

Table 5.1 - U.S. Primary and Delivered Energy – Overview

(Quadrillion Btu per year)

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Primary Consumption by Source						
Petroleum ¹	34.20	33.55	38.25	38.63	45.20	51.99
Natural Gas	20.39	19.29	22.57	23.43	28.85	34.63
Coal	15.42	19.11	21.56	22.34	25.41	27.35
Nuclear	2.74	6.16	7.74	8.03	7.87	7.49
Renewable ²	5.71	6.19	6.70	6.48	7.90	8.94
Other ³	0.00	-0.08	0.28	0.38	0.38	0.44
Total Primary	78.46	84.22	97.10	99.29	115.61	130.85
Primary Consumption by Sector						
Residential	15.91	16.41	19.10	19.85	22.24	24.27
Commercial	10.64	12.81	15.84	16.49	19.98	23.18
Industrial	32.19	32.42	35.54	35.50	39.75	43.76
Transportation	19.69	22.54	26.61	27.45	33.66	39.64
Total Primary	78.43	84.18	97.09	99.29	115.63	130.85
Delivered Consumption by Sector						
Residential	7.50	6.46	10.67	11.06	12.40	13.55
Commercial	4.09	3.92	7.70	8.07	9.91	11.64
Industrial	22.64	21.11	27.75	27.62	31.35	34.69
Transportation	19.66	22.49	26.49	27.32	33.50	39.43
Total Delivered	53.89	53.98	72.61	74.07	87.16	99.31

Sources: EIA, *Annual Energy Outlook 2002*, DOE/EIA-0383 (2002) (Washington, D.C., December 2001), Tables A1 and A2; EIA, *Annual Energy Review*, DOE/EIA-0384(2000) (Washington, D.C., August 2001), Tables 2.1a-f.

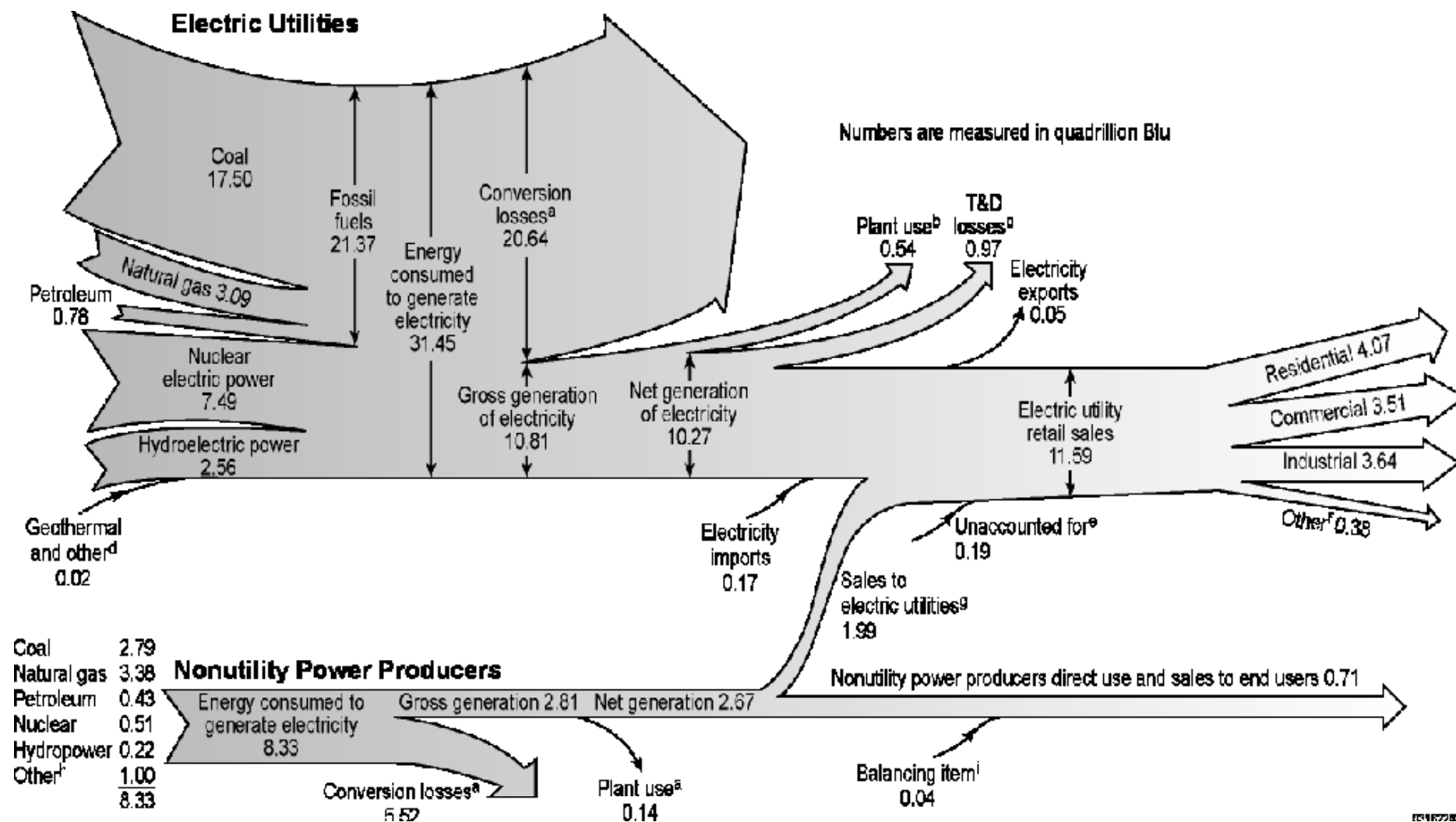
Notes:

¹Petroleum products supplied, including natural gas plant liquids, crude oil burned as fuel, and ethanol.

²End-use consumption, electric utility and nonutility electricity net generation, and net imports of electricity from renewable energy.

³Includes net electricity imports, methanol, and liquid hydrogen. Included in Renewable (conventional hydropower) for 1980.\

Table 5.2 - Electricity Flow Diagram



- a Approximately two-thirds of all energy used to generate electricity.
- b The electric energy used in the operation of power plants, estimated as 5 percent of gross generation.
- c Transmission and distribution losses are estimated as 9 percent of gross generation of electricity.
- d Wood, waste, wind, and solar energy used to generate electricity.

- e Balancing item to adjust for data collection frame differences and nonsampling error.
- f Public street and highway lighting, other sales to public authorities, sales to railroads.
- g Sales, interchanges, and exchanges of electric energy with utilities.
- h Geothermal, wood, waste, wind, and solar energy used to generate electricity.
- i Transmission and distribution losses and unaccounted for.

Table 5.3 - Electricity Overview

(Billion Kilowatthours, unless otherwise noted)

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Electric Utility Generation ¹	2,286	2,808	3,392	3,504	4,263	4,983
Nonutility Generation ²	68	217	321	311	379	452
Net Electricity Generation	2,286	3,025	3,713	3,815	4,642	5,435
Capability (gigawatts)						
Utility ¹	579	735	783	809	972	1,138
Nonutility ²	579	691	730	754	906	1,062
	17	45	53	56	66	76
Utility/Nonutility Stocks (end of year)						
Coal (million short tons)	183	156	143	103	NA	NA
Petroleum (million barrels)	135	84	53	41	NA	NA
Imports from Canada/Mexico	25	18	39	48	51	47
Exports to Canada/Mexico	3	16	14	13	16	8
Loss and Unaccounted for ³	NA	210	234	221	NA	NA
Electric Utility Retail Sales ⁴	2,094	2,713	3,324	3,426	4,170	4,916
Nonutility End Use ⁵	NA	104	178	277	225	269
Total End Use	NA	2,817	3,502	3,603	4,395	5,185

Sources: EIA, *Annual Energy Outlook 2002*, DOE/EIA-0383 (2002) (Washington, D.C., December 2001), Tables A8, A9 and A10 ; EIA, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, D.C., August 2001), Tables 8.1 and 8.11.

Notes:

¹ As of 1999, grid-connected nonutility generation is included with electric utility generation. Grid-connected nonutility generation contributed 60% of new capacity additions in 2000 and is expected to represent 80% by 2010. Coverage has increased over time from facilities >25 MW before 1989 to include those >5 MW in 1989 and > 1 MW since 1992.

² As of 1999, only cogenerators and off-grid nonutility generation.

³ Energy losses that occur between the point of generation and delivery to the customer.

⁴ Includes nonutility sales of electricity to utilities for distribution to end-users. Beginning in 1996, also includes sales to ultimate consumers by power marketers.

⁵ Nonutility facility use of onsite net electricity generation, and nonutility sales of electricity to end-users.

Table 5.4 - Consumption of Fossil Fuels by Electric Generators ¹

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Coal (million short tons)	569	806	929	965	1,141	1,254
Distillate Fuel Oil (million barrels) ²	29	15	35	31	9	10
Residual Fuel Oil (million barrels) ³	391	209	161	137	75	35
Petroleum Coke (million short tons)	s	2	5	4	NA	NA
Total Petroleum (million barrels) ⁴	421	234	201	171	84	45
Natural Gas (billion cubic feet)	3,682	2,787	3,790	4,240	6,850	10,300

Sources: EIA, *Annual Energy Outlook 2002*, DOE/EIA-0383 (2002) (Washington, D.C., December 2001), Tables A2, A13 and A16 ; EIA, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, D.C., August 2001), Table 8.8.

Notes:

s = < 0.5 million short tons

¹ As of 1999, grid-connected nonutility generation is included with electric utility generation. Grid-connected nonutility generation contributed 60% of new capacity additions in 2000 and is expected to represent 80% by 2010. Coverage has increased over time from facilities >25 MW before 1989 to include those >5 MW in 1989 and > 1 MW since 1992.

² Forecast values calculated from quadrillion Btu using conversion factor 5.825 MMBtu/barrel.

³ Forecast values calculated from quadrillion Btu using conversion factor 6.287 MMBtu/barrel.

⁴ Petroleum coke is converted from short tons to barrels by multiplying by 5. Total Petroleum is calculated sum.

Table 5.5 - Fossil Fuel Generation by Age of Generating Units

(Megawatts)

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>
<5 years	91,041	39,498	34,050	51,783
6-10 years	134,949	53,332	41,373	43,671
11-20 years	145,474	223,877	103,411	91,856
21-30 years	97,476	143,742	225,917	221,659
31-40 years	21,018	91,608	129,053	141,811
41-50 years	4,017	15,053	79,789	85,532
>50 years	4,413	3,038	9,049	12,487
Total	498,388	570,148	622,642	648,799

Source: RDI/FT Energy/Platts Database, query by NREL 1/02.

Note: Total MW does not equal fossil fuel generation capacity cited in Table 6.1.

Table 5.6 - Nuclear Generation by Age of Generating Units

(Megawatts)

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>
<5 years	16,116	30,219	1,270	1,270
6-10 years	33,423	25,598	4,776	1,215
11-20 years	6,329	48,190	54,177	55,816
21-30 years	309	5,990	43,805	43,858
31-40 years	0	0	2,142	4,012
Total	56,177	109,997	106,170	106,171

Source: RDI/FT Energy/Platts Database, query by NREL 1/02.

Note: Total MW does not equal nuclear generation capacity cited in Table 6.1.

Table 5.7 - Renewable Energy Generating Capacity

(Megawatts)

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>
Agricultural Residues	105	230	438	438
Biogas	19	360	894	900
Municipal Solid Waste	294	2,203	2,969	2,969
Timber Residues	4,059	6,805	7,986	7,986
Bioenergy Total	4,477	9,598	12,287	12,293
Geothermal	802	2,569	2,719	2,768
Hydro	80,503	90,973	94,183	94,183
Photovoltaic	0.06	4	19	25
Solar Thermal	0	354	354	354
Wind	3.12	1,571	2,635	2,673
Total	85,785	105,069	112,197	112,296

Source: *Renewable Electric Plant Information System (REPiS Database)*, National Renewable Energy Laboratory, 2001, <http://www.eren.doe.gov/repis/index.html>.

Note: Total does not equal renewable generation capacity cited in Table 6.1

Table 5.8 - Electric Power-Sector Energy Consumption

(Trillion Btu)

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Coal	12,123	16,190	18,950	19,690	22,800	24,670
Natural Gas	3,810	2,882	3,860	4,320	6,980	10,490
Petroleum	2,634	1,250	1,100	930	210	280
Other ¹	0	-80	280	380	380	440
Total Fossil Fuels	18,567	20,242	24,190	25,320	30,370	35,880
Nuclear Electric Power	2,739	6,162	7,736	8,030	7,870	7,490
Hydroelectric Pumped Storage	NA	-36	-65	-58	NA	NA
Conventional Hydroelectric ²	3,118	3,146	3,210	2,820	3,110	3,100
Wood	3	316	110	110	250	190
Waste	2	137	270	280	380	420
Geothermal ³	110	344	280	280	500	960
Solar	na	7	9	9	10	20
Wind	na	24	46	51	200	250
Total Renewable Energy	3,232	3,982	3,925	3,550	4,450	4,940
Total Primary Consumption ⁴	24,538	30,350	35,786	36,842	42,690	48,310

Sources: EIA, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, D.C., August 2001), Table 2.1f and EIA, *Annual Energy Outlook 2002*, DOE/EIA-0383 (2002) (Washington, D.C., December 2001), Tables A2 and A18.

Notes:

¹ Electricity net imports from fossil fuels; may include some nuclear-generated electricity.

² Through 1988, includes all electricity net imports. From 1989, includes electricity net imports derived from hydroelectric power only. In 1980 includes other fossil fuels and pumped storage.

³ From 1989, includes electricity imports from Mexico that are derived from geothermal energy.

⁴ As of 1999, only grid-connected nonutility and electric utility generation. Coverage has increased over time from facilities >25 MW before 1989 to include those >5 MW in 1989 and > 1 MW since 1992.

Table 5.9 - Number of Utilities by Class of Ownership and Nonutilities

	<u>1980</u>	<u>1990</u>	<u>1999</u>	<u>2000</u>
Investor Owned Utilities	240	266	239	240
Federally Owned Utilities	41	10	9	9
Cooperatively Owned Utilities ¹	936	951	900	894
Other Publicly Owned Utilities	1,753	2,010	2,012	2,009
Total Number of Utilities	2,970	3,237	3,160	3,152
Nonutilities			1,930	

Source: EIA, *The Changing Structure of the Electric Power Industry 2000: An Update*; Electrical World: Directory of Electric Power Producers, The McGraw-Hill Companies

Notes:

¹ Co-ops operate in all states except Connecticut, Hawaii, Rhode Island, and the District of Columbia

Table 5.10 – Top 10 Investor-Owned Utilities

Utility by Sales (Million kWh)	<u>1980</u>		<u>1990</u>		<u>1999</u>	
	Rank	Million kWh	Rank	Million kWh	Rank	Million kWh
TXU Electric Co	NA		1	78,340	1	95,927
Florida Power & Light Co	NA		5	65,222	2	84,450
Commonwealth Edison Co	NA		2	70,852	3	83,501
Georgia Power Co	NA		8	53,953	4	70,972
Pacific Gas & Electric Co	NA		3	70,597	5	70,187
Reliant Energy HL&P	NA		6	58,583	6	69,375
Southern California Edison Co	NA		4	70,063	7	67,207
Virginia Electric & Power Co	NA		9	52,122	8	62,650
Duke Energy Corp	NA		7	58,359	9	52,009
Alabama Power Co	NA		12	38,081	10	50,157
PacifiCorp	NA		10	40,288	46	17,846

Utility by Revenue (Million \$)

	Rank	Million \$	Rank	Million \$	Rank	Million \$
Pacific Gas & Electric Co	NA		2	6,513	1	6,786
Southern California Edison Co	NA		1	6,767	2	6,692
Commonwealth Edison Co	NA		3	5,668	3	6,176
TXU Electric Co	NA		6	4,200	4	5,852
Florida Power & Light Co	NA		4	4,803	5	5,830
Consolidated Edison Co-NY Inc	NA		5	4,385	6	4,501
Reliant Energy HL&P	NA		7	3,436	7	4,247
Georgia Power Co	NA		8	3,426	8	4,129
Public Service Electric & Gas Co	NA		10	3,262	9	3,874
Detroit Edison Co	NA		12	3,187	10	3,791
Virginia Electric & Power Co	NA		9	3,299	11	3,782

Source: EIA, *Electric Sales and Revenue*, DOE/EIA -0540 (99) (Washington, D.C., October 2000), Table 17.

Table 5.11 - Top 10 Independent Power Producers Worldwide, 2001

(Megawatts)

<u>Company</u>	<u>Worldwide Capacity (9/01)</u>
AES	60,000
Tractebel	50,000
Calpine	34,900
Entergy Wholesale Operations	30,000
Dynegy	28,000
Edison Mission Energy	28,000
NRG Energy	22,410
Mirant	21,500
Cinergy	21,000
Dominion Generation	21,000

Source: Energy InfoSource, *Merchant Power Producer Quarterly, 3rd Quarter 2001 Edition*.

Table 5.12 - Utility Mergers and Acquisitions

	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>Planned</u>
Mergers/Acquisitions														
IOU-IOU	4	1	2	1	7	4	1	3	1	5	10	4	10	6
Co-op-Co-op	4	3	2	2	7	2	1	4	2	13	15	15	3	
IOU-Co-op				1	2			1		1				
IOU-Gas ¹									1	5	4	3	6	
Muni-Muni								1				2		
Muni-Co-op										1			1	
Power Authority-IOU											1			
Nonutility-IOU													6	2
Foreign-IOU ²												2	1	3
Total	8	4	4	4	16	6	2	9	4	25	30	26	27	11
Related Activities														
Name Changes									5	2	7	11	1	
New Holding Company										1	5	4	2	
Moved Headquarters						1								
Ceased Operations											1			

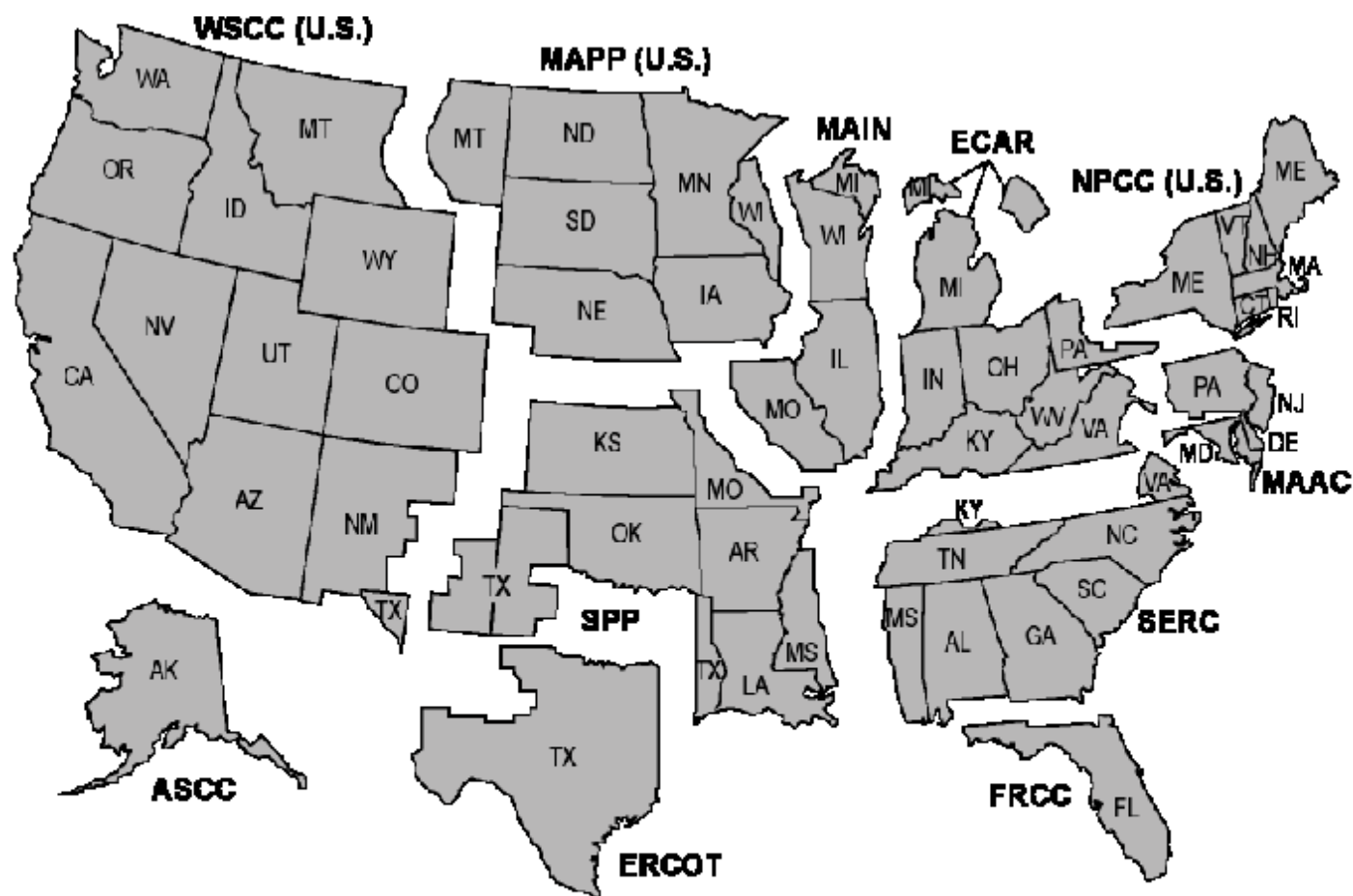
Source: Calculated from Electrical World, *Directory of Electric Power Producers*, 2001, The McGraw-Hill Companies

Notes:

¹ Gas local distribution company, pipeline, or developer

² Excludes Canadian mergers and acquisitions. Includes foreign acquisition of U.S. companies

Table 5.13a - North American Electric Reliability Council Map for the United States



ECAR	East Central Area reliability Coordination	NPCC	Northeast Power Coordinating Council
ERCOT	Electric Reliability Council of Texas	SERC	Southeastern Electric Reliability Council
FRCC	Florida Reliability Coordinating Council	SPP	Southwest Power Pool
MAAC	Mid-Atlantic Area Council	WSCC	Western Systems Coordinating Council
MAIN	Mid-America Interconnected Network	ASCC	Alaska Systems Coordinating Council
MAPP	Mid-Continent Area Power Pool		