood Products, Furniture and Related Products	629	2.9
Paper, Printing and Related Products	3,000	13.7
Petroleum and Coal Products	3,454	15.8
Chemicals	4,803	21.9
Plastics, Rubber Products and Other Nonmetallic Mineral Products	2,038	9.3
Primary Metal and Fabricated Metal Products	3,806	17.4
Computers, Electronics, Electrical Equipment, Appliances and Components	656	3
Machinery and Transportation Equipment	1,106	5
Miscellaneous	204	1
<b>Total</b>	<b>21,893</b>	<b>100%</b>

Source: U.S. Energy Information Administration.



EXHIBIT 25-4



## TRENDS AND OUTLOOK

Between 1980 and 2006, U.S. direct-use energy consumption by the residential sector fell by 14 percent; the commercial sector by 4 percent; and the industrial sector by 5 percent.<sup>10</sup> These reductions were made possible by advances in efficiency, conservation and a gradual shift from direct-use energy to energy provided through electricity. According to EIA, overall energy demand will increase by 0.7 percent per year through 2030; direct-use energy in the residential, commercial and industrial sectors is projected to stay flat or slightly decrease.<sup>11</sup>

## ENDNOTES

<sup>1</sup> U.S. Energy Information Administration, "Energy Consumption by Sector: Table 2.1a, Energy Consumption by Sector, 1949-2006," <http://www.eia.doe.gov/emeu/aer/consump.html>. (Last visited April 10, 2008).

- <sup>2</sup> U.S. Energy Information Administration, Table 2.16, "Residential Sector Energy Consumption, 1949-2006," <http://www.eia.doe.gov/emeu/aer/txt/ptb0201b.html>. (Last visited April 10, 2008.)
- <sup>3</sup> U.S. Energy Information Administration, "Energy Consumption by Sector: Table 2.7, Types of Heating in Occupied Housing Units, 1950-2005," <http://www.eia.doe.gov/emeu/aer/consump.html>. (Last visited April 10, 2008.)
- <sup>4</sup> U.S. Energy Information Administration, Table 8, "Residential Sector Energy Consumption Estimates, 1960-2005, Texas," [http://www.eia.doe.gov/emeu/states/sep\\_use/res/use\\_res\\_tx.html](http://www.eia.doe.gov/emeu/states/sep_use/res/use_res_tx.html). (Last visited April 11, 2008.); U.S. Energy Information Administration, Table S5, "Commercial Sector Energy Consumption Estimates, 2005," [http://www.eia.doe.gov/emeu/states/sep\\_sum/html/sum\\_btu\\_com.html](http://www.eia.doe.gov/emeu/states/sep_sum/html/sum_btu_com.html).
- <sup>5</sup> U.S. Energy Information Administration, Table S4, "Residential Sector Energy Consumption Estimates, 2005," [http://www.eia.doe.gov/emeu/state/sep\\_sum/html/sum\\_btu\\_res.html](http://www.eia.doe.gov/emeu/state/sep_sum/html/sum_btu_res.html). (Last visited April 11, 2008.)
- <sup>6</sup> Texas Railroad Commission, "Q & A Regarding Natural Gas Prices," <http://www.rrc.state.tx.us/divisions/gs/rap/gsrapp.html>. (Last visited April 11, 2008.)
- <sup>7</sup> U.S. Energy Information Administration, "Energy Consumption by Sector: Table 2.1a, Energy Consumption by Sector, 1949-2006," <http://www.eia.doe.gov/emeu/aer/consump.html>. (Last visited April 10, 2008.)
- <sup>8</sup> U.S. Energy Information Administration, "Table 2b: End Uses of Fuel Consumption for Selected Industries, 1998 and 2002," [http://www.eia.doe.gov/emeu/efficiency/mecs\\_trend\\_9802/mecs9802\\_table2b.html](http://www.eia.doe.gov/emeu/efficiency/mecs_trend_9802/mecs9802_table2b.html). (Last visited April 10, 2008.)
- <sup>9</sup> U.S. Energy Information Administration, Table S6, "Industrial Sector Energy Consumption Estimates, 2005," [http://www.eia.doe.gov/emeu/states/sep\\_sum/html/sum\\_btu\\_ind.html](http://www.eia.doe.gov/emeu/states/sep_sum/html/sum_btu_ind.html). (Last visited April 11, 2008.)
- <sup>10</sup> U.S. Energy Information Administration, "Energy Consumption by Sector: Table 2.1a, Energy Consumption by Sector, 1949-2006."
- <sup>11</sup> U.S. Energy Information Administration, "Annual Energy Outlook 2008 - Early Release" p. 6, <http://www.eia.doe.gov/oiaf/aeo/index.html>. (Last visited November 14, 2007.)

