

Uranium Industry Annual 1995

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Preface

The *Uranium Industry Annual 1995* (UIA 1995) provides current statistical data on the U.S. uranium industry's activities relating to uranium raw materials and uranium marketing. The UIA 1995 is prepared for use by the Congress, Federal and State agencies, the uranium and nuclear electric utility industries, and the public. It contains data for the period 1986 through 2005 as collected on the Form EIA-858, "Uranium Industry Annual Survey."

Data collected on the "Uranium Industry Annual Survey" provide a comprehensive statistical characterization of the industry's activities for the survey year and also include some information about industry's plans and commitments for the near-term future. Where aggregate data are presented in the UIA 1995, care has been taken to protect the confidentiality of company-specific information while still conveying accurate and complete statistical data.

The legal authority for Form EIA-858, "Uranium Industry Annual Survey," comes from Section 13b of the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b).

On October 24, 1992, the Congress enacted the Energy Policy Act of 1992 (EPACT 1992), Public Law 102-486. This law provides under Subtitle B, 42 USC § 2296b-4, Sec. 1015, that:

" . . . the owner or operator of any civilian nuclear power reactor shall report to the Secretary (of Energy), acting through the Administrator of the Energy Information Administration, for activities of the previous fiscal year—

(1) the country of origin and the seller of any uranium or enriched uranium purchased or imported into the United States either directly or indirectly by such owner or operator; and

(2) the country of origin and the seller of any enrichment services purchased by such owner or operator."

The information is required to be made available to the Congress annually.

Data on uranium raw materials activities for 1986 through 1995 including exploration activities and expenditures, EIA-estimated reserves, mine production of uranium, production of uranium concentrate, and industry employment are presented in Chapter 1. Data on uranium marketing activities for 1994 through 2005, including purchases of uranium and enrichment services, enrichment feed deliveries, uranium fuel assemblies, filled and unfilled market requirements, uranium imports and exports, and uranium inventories are shown in Chapter 2.

The methodology used in the 1995 survey, including data edit and analysis, is described in Appendix A. The methodologies for estimation of resources and reserves are described in Appendix B. A list of respondents to the "Uranium Industry Annual Survey" is provided in Appendix C. For the readers convenience, metric versions of selected tables from Chapters 1 and 2 are presented in Appendix D along with the standard conversion factors used. A glossary of technical terms is at the end of the report.

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Highlights

1995 was a turnaround year for the U.S. uranium industry. Domestic uranium mine and concentrate production were at their highest levels in four years. The following are highlights of the year.

Uranium Raw Material Activities

Uranium production (in the form of uranium concentrate) in 1995 totaled 6.0 million pounds U_3O_8 , an increase of 80 percent from the 1994 level, and the highest level since 1991 (Table H1). Eight uranium concentrate production facilities were commercially operating at the end of 1995: one mill, five in situ leach plants, and two byproduct recovery plants. Conventional mills accounted for 27 percent of the total production, and nonconventional plants accounted for 73 percent. The one commercial operating mill produced uranium concentrate from stock-piled ores, mined prior to 1993. Uranium concentrate shipments from U.S. producers were 5.5 million pounds in 1995, a decrease of 13 percent compared with the 1994 shipments.

During 1995, a total of 3.5 million pounds U_3O_8 of uranium were produced by U.S. mines. This is the highest level of production since 1991. Most of that amount was by in situ leach methods. Compared with 1994, 1995 production represents an increase of 38 percent. However, it was the third consecutive year in which no ore was mined from openpit or in underground mines.

Total exploration and development expenditures in 1995 were \$6.0 million, a 64-percent increase from 1994, due to a significant increase in surface drilling activities. Foreign participation in U.S. uranium exploration and development activities was \$2.1 million, and represented 35 percent of the total expenditures.

Employment in the raw materials sector of the uranium industry increased during 1995 by 13 percent to 1,107 person years. This is the third consecutive year of increasing employment. The reclamation sector employment accounted for more than half of this total.

Uranium Marketing Activities

Purchases

Domestic and foreign suppliers delivered a total of 43.4 million pounds U_3O_8 (equivalent) to U.S. utilities in 1995 (Table H2). Utilities were delivered 13 percent more uranium, compared with the 1994 level. The average price paid by the utilities was \$11.25 per pound U_3O_8 , an increase of 8 percent compared with the 1994 price.

Deliveries of uranium to U.S. brokers and traders totaled 22.9 million pounds U_3O_8 in 1995. The average price for these purchases was \$9.53 per pound, an increase of 15 percent compared with the 1994 price.

Imports and Exports

In 1995, purchases from foreign suppliers by U.S. suppliers and utilities totaled 41.3 million pounds U_3O_8 , at an average price of \$10.20 per pound (Table H2). This represents an increase of 14 percent compared with the 1994 price.

Uranium exported to foreign suppliers and utilities was 9.8 million pounds, at an average price of \$13.48 per pound. Compared with 1994, the quantity was 45 percent lower.

Uranium in Fuel Assemblies

Utilities loaded fuel assemblies that contained 51.1 million pounds U_3O_8 into U.S. commercial nuclear reactors during 1995, 10.7 million pounds more than in 1994 (Table H3).

Inventories

Uranium inventories held by U.S. utilities continued to decline in 1995 reaching 56.2 million pounds U_3O_8 at the end of the year (Table H3). This represented a 14 percent decrease from the level of inventories at the end of 1994 and was 65 percent below the record-high level of inventories held by utilities at the end of 1984 (160.2 million pounds).

Table H1. Raw Materials Summary Statistics of the U.S. Uranium Industry, 1986-1995

Processing Operations	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Exploration and Development										
Surface Drilling (million feet)	2.1	2.0	3.0	2.2	1.7	1.8	1.1	1.1	0.7	1.3
(million meters)	0.6	0.6	0.9	0.7	0.5	0.6	0.3	0.3	0.2	0.4
Expenditures ^a (million dollars)	22.1	19.7	20.1	14.8	17.1	17.8	14.5	11.3	3.7	6.0
Reserves at End of Year										
(million pounds U ₃ O ₈)										
\$US30 per pound)	322	304	289	277	265	304	295	292	294	290
(thousand metric tons U, \$US80 per kilogram)	124	117	111	107	102	117	114	112	113	112
Mine Production of Uranium										
(million pounds U ₃ O ₈)	8.3	6.0	9.5	9.7	5.9	5.2	1.0	2.0	2.5	3.5
(thousand metric tons U)	3.2	2.3	3.7	3.7	2.3	2.0	0.4	0.8	1.0	1.4
Uranium Concentrate Production										
(million pounds U ₃ O ₈)	13.5	13.0	13.1	13.8	8.9	8.0	5.6	3.1	3.4	6.0
(thousand metric tons U)	5.2	5.0	5.0	5.3	3.4	3.1	2.2	1.2	1.3	2.3
Uranium Concentrate Shipments										
(million pounds U ₃ O ₈)	10.6	11.6	12.8	14.8	13.0	8.4	6.9	3.4	6.3	5.5
(thousand metric tons U)	4.1	4.4	4.9	5.7	4.9	3.2	2.6	1.3	2.4	2.1
Employment (person-years expended) ...	2,120	2,002	2,141	1,583	1,335	1,016	682	871	980	1,107

^aExpenditures are in nominal U.S. dollars.

Note: Specific references for each category of data and year are provided in various detailed text or tables included in the main body of this report. For 1993 through 1995, total employment includes reclamation employment.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table H2. Transaction Summary Statistics of the U.S. Uranium Industry, 1994-1995

Actual Deliveries	1994		1995	
	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price
Purchases by U.S. Brokers and Traders				
(million pounds U ₃ O ₈ e; dollars per pound U ₃ O ₈ e)	30.8	8.29	22.9	9.53
(thousand metric tons U; dollars per kilogram U)	11.8	21.56	8.8	24.79
Purchases by U.S. Utilities				
(million pounds U ₃ O ₈ e; dollars per pound U ₃ O ₈ e)	38.3	10.40	43.4	11.25
(thousand metric tons U; dollars per kilogram U)	14.7	27.03	16.7	29.24
Imports by U.S. Suppliers and Utilities				
(million pounds U ₃ O ₈ e; dollars per pound U ₃ O ₈ e)	36.6	8.95	41.3	10.20
(thousand metric tons U; dollars per kilogram U)	14.1	23.27	15.9	26.52
Exports by U.S. Suppliers and Utilities				
(million pounds U ₃ O ₈ e; dollars per pound U ₃ O ₈ e)	17.7	11.34	9.8	13.48
(thousand metric tons U; dollars per kilogram U)	6.8	29.49	3.8	35.06

U₃O₈e=U₃O₈ equivalent.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table H3. Summary Statistics of Uranium Fuel and Inventories, 1994-1995

Items	1994	1995 ^P
Fuel Assemblies Loaded into Commercial Nuclear Reactors		
(million pounds U ₃ O ₈ e)	R40.4	51.1
(thousand metric tons U)	R15.5	19.7
Commercial Inventories at the End of the Year		
U.S. Utility Inventories		
(million pounds U ₃ O ₈ e)	R65.4	56.2
(thousand metric tons U)	R25.2	21.6
U.S. Utility and Supplier Inventories		
(million pounds U ₃ O ₈ e)	R86.9	70.1
(thousand metric tons U)	R33.4	27.0

U₃O₈e=U₃O₈ equivalent.

P = Preliminary data. R=Revised data. Final 1994 data reported in the 1995 survey.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

1. U.S. Uranium Raw Materials Industry

Introduction

The levels of activity in the U.S. uranium raw materials industry were higher at the end of 1995, compared with 1994. Expenditures for exploration, drilling, and related activities reported for 1995 were more than in 1994 (Figure 1). Uranium concentrate production also increased in 1995 (Figure 2). Total employment for uranium exploration, mining, milling, and processing increased in 1995 compared with 1994 (Figure 3). Employment for reclamation activities has risen steadily since 1993.

Uranium concentrate was produced in 1995 from conventional milling, in situ leach methods, and as a byproduct of wet-process phosphoric acid manufacture. One conventional uranium mill was in commercial operation in 1995, and it milled ore stockpiled in years prior to 1993. Also, a small amount of uranium was recovered from the processing of mine water and other materials.

Exploration and Development Activities

Land Holdings and Acquisitions

U.S. uranium exploration companies held 259 thousand acres for all exploration purposes at the end of 1995 (Table 1). This represents the lowest amount of land held for exploration at year end since 1974 and is one tenth of the number of acres held in 1986. Only 7,000 acres were acquired for exploration at a total cost of \$69 thousand (Table 2). The types of land acquired and held include fee land, mineral fee leases, patented and unpatented mining claims, and options to purchase mineral fee land.

Surface Drilling

Surface drilling (exploration and development) in the United States was 1.3 million feet in 2,312 holes (Table 1). Development drilling footage in 1995 was 947 thousand feet, a three-fold increase compared with 1994, while exploration drilling footage increased slightly.

Expenditures for Uranium Exploration and Development

Total U.S. uranium exploration and development expenditures in 1995 were \$6.0 million, consisting of (in millions) \$0.1 for land, \$2.6 for surface drilling, and \$3.4 for other exploration activities (Table 2). This represents a 64 percent increase over the 1994 level, but only slightly more than half of the 1993 level. Participation from foreign sources to U.S. exploration expenditures in 1995 were \$2.1 million, which represents 35 percent of the total U.S. expenditures in 1995.

Estimates of U.S. Uranium Reserves

As of the end of 1995, the EIA's estimates of uranium reserves in the \$30- and \$50-per-pound categories were 290 and 947 million pounds, respectively. Underground mining reserves accounted for about one-half of the total reserves in each cost category (Table 3). Three States, New Mexico, Texas and Wyoming, contained about 73 percent of \$30-per-pound U_3O_8 reserves (Appendix B, Table B4). Reserve estimates represent the quantities of uranium (as U_3O_8) that occur in known deposits such that portions of the mineralized deposits can be recovered at specific costs under current regulations using state-of-the-art mining and milling methods. The specified forward-cost categories used for the reserves are not equivalent to current market prices.

Mine Production of Uranium

During 1995, a total of 3.5 million pounds U_3O_8 of uranium were produced by U.S. mines, the highest level of production since 1991 (Table 4). This is in contrast to 1991 and prior years when most of the production came from conventional (open pit and underground) mines. Other sources were recovery of uranium from waste mine water and from reclamation activities at closed in situ mine sites. Compared with 1994, in situ leach mine production increased 38 percent in 1995. For the third straight year, commercial mining at underground and openpit mines did not occur.

There were five commercially operated in situ leach mines at the end of 1995, the same as in 1994 (Table 4). One in situ leach mine (Irigaray in Wyoming) was permanently shutdown and one (Rosita in Texas) resumed commercial operation during 1995.

Concentrate Production and Shipments

U.S. uranium concentrate production in 1995 was 6.0 million pounds U_3O_8 , an increase of 80 percent above the 1994 level (Table 5). Concentrate production from conventional mills was 1.6 million pounds. This was the first year that uranium concentrate was produced commercially at conventional mills in the United States since 1992.

Concentrate production in the "Other Processing" category includes production from in situ leaching and as a byproduct of phosphate processing. Compared with 1994, this category increased 34 percent and totaled 4.4 million pounds U_3O_8 in 1995.

Shipments of uranium concentrate from domestic production facilities (mills, in situ and phosphate byproduct plants) totaled 5.5 million pounds in 1995 (Table 5). The total annual production of 6.0 million pounds exceeded annual shipments for the first year since 1988, which resulted in an overall increase of 0.5 million pounds in concentrate inventories held at production facilities at the end of 1995.

Status of Uranium Processing Facilities

At the end of 1995, one conventional mill in the United States was commercially producing uranium concentrate

from stockpiled ores mined prior to 1993. This mill, White Mesa in Utah, has a capacity of 2,000 short tons of ore per day (Table 6). A small amount of uranium concentrate was recovered (at other mills) from processing of mine water and materials recovered from water treatment plants.

Seven nonconventional uranium producing plants, consisting of five in situ leach plants and two phosphate byproduct plants, were in commercial operation in the United States at the end of 1995. These plants had a combined rated capacity of 6.4 million pounds U_3O_8 per year (Table 7). Eight nonconventional plants were inactive at the end of 1995. Four of the six inactive in situ leach plants had produced a small amount of uranium concentrate in 1995 from reclamation activities. Two other in situ leach plants were on standby, with one having plans to restart in 1996. The two inactive byproduct plants in Florida were closed indefinitely.

The locations of active (commercially operating) and inactive U.S. uranium concentrate production facilities, along with the locations of major uranium reserve areas, are shown in Figure 4.

Employment

Employment in the U.S. uranium raw materials industry in 1995 was reported as 1,107 person years expended (Table 8). Compared with 1994, 1995 employment overall rose 13 percent: mining rose by 44 percent, milling by 15 percent, processing by 8 percent, and reclamation by 9 percent. However, exploration employment declined compared with 1994. For consecutive years since 1992, reclamation employment was more than the combined employment in uranium exploration, mining, milling and processing. Three States, Colorado, Texas and Wyoming, accounted for 65 percent of the total employment in 1995 (Table 9).

Figure 1. Exploration and Development Expenditures, 1986 - 1995

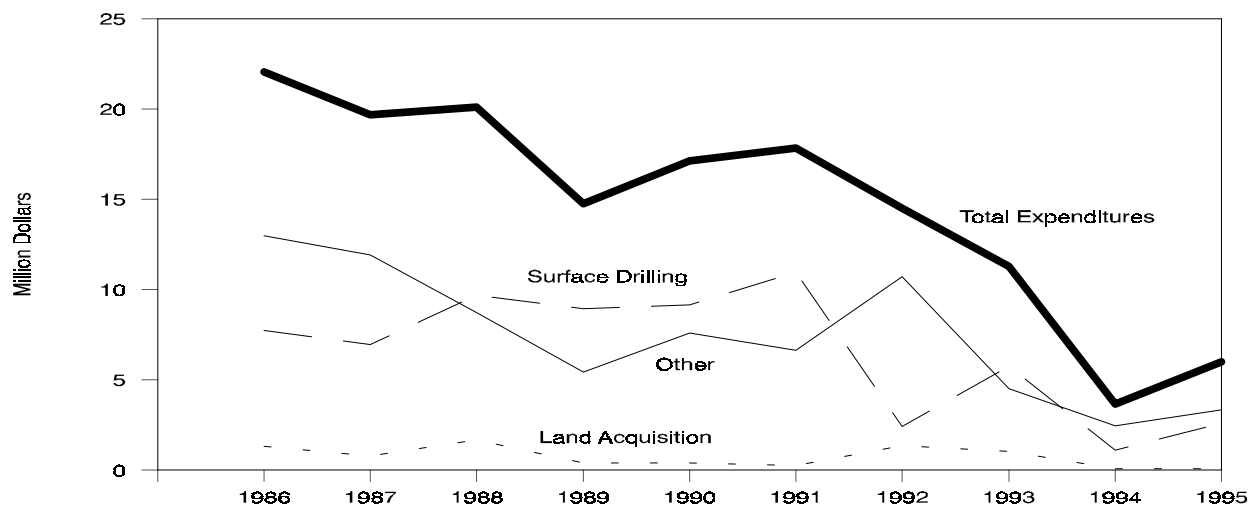


Figure 2. Concentrate Production, 1986 - 1995

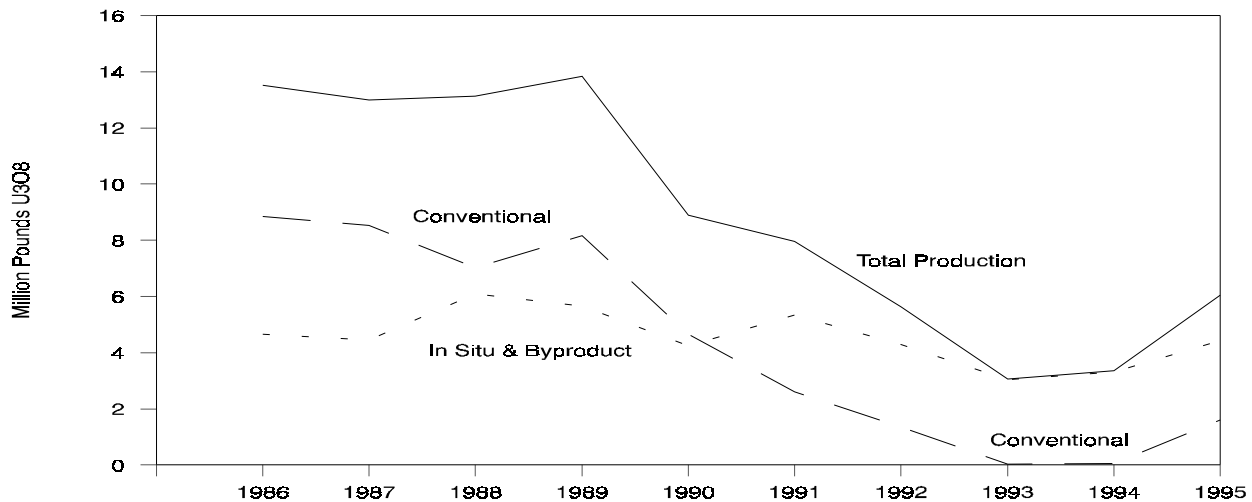
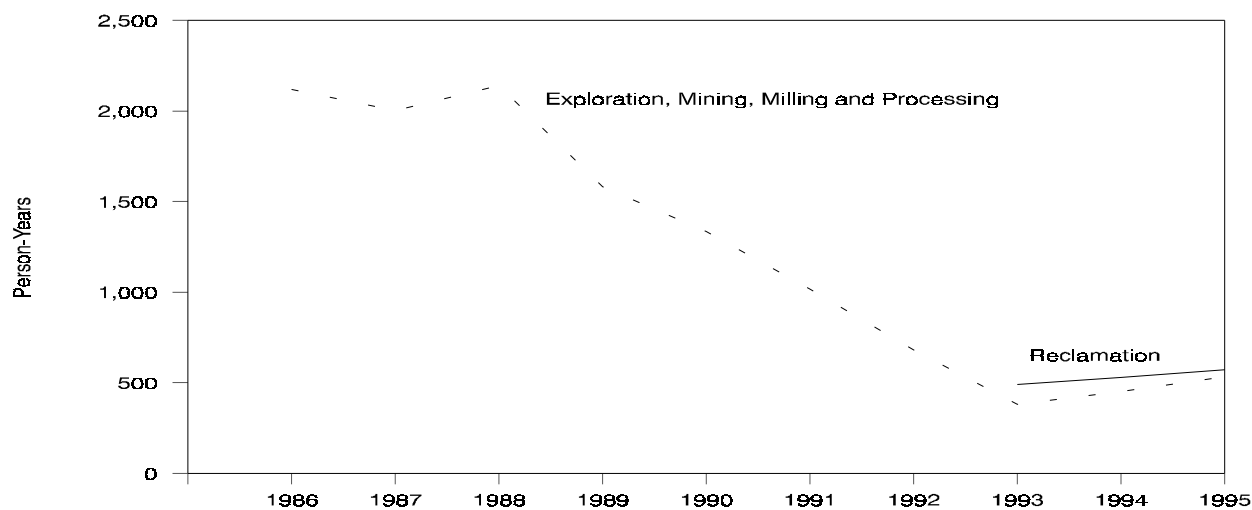


Figure 3. Employment - Raw Materials Sector, 1986 - 1995



Sources: Energy Information Administration: 1986-1994-Uranium Industry Annual 1994 (July 1995). 1995-Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 1. U.S. Uranium Land and Surface Drilling Activities, 1986-1995

Year	Land Exploration		Surface Drilling Exploration			Surface Drilling Development			Surface Drilling Exploration and Development		
	Acres Acquired during Year (thousand)	Acres Held at End of Year (thousand)	Number of Holes	Feet (thousand)	Cost (thousand dollars)	Number of Holes	Feet (thousand)	Cost (thousand dollars)	Number of Holes	Feet (thousand)	Cost (thousand dollars)
1986	220	2,600	1,985	1,100	6,400	1,846	970	1,350	3,831	2,070	7,750
1987	90	1,900	1,820	1,110	5,900	1,994	860	1,060	3,814	1,970	6,960
1988	90	1,700	2,029	1,280	6,440	3,176	1,730	3,260	5,205	3,010	9,700
1989	28	1,529	2,087	1,430	5,820	1,753	800	3,120	3,840	2,230	8,940
1990	38	1,209	1,507	870	3,210	1,908	810	5,950	3,415	1,680	9,160
1991	32	1,060	1,624	973	2,832	1,573	869	8,114	3,197	1,842	10,946
1992	85	788	935	562	1,267	833	502	1,162	1,768	1,064	2,429
1993	65	455	355	223	983	1,665	885	4,754	2,020	1,108	5,737
1994	9	325	519	341	736	477	316	383	996	657	1,119
1995	7	259	584	402	790	1,728	947	1,799	2,312	1,348	2,589

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995). **1995-Form EIA-858, "Uranium Industry Annual Survey" (1995).**

Table 2. Expenditures for Exploration and Development of Uranium in the United States, 1986-1995 (Thousand Dollars)

Year	Surface Drilling	Land Acquisition	Other Exploration and Development Expenditures	Total U.S. Expenditures	Foreign Participation	
					Expenditures	Percent of Total U.S. Expenditures
1986	7,740	1,330	12,990	22,060	12,000	54
1987	6,960	790	11,920	19,670	11,900	60
1988	9,700	1,670	8,730	20,100	8,900	44
1989	8,940	390	5,430	14,770	6,100	41
1990	9,150	400	7,580	17,120	2,530	15
1991	10,946	250	6,649	17,845	3,500	20
1992	2,429	1,365	10,716	14,510	8,004	55
1993	5,737	1,024	4,509	11,270	8,527	76
1994	1,119	71	2,464	3,654	1,864	51
1995	2,589	69	3,350	6,008	2,078	35

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995). **1995-Form EIA-858, "Uranium Industry Annual Survey" (1995).**

Table 3. Forward-Cost Uranium Reserves by Mining Method, 1995

Mining Method	Forward-Cost Category					
	\$30 per pound			\$50 per pound		
	Ore (million tons)	Grade ^a (percent U ₃ O ₈)	U ₃ O ₈ (million pounds)	Ore (million tons)	Grade ^a (percent U ₃ O ₈)	U ₃ O ₈ (million pounds)
Underground	25	0.274	139	143	0.163	466
Openpit	10	0.139	29	163	0.079	258
In Situ Leaching	46	0.133	122	131	0.079	208
Other ^b	< 1	0.263	< 1	15	0.050	15
Total	82	0.178	290	453	0.105	947

^aWeighted average percent U₃O₈ per ton of ore.

^bIncludes heap leach, mine water, and low grade stockpiles.

Notes: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in this table. Reserves values in forward-cost categories are cumulative: that is, the quantity at each level of forward-cost includes all reserves at the lower costs. Totals may not equal sum of components because of independent rounding.

Sources: Estimated by Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 4. U.S. Uranium Mine Production and Number of Mines and Sources, 1986-1995

Mining Method	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Underground (thousand pounds U ₃ O ₈)	6,400	4,900	5,400	5,300	W	W	W	0	0	0
Openpit (thousand pounds U ₃ O ₈)	W	W	W	W	1,881	2,528	W	0	0	0
In Situ Leaching (thousand pounds U ₃ O ₈)	W	W	W	W	W	W	W	W	2,448	3,372
Other ^a (thousand pounds U ₃ O ₈)	1,800	1,100	4,100	4,400	3,995	2,654	986	2,050	78	156
Total Mine Production (thousand pounds U ₃ O ₈)	8,300	6,000	9,500	9,700	5,876	5,182	986	2,050	2,526	3,528
Number of Mines Operated										
Underground	13	19	17	19	27	6	4	0	0	0
Openpit	4	2	4	2	2	2	1	0	0	0
In Situ Leaching	12	15	11	9	7	6	4	5	5	5
Other Sources ^b	2	1	0	2	3	1	8	7	7	7
Total Mines and Sources	31	37	32	32	39	15	17	12	12	12

^aFor 1986 through 1989, "Other" includes production from openpit, in situ leach, heap leach, mine water, and water-treatment plant solutions. Production quantities were rounded to the nearest 100 thousand pounds. For 1990 and 1991, "Other" includes production from underground, in situ leach, heap leach (1990), mine water, water treatment plant solutions (1990), and restoration. For 1992, "Other" includes production from underground, openpit, and in situ leach mines and uranium bearing water from mine workings, tailings ponds, and restoration. For 1993, the "Other" includes production from in situ leach mines and uranium bearing water from mine workings and restoration. For 1994 and 1995, "Other" includes production from uranium bearing water from mine workings and restoration.

^bOther Sources includes, in various years, heap leach, mine water, mill site cleanup and mill tailings, well field restoration, and low-grade stockpiles as sources of uranium.

W=Data withheld to avoid disclosure. The data are included in the total for "Other."

Notes: Totals may not equal sum of components because of independent rounding. Table does not include byproduct production and sources.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table 5. U.S. Uranium Concentrate Processing Operations, 1986-1995

Processing Operations	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Ore Fed to Process ^a (thousand tons)	1,308	1,441	1,214	1,235	722	639	256	0	0	167
Percent U ₃ O ₈ ^b	0.336	0.284	0.288	0.323	0.293	0.198	0.229	--	--	0.520
Contained U ₃ O ₈ (thousand pounds)										
In Ore	8,783	8,191	6,998	7,977	4,227	2,529	1,171	0	0	1,739
Other Feed Materials ^c	260	474	507	429	485	179	181	42	78	163
Total Mill Feed (thousand pounds U ₃ O ₈)	9,043	8,664	7,505	8,406	4,712	2,708	1,353	42	78	1,902
In-Process Inventory Change	-64	-210	136	-234	-244	-122	-25	10	24	157
(thousand pounds U ₃ O ₈)										
Concentrate Produced at Mills (thousand pounds U ₃ O ₈)										
Theoretical ^d	9,107	8,874	7,369	8,640	4,956	2,830	1,377	31	54	1,744
Actual	8,853	8,536	7,034	8,175	4,649	2,608	1,359	30	46	1,615
Recovery as Percent of Total Mill Feed ...	97.2	96.2	95.5	94.6	93.8	92.2	98.7	--	--	92.6
Tailings and Unaccountable. (thousand pounds U ₃ O ₈)	254	338	335	465	307	222	18	1	8	130
Other Processing ^e (thousand pounds U ₃ O ₈)	4,653	4,455	6,096	5,662	4,237	5,344	4,286	3,033	3,306	4,428
Total Uranium Concentrate Production (thousand pounds U ₃ O ₈)	13,506	12,991	13,130	13,837	8,886	7,952	5,645	3,063	3,352	6,043
Total Concentrate Shipped From Mills and Plants										
(thousand pounds U ₃ O ₈)	10,641	11,558	12,791	14,808	12,957	8,437	6,853	3,374	6,319	5,500

^aUranium ore "fed to process" in any year can include: ore mined and shipped to a mill during the same year, ore that was mined during a prior year and later shipped from mine-site stockpiles, and/or ore obtained from drawdowns of stockpiles maintained at a mill site.

^bWeighted average percent U₃O₈ per ton of ore.

^cIncludes for various years uranium from low-grade ore, mill cleanup, mine water, tailings water, and heap leaching, except as footnoted below.

^dAt 100-percent recovery.

^eU₃O₈ concentrate production from in situ leaching and as a byproduct of other processing. The totals for 1986 through 1988 include U₃O₈ recovered from reclamation and mine water at some mills that did not report processing of uranium ore for those years.

^fTotal does not include uranium concentrate production from pilot projects or other research project sources.

--=Not applicable.

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table 6. Operating Status of Conventional Uranium Mills, End of the Year, 1992-1995

Mill Owner	Name	Milling Capacity ^a (short tons of ore per day)	Operating Status at End of the Year			
			1992	1993	1994	1995
Cotter	Canon City	1,200	I	I	I	I
Dawn Mining	Ford	450	I	I	I	I
Energy Fuels Nuclear	White Mesa	2,000	I	I	I	O
Green Mountain Mining Venture	Sweetwater	3,000	I	I	I	I
Rio Algom Mining	Ambrosia Lake	7,000	I	I	I	I
U.S. Energy/Plateau Resources	Shootaring	^b 750	I	I	I	I
Summary of Mill Status						
Number of Mills						
Operating ^c	--	--	0	0	0	1
Inactive	--	--	6	6	6	5
Total	--	--	6	6	6	6
Available Milling Capacity						
Operating (tons of ore per day)	--	--	0	0	0	2,000
Inactive (tons of ore per day)	--	--	14,650	14,650	14,650	12,400
Total Available Capacity (tons of ore per day)	--	--	14,650	14,650	14,650	14,400
Average Daily Mill Feed						
(tons of ore per day) ^d	--	--	730	0	0	476
Percent of Total Available Capacity ^e	--	--	5	0	0	3

^aMilling capacity based on historical data and data reported on Form EIA-858 for 1995.

^bFor 1992 through 1994, Shootaring's capacity was 1,000 short tons of ore per day.

^cNumber of mills being operated to process uranium at the end of year.

^dRounded value. Based on 350 workdays per year and total ore fed to process during the year shown in Table 5.

^eRounded value. Calculated based on ore fed to process (Table 5) during 350 workdays per year.

O=Operating at the end of the year; I=Inactive at the end of the year.

--=Not applicable.

Sources: Energy Information Administration: **1992-1994-Uranium Industry Annual 1994** (July 1995). **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table 7. Operating Status of Nonconventional Uranium Plants, 1995

Plant Owner	Name	Plant Type	Rated Capacity ^a (thousand pounds U ₃ O ₈ per year)	Operating Status at the End of the Year ^b
Converse County Mining Venture	Highland	In Situ Leach	2,000	O
COGEMA Mining, Inc.	West Cole	In Situ Leach	200	I
Crow Butte Resources	Crow Butte	In Situ Leach	1,000	O
Everest Minerals	Hobson	In Situ Leach	1,000	I
IMC-Agrico Company	Sunshine Bridge	Phosphate Byproduct	420	O
IMC-Agrico Company	Uncle Sam	Phosphate Byproduct	750	O
IMC-Agrico Company	Plant City	Phosphate Byproduct	608	I
IMC-Agrico Company	New Wales	Phosphate Byproduct	750	I
Malapai Resources	Christensen Ranch	In Situ Leach	650	O
Malapai Resources	Holiday-El Mesquite	In Situ Leach	600	O
Malapai Resources	Irigaray	In Situ Leach	350	I
Malapai Resources	O'Hern	In Situ Leach	^c 0	I
Rio Algom Mining Company	Smith Ranch	In Situ Leach	250	I
Uranium Resources, Inc.	Kingsville Dome	In Situ Leach	1,300	I
Uranium Resources, Inc.	Rosita	In Situ Leach	1,000	O

^aMilling capacity based on data reported on Form EIA-858 for 1995.

^bO=Operating at the end of the year; I=Inactive at the end of the year.

^cMalapai Resources did not report a rated capacity for the O'Hern plant.

Note: Pathfinder Mines, Inc. has been granted a commercial license for its North Butte-Ruth in situ leach project in Campbell County, Wyoming.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 8. Employment in the U.S. Uranium Industry by Category, 1986-1995
(Person-Years)

Year	Employment Categories					Total
	Exploration	Mining	Milling	Processing	Reclamation ^a	
1986	162	954	513	490	NA	2,120
1987	183	819	432	568	NA	2,002
1988	144	849	572	576	NA	2,141
1989	86	659	367	471	NA	1,583
1990	73	664	304	293	NA	1,335
1991	52	411	191	361	NA	1,016
1992	51	219	129	283	NA	682
1993	36	133	65	145	491	871
1994	41	157	105	149	528	980
1995	27	226	121	161	573	1,107

^aData on reclamation employment was not collected prior to 1993.

NA = Not available.

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table 9. Employment in the U.S. Uranium Industry by State, 1995
(Person-Years)

State(s)	Total	Percent of Total
Wyoming	350	32
Texas	253	23
Colorado	116	10
Arizona, New Mexico, Utah	233	21
Other ^a	155	14
Total	1,107	100

^aIncludes Florida, Louisiana, Nevada, Washington.

Notes: Totals may not equal sum of components because of independent rounding. Total employment includes 573 person years for reclamation.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

2. Uranium Marketing Activities in the United States

Introduction

Movement of both natural and enriched uranium materials illustrates, for 1995, the normal market mechanisms used by U.S. suppliers and utilities to procure and dispose of uranium (Figure 5). The uranium quantities throughout this chapter are expressed as U_3O_8 equivalent (U_3O_8e). U.S. utilities acquire uranium each year both from domestic suppliers (domestic purchases) and foreign suppliers (foreign purchases).

Domestic suppliers are U.S.-based firms that exchange, loan, purchase, or sell uranium, and are not domestic electric utilities. They can include uranium brokers, converters, enrichers, fabricators, traders, producers, and uranium property holders. Foreign suppliers and foreign utilities are non-U.S. based firms that market uranium into and from the United States.

Uranium market activities of domestic utilities include purchases from both domestic and foreign suppliers of uranium from domestic and foreign sources, contracting for future supplies, and anticipated uranium requirements of U.S. utilities. In addition, this chapter also presents enrichment activities, the amount of uranium loaded into reactors, total levels of imports and exports, purchases by U.S. brokers and traders, and the year-end 1995 status of uranium inventories in the United States.

Uranium Market Activity of U.S. Utilities

Uranium Purchases

In 1995, U.S. utilities received 43.4 million pounds U_3O_8e , and the average price was \$11.25 per pound (Table 10). Compared with 1994, the quantity is an increase of 13 percent (Figure 6). Foreign-origin uranium accounted for 38.2 million pounds (88 percent) of the deliveries at an average price of \$10.84 per pound (Table 11). Approximately 40 percent of all uranium received by U.S. utilities was Canadian origin (Table 12). In rank order, the next four country origins were Russia (13 percent), United States (12 percent), Australia (10 percent), and Uzbekistan (9 percent) (Figure 7).

The utilities purchased uranium of several material types (Table 13). Uranium concentrate (U_3O_8) accounted for 85 percent of the purchases, uranium hexafluoride (UF_6) was 13 percent, and enriched uranium was 2 percent (Figure 8).

Purchases of uranium (both U.S. and foreign-origin) from domestic suppliers by domestic utilities in 1995 totaled 22.3 million pounds U_3O_8e , 0.4 million pounds less than the deliveries for 1994 (Table 14). The average price of these domestic purchases in 1995 was \$11.11 per pound.

Purchases of uranium (only foreign-origin) from foreign suppliers by U.S. utilities in 1995 totaled 21.1 million pounds U_3O_8e , 5.6 million pounds more than the deliveries for 1994. The average price of these foreign purchases in 1995 was \$11.39 per pound.

Uranium Price Distributions and Contract Types

A pricing mechanism was reported for each price of a uranium delivery. One mechanism, contract-specified, was dominant for deliveries in 1995, whereas, the market-related with no floor pricing mechanism was prevalent in 1994 (Table 14).

While average prices of uranium had risen by 8 percent from its 1994 level of \$10.40 per pound to \$11.25 per pound in 1995, the range of prices from highest to lowest was more narrow in 1995 (Table 15).

During 1995, 67 percent of the deliveries to utilities involved purchases under spot and long-term arrangements. The average price for spot purchases was \$10.30 per pound, and for long-term purchases was \$12.57 per pound (Table 16).

New Uranium Purchases

The quantity of uranium delivered in 1995 under 63 new purchase contracts was 15.6 million pounds U_3O_8e , and the average price was \$10.37 per pound (Table 17). Of this quantity, 51 new spot contracts accounted for 12.4 million pounds in 1995.

Future deliveries reported for 1996 through 2005, for contracts signed in 1995, total 39.8 million pounds. Of this quantity, firm deliveries amount to 33.2 million pounds (Table 18).

Anticipated Uranium Market Requirements

Future deliveries for 1996-2005, based on contracts reported in effect at the end of 1995, for all purchase contracts consisted of 123.7 million pounds for firm deliveries and 47.0 million pounds for optional deliveries (Table 19). Foreign suppliers have contracts for 57 percent of the existing firm deliveries to utilities through 2005.

At the end of 1995, cumulative unfilled uranium requirements for commercial nuclear reactors for 1996 through 2005 were reported to be 314.0 million pounds U_3O_8e (Table 20). The quantity of firm and optional deliveries of uranium for the same period under existing purchase contracts totaled 170.7 million pounds (Table 21). The contracted deliveries and unfilled requirements combined represent the U.S. utilities anticipated market requirements of uranium (Figure 9). The total ten-year requirements of U.S. utilities, at the end of 1995, was 484.7 million pounds.

Unfilled requirements category, as reported at the end of 1995, constitute a small portion of anticipated market requirements in 1996. However, it increases to 55 percent of total anticipated requirements by 1999 and to 95 percent by 2005. For the years 1996 through 1998 it would appear that utilities meet a portion of their enrichment feed deliveries by drawing down uranium inventories (Figure 9). However, for 1999 through 2005, the utilities' enrichment feed deliveries are less than their anticipated market requirements, indicating perhaps a period of uranium inventory build-up or an increase in purchases of enriched uranium product by the U.S. utilities (Table 21).

Uranium Enrichment Activities

Uranium Feed for Enrichment

In 1995, U.S. utilities delivered 44.3 million pounds U_3O_8e of natural uranium feed to domestic and foreign enrichment suppliers (Table 22). U.S.-origin uranium accounted for 9.2 million pounds (21 percent) of the feed deliveries (Table 23). Of the 44.3 million pounds, 77

percent was delivered to the United States Enrichment Corporation (USEC) enrichment plants.

A total of 10.4 million pounds of uranium feed was delivered to foreign enrichment plants in 1995 (Figure 10). Enrichment feed deliveries to foreign enrichment plants was 23 percent of total feed deliveries in 1995, compared with 11 percent in 1994.

At the end of 1995, the U.S. utilities reported that the amount of natural uranium feed to be shipped for enrichment for the years 1996 through 2005 will vary between 30 million and 53 million pounds annually (Table 24). The total 10-year quantity of natural uranium that utilities expect to send for enrichment is reported at the end of 1995 to be 12.4 million pounds higher than the quantity reported at the end of 1994 for the same period.

Purchases of Enrichment Services

In 1995, 9.5 million separative work units (SWU) were purchased by U.S. utilities under enrichment services contracts (Table 25.) USEC provided 71 percent of the utilities' SWU and foreign enrichers the remaining 29 percent. In comparison in 1994, U.S. enrichment plants provided 82 percent of the utilities' enrichment needs.

The long-term enrichment service contracts were dominant in 1995, and represented 84 percent of total contracts and were provided at both U.S. and foreign enrichment plants (Table 26). In contrast, uranium enrichment under spot contracts represents only 4 percent of total contracts and was only provided at foreign enrichment plants.

Fuel Assemblies

The total amount of uranium contained in fuel assemblies loaded into U.S. commercial nuclear reactors during 1995 was 51.1 million pounds U_3O_8e (Table 27). This was 10.7 million pounds more than in 1994 (Figure 11). These quantities do not include uranium in fuel assemblies removed from reactors that may be reloaded later.

Imports

In 1995, 41.3 million pounds U_3O_8e was delivered to U.S. suppliers and U.S. utilities from foreign suppliers in 1995 (Table 28). The average price for the foreign purchases was \$10.20 per pound U_3O_8e . This is 14 percent higher than the 1994 average import price of \$8.95 per pound.

Purchases by U.S. Brokers and Traders

In 1995, U.S. brokers and traders received 22.9 million pounds U_3O_8 of uranium at an average price of \$9.53 per pound (Table 29). Brokers and traders received 3.4 million pounds of U.S.-origin uranium and 19.6 million pounds of foreign origin. Most of the uranium (18.3 million pounds or 80 percent) was from foreign suppliers. In 1994, by comparison, U.S. brokers and traders received 30.8 million pounds U_3O_8 at an average price of \$8.29 per pound.

Exports

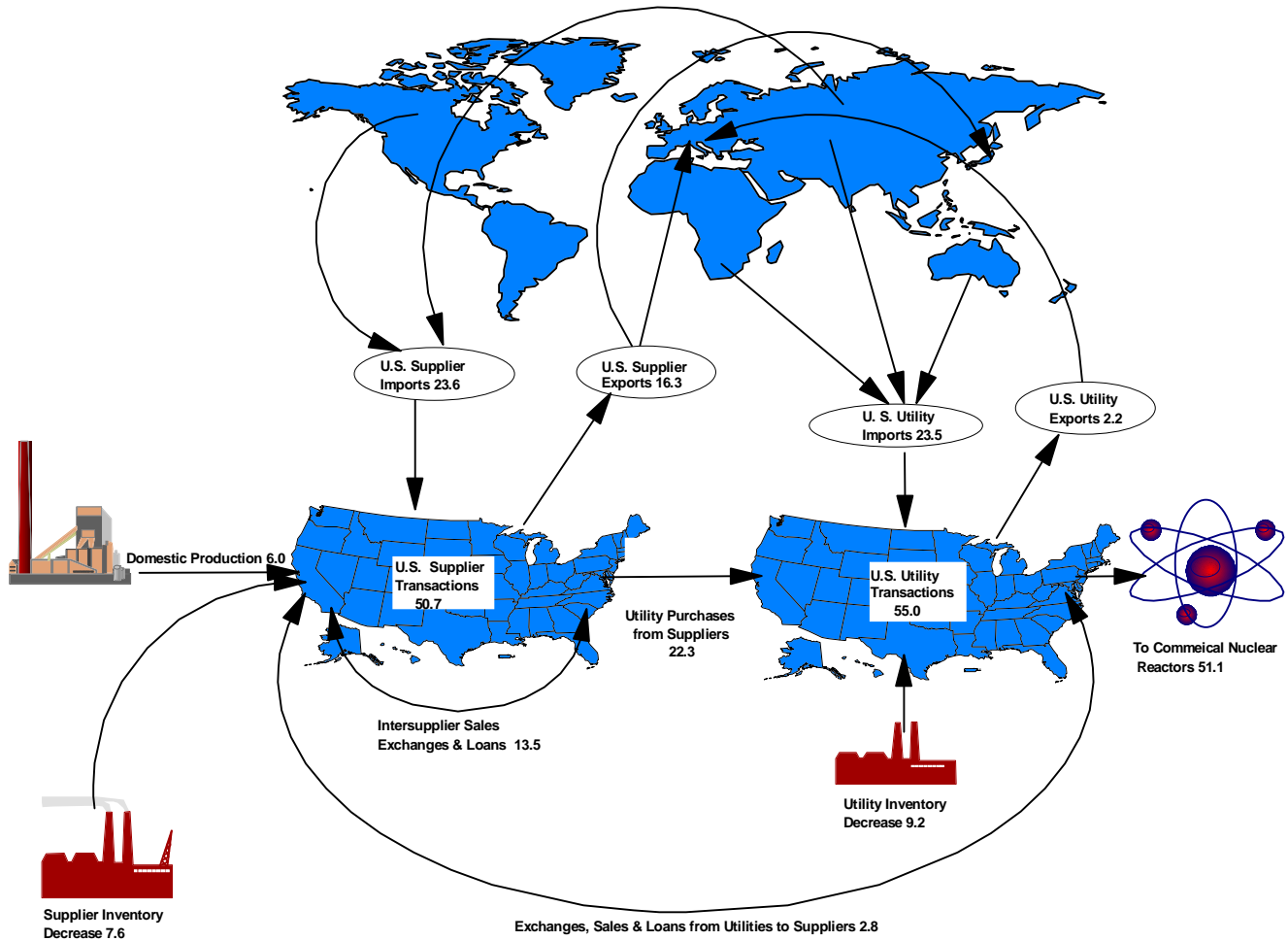
In 1995, uranium deliveries exported to foreign suppliers and foreign utilities was 9.8 million pounds U_3O_8 , 45 percent less than in 1994, and the average price was \$13.48 per pound, 19 percent more than in 1994 (Table 30). Of the exported uranium, 52 percent was foreign-origin and 48 percent was U.S.-origin. U.S. brokers and traders sold 5.5 million pounds at an average export price of \$9.83 per pound in 1995.

Uranium Inventories

Total commercial inventories of all material types, as of December 31, 1995, were 70.1 million pounds U_3O_8 , a decrease of 16.8 million pounds compared with the end of 1994 (Table 31). U.S. utility inventories decreased by 9.2 million pounds or 14 percent (Figure 12). U.S. supplier inventories totaled 13.9 million pounds at the end of 1995, a decrease of 35 percent. The DOE and USEC inventories of uranium totaled 110.8 million pounds at year-end 1995.

Uranium concentrate inventories on hand, in storage, or at conversion plants at the end of 1995 were 34.3 million pounds U_3O_8 (Table 32), about the same as at the end of 1994. U.S. producers' concentrate inventories totaled 6.2 million pounds (Table 33). Compared with 1994, producer inventories increased by 11 percent. During 1995, U.S. brokers and traders commercial inventories declined 5.0 million pounds, or 43 percent, to 6.7 million pounds.

Figure 5. Uranium Marketing Activity During 1995



Notes: Quantities are in million pounds U₃O₈ equivalent. Imports and exports include uranium from purchases, sales, and net inflows or outflows from exchanges and loan transactions.

Source: Prepared by the Energy Information Administration, Office of Coal Nuclear, Electric and Alternate Fuels, based on data reported on Form EIA-858 for 1995.

Figure 6. U.S. Utilities Purchases of Uranium by Origin and Delivery Year, 1994 - 1995

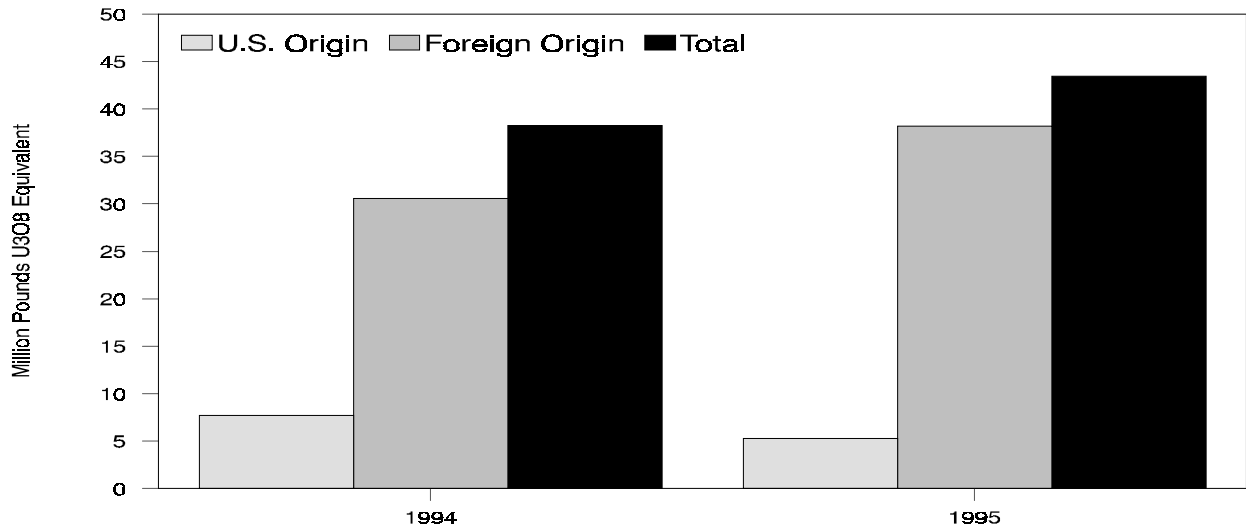


Figure 7. Purchases of Uranium by Selected Country Origin and Delivery Year, 1995

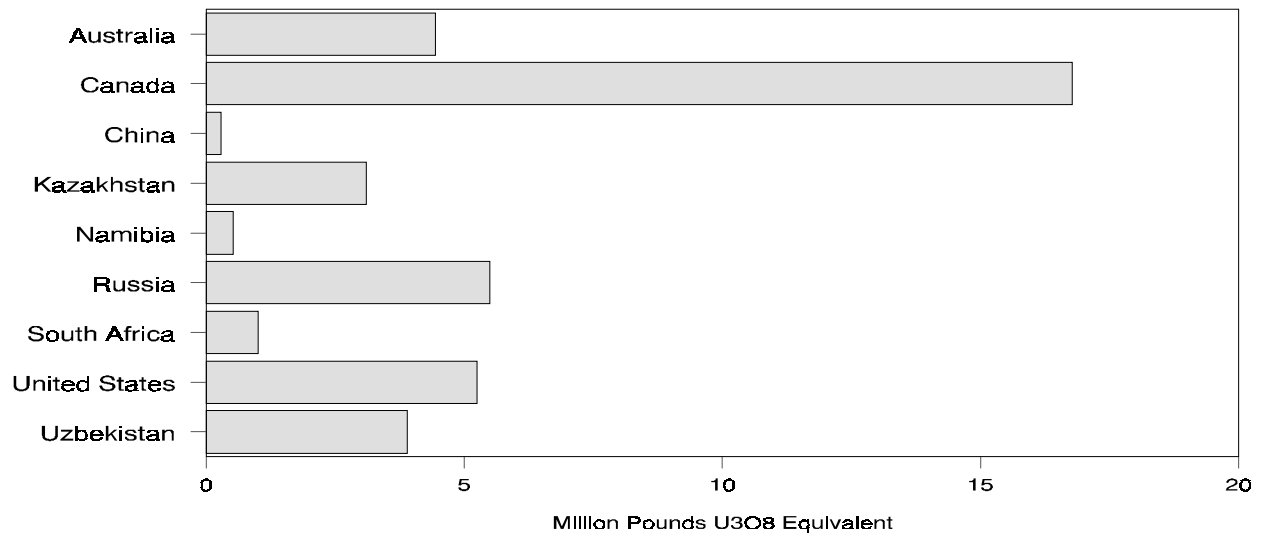
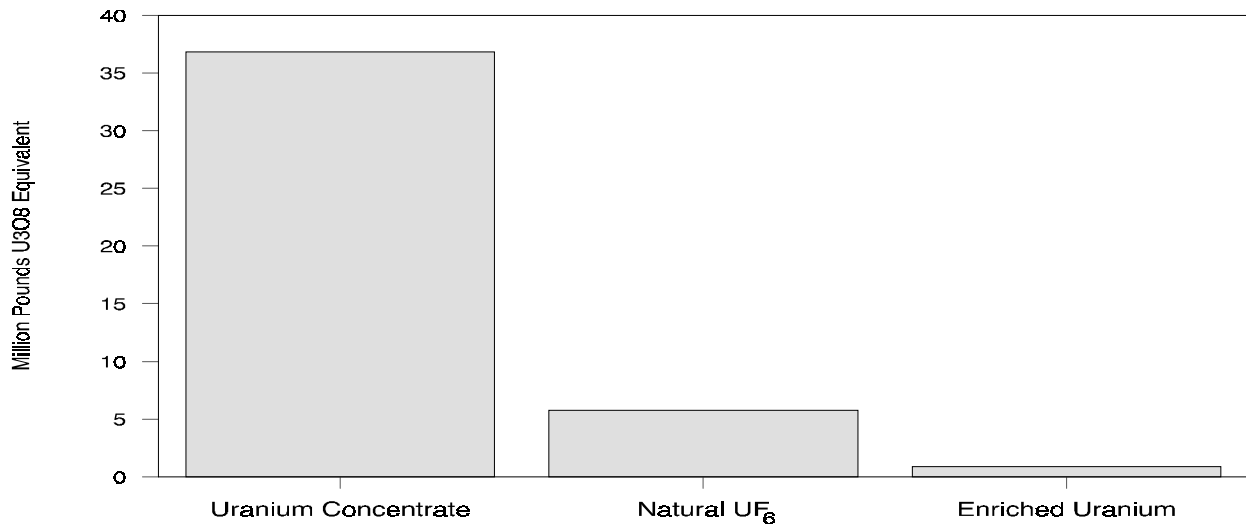


Figure 8. Purchases of Uranium by Material Type and Delivery Year, 1995



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Figure 9. Anticipated Uranium Market Requirements of U.S. Utilities, 1996 - 2005

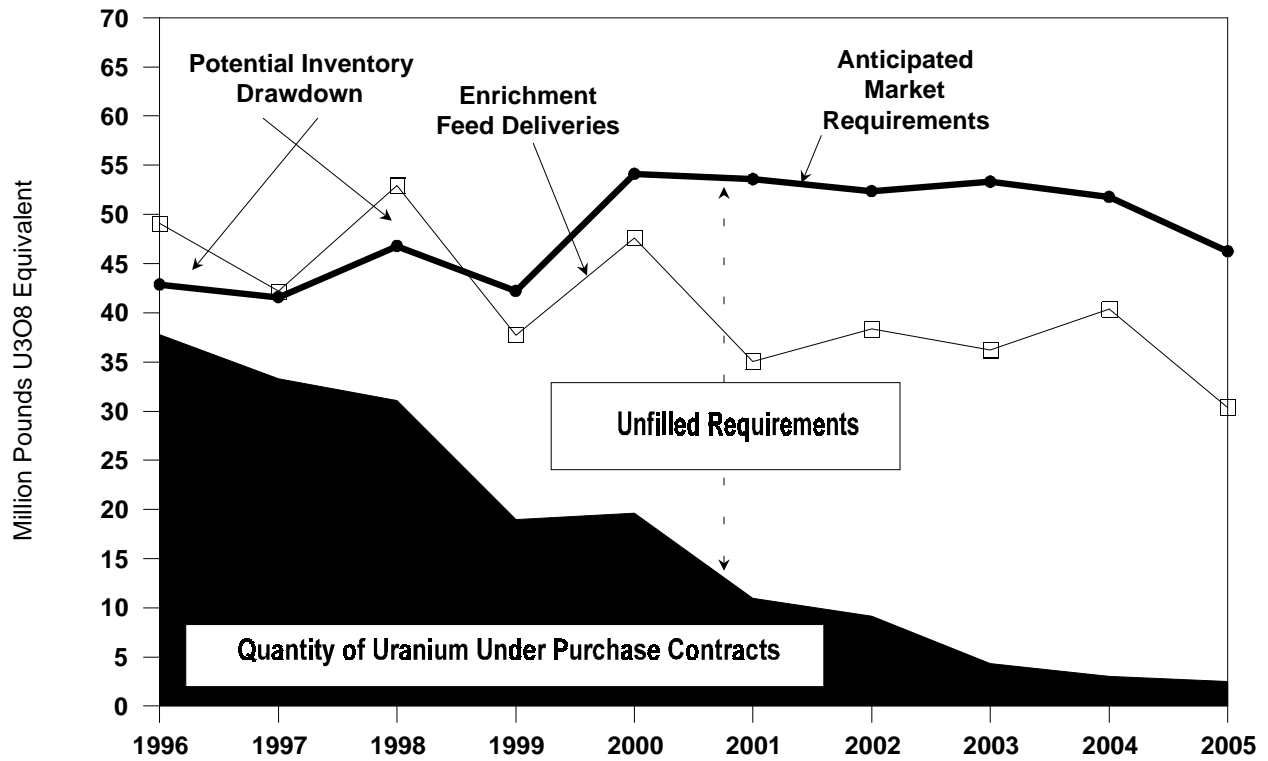
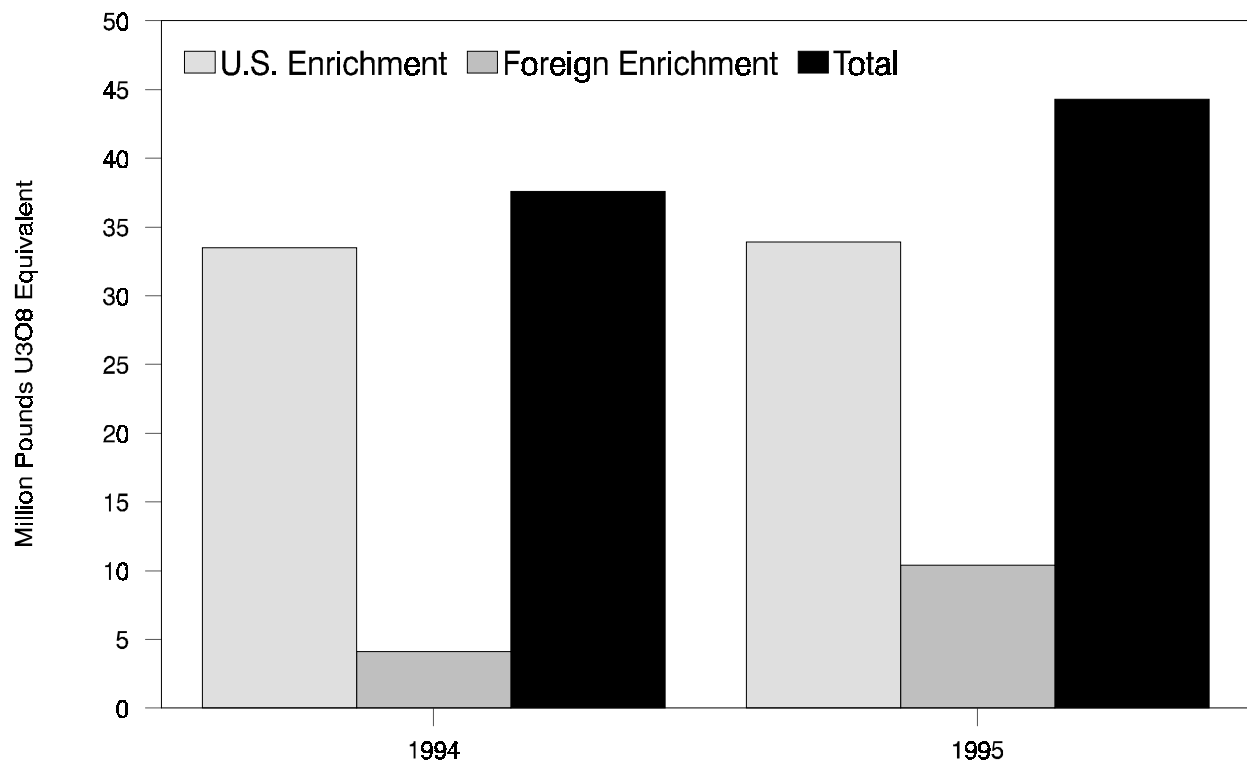


Figure 10. Natural Uranium Feed for Enrichment by Delivery Year, 1994 - 1995



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Figure 11. Uranium Used in Fuel Assemblies for U.S. Commercial Nuclear Reactors, 1994 - 1995

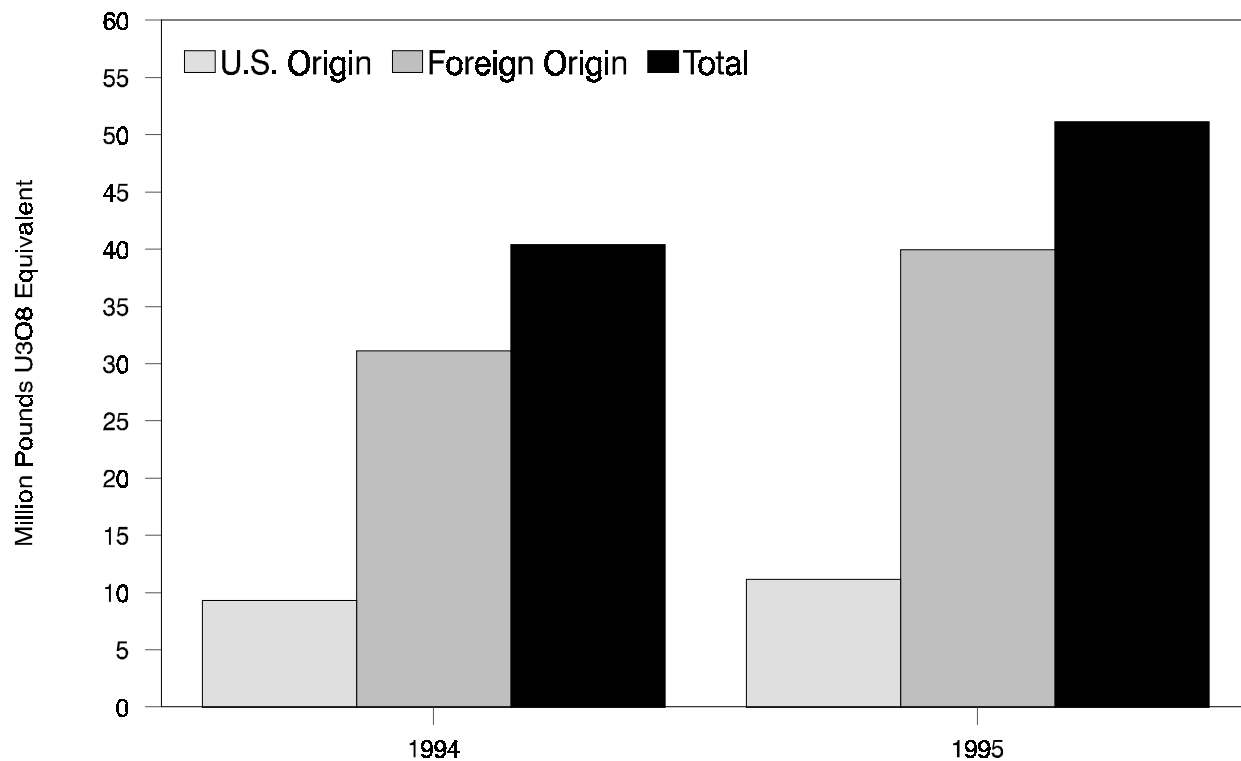
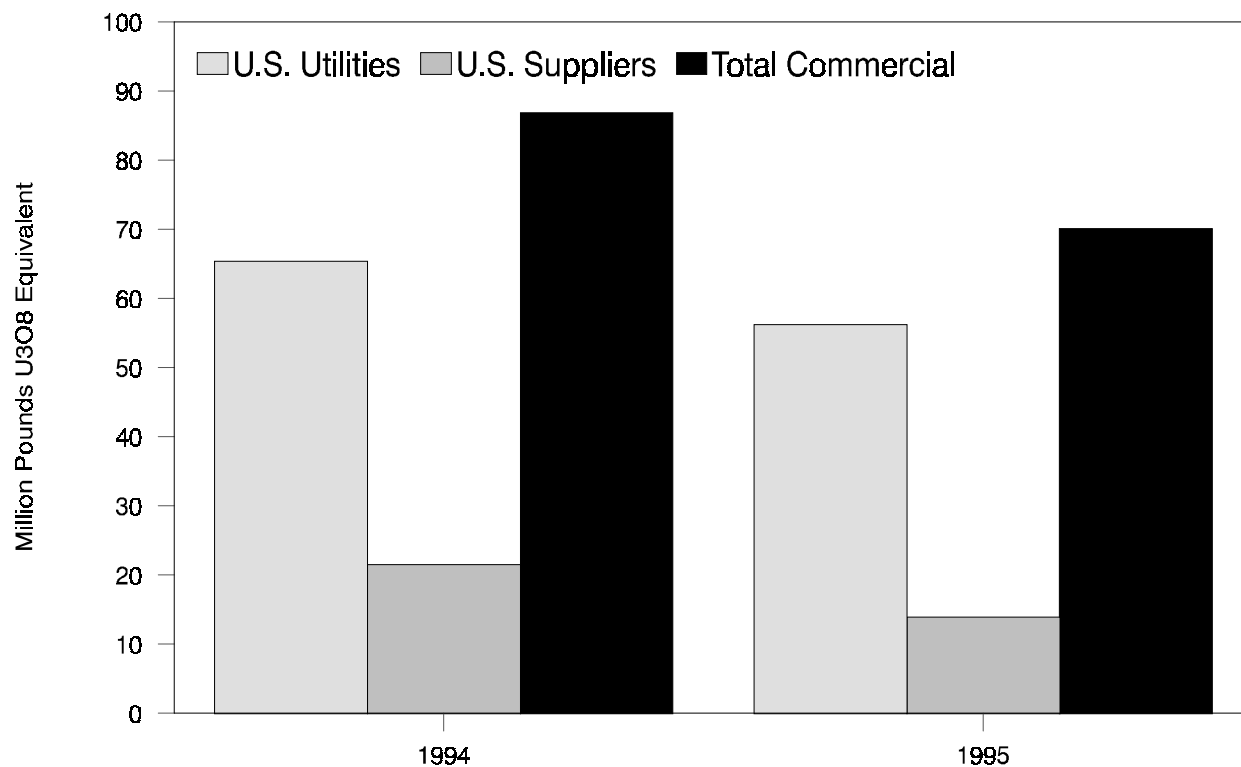


Figure 12. Commercial Uranium Inventories at End of the Year, 1994 - 1995



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 10. U.S. Utilities Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1994-1995

(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Actual Deliveries	1994	1995
Received by U.S. Utilities from U.S. Producers:		
Purchases	5,442	5,289
Weighted-Average Price	13.72	14.84
Received by U.S. Utilities from U.S. Brokers and Traders:		
Purchases	15,284	16,202
Weighted-Average Price	9.34	9.83
Received by U.S. Utilities from other U.S. Utilities:		
Purchases	0	0
Weighted-Average Price	--	--
Received by U.S. Utilities from other U.S. suppliers:		
Purchases	1,092	561
Weighted-Average Price	8.04	12.52
Received by U.S. Utilities from Foreign Suppliers:		
Purchases	16,463	21,389
Weighted-Average Price	10.43	11.40
Total Received by U.S. Utilities:		
Purchases	38,281	43,441
Weighted-Average Price	10.40	11.25

-- = Not applicable.

Note: "Other U.S. suppliers" are U.S. converters, enrichers, and fabricators.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 11. U.S. Utilities Contracted Uranium by Transaction Type and Delivery Year, 1994-1995

(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Actual Deliveries	1994	1995
Received by U.S. Utilities of U.S.-Origin Uranium:		
Purchases	7,718	5,246
Weighted-Average Price	12.08	14.20
Received by U.S. Utilities of Foreign-Origin Uranium:		
Purchases	30,563	38,195
Weighted-Average Price	9.97	10.84
Total:		
Purchases	38,281	43,441
Weighted-Average Price	10.40	11.25

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 12. U.S. Utilities Purchases of Uranium by Origin Country and Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Origin Country	Actual Deliveries in 1994		Actual Deliveries in 1995	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
Australia	2,812	9.88	4,448	10.98
Brazil	W	W	0	--
Canada	14,613	10.49	16,799	11.82
China	1,696	9.56	293	11.49
France	W	W	W	W
Gabon	W	W	W	W
Germany	W	W	W	W
Kazakhstan	2,777	8.94	3,097	8.99
Kyrgyzstan	W	W	W	W
Mongolia	W	W	W	W
Namibia	796	9.76	530	9.88
Niger	0	--	W	W
Netherlands	0	--	W	W
Russia	1,779	8.81	5,500	9.45
South Africa	1,106	9.64	1,002	12.57
Spain	0	--	W	W
Tajikistan	W	W	W	W
Ukraine	W	W	W	W
United Kingdom	W	W	W	W
Uzbekistan	3,550	8.35	3,895	8.61
Foreign Total Quantity	30,563	9.97	38,195	10.84
United States	7,718	12.08	5,246	14.20
Total Quantity	38,281	10.40	43,441	11.25

W=Data withheld to avoid disclosure. -- = Not applicable.

Sources: Energy Information Administration: **1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table 13. U.S. Utilities Contracted Uranium by Transaction Type, Material Type, and Delivery Year, 1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Actual Deliveries	U ₃ O ₈	Natural UF ₆	Enriched Uranium	Total
Received by U.S. Utilities from U.S.-Origin Uranium:				
Purchases	4,627	619	0	5,246
Weighted-Average Price	14.63	11.03	--	14.20
Received by U.S. Utilities of Foreign-Origin Uranium:				
Purchases	32,196	5,134	865	38,195
Weighted-Average Price	10.84	11.10	9.29	10.84
Total:				
Purchases	36,823	5,753	865	43,441
Weighted-Average Price	11.32	11.10	9.29	11.25

-- = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 14. Average Price and Quantity for Purchases of Uranium by U.S. Utilities by Pricing Mechanisms and Delivery Year, 1994-1995
(Dollars per Pound U₃O₈ Equivalent; Thousand Pounds U₃O₈ Equivalent)

Pricing Mechanisms	Domestic Purchases		Foreign Purchases		Total Purchases	
	1994	1995	1994	1995	1994	1995
Contract-Specified Pricing						
Weighted-Average Price	10.68	10.58	11.92	12.96	10.90	11.16
Quantity with Reported Price	11,154	17,065	2,489	5,584	13,643	22,649
Market-Related Pricing						
No Floor Type						
Weighted-Average Price	9.76	10.19	9.21	10.85	9.46	10.72
Quantity with Reported Price	7,083	2,119	8,269	8,278	15,352	10,397
Floor Type						
Weighted-Average Price	20.03	17.86	11.80	10.84	12.91	11.81
Quantity with Reported Price	606	683	3,899	4,291	4,505	4,974
Total Market Related						
Weighted-Average Price	10.57	12.05	10.04	10.85	10.24	11.07
Quantity with Reported Price	7,689	2,802	12,168	12,569	19,857	15,371
Contract Specified and Market Related Pricing						
Weighted-Average Price	10.63	10.79	10.36	11.50	10.51	11.13
Quantity with Reported Price	18,843	19,867	14,657	18,153	33,500	38,020
Spot-Market Pricing						
Weighted-Average Price	9.37	9.07	--	10.26	9.37	9.90
Quantity with Reported Price	714	748	0	1,706	714	2,454
Other Pricing^a						
Weighted-Average Price	8.56	15.87	13.43	11.34	9.61	13.92
Quantity with Reported Price	3,188	1,687	879	1,280	4,067	2,967
All Pricing Mechanisms						
Weighted-Average Price	10.30	11.11	10.53	11.39	10.40	11.25
Quantity with Reported Price	22,745	22,302	15,536	21,139	38,281	43,441

^aCategory used to report pricing mechanisms that are different from the other categories.

--=Not applicable

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 15. Price Distributions of Uranium Purchases by U.S. Utilities by Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Distributions	Actual Deliveries in 1994		Actual Deliveries in 1995	
	Quantity with Reported Price	Weighted-Average Price	Quantity with Reported Price	Weighted-Average Price
Octile^a:				
First	4,785	7.08	5,430	7.50
Second	4,785	8.86	5,430	9.34
Third	4,785	9.13	5,430	9.85
Fourth	4,785	9.23	5,430	10.40
Fifth	4,785	9.35	5,430	11.06
Sixth	4,785	9.54	5,430	11.61
Seventh	4,785	10.89	5,430	12.17
Eighth	4,785	19.08	5,430	18.05
Total Quantity	38,281	10.40	43,441	11.25
Quartile^b:				
First	11,966	8.51	15,601	9.48
Second	9,878	9.35	13,620	10.74
Third	7,828	10.29	5,037	11.69
Fourth	8,609	14.31	9,183	14.75
Total Quantity	38,281	10.40	43,441	11.25

^aOctile distribution divides total pounds of uranium delivered (with a price) into eight distributions by price and provides the quantity-weighted average price for each distribution.

^bQuartile distribution divides total pounds of uranium delivered (with a price) into four distributions by each utility's aggregate weighted-average price and provides the quantity and average price for each distribution.

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1994**-Uranium Industry Annual 1994 (July 1995); **1995**-Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 16. U.S. Utility Uranium Purchases by Contract Type and Material Type, 1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Material Type	Spot Contracts		Short-term Contracts		Medium-term Contracts		Long-term Contracts		Total	
	Quantity with Reported Price	Weighted Average Price	Quantity with Reported Price	Weighted Average Price	Quantity with Reported Price	Weighted Average Price	Quantity with Reported Price	Weighted Average Price	Quantity with Reported Price	Weighted Average Price
U ₃ O ₈	8,968	10.13	3,808	9.17	9,731	11.14	14,316	12.75	36,823	11.32
Natural UF ₆	W	W	0	--	724	12.88	W	W	5,753	11.10
Enriched Uranium	W	W	0	--	0	--	W	W	865	9.29
Total Quantity	13,601	10.30	3,808	9.17	10,455	11.26	15,577	12.57	43,441	11.25

W = Data withheld to avoid disclosure. -- = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 17. New Contracts Signed by U.S. Utilities in 1995 by Contract Type and Delivery Year 1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Purchase Contract Type	Quantity of Actual Deliveries Received in 1995	Weighted-Average Price	Number of New Purchase Contracts
Spot.....	12,417	10.42	51
Short-term	W	W	1
Medium-term	2,365	10.20	10
Long-term	W	W	1
Total	15,573	10.37	63

W = Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 18. U.S. Utilities New Contracted Purchases of Uranium by Delivery Year, 1996-2005
(Thousand Pounds U₃O₈ Equivalent)

Year of Delivery	Firm Deliveries	Optional Deliveries	Total Deliveries
1996	6,590	520	7,110
1997	6,609	1,429	8,038
1998	6,928	1,005	7,933
1999	3,123	945	4,068
2000	4,172	1,269	5,441
2001	2,117	485	2,602
2002	2,160	895	3,055
2003	773	0	773
2004	677	0	677
2005	96	0	96
Total	33,245	6,548	39,793

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 19. U.S. Utilities Contracted Purchases of Uranium from Suppliers, in Effect at the End of 1995, by Delivery Year, 1996-2005
(Thousand Pounds U₃O₈ Equivalent)

Year of Delivery	Purchases from U.S. Suppliers		Purchases from Foreign Suppliers		Purchases from All Suppliers	
	Firm Deliveries	Optional Deliveries	Firm Deliveries	Optional Deliveries	Firm Deliveries	Optional Deliveries
1996	13,863	2,154	18,097	3,673	31,960	5,827
1997	11,207	3,052	14,378	4,649	25,585	7,701
1998	9,096	2,607	14,575	4,793	23,671	7,400
1999	5,065	1,906	8,111	3,907	13,176	5,813
2000	5,781	1,773	9,432	2,616	15,213	4,389
2001	3,426	798	3,558	3,184	6,984	3,982
2002	3,254	1,053	1,939	2,911	5,193	3,964
2003	773	1,352	140	2,085	913	3,437
2004	677	752	140	1,480	817	2,232
2005	96	752	140	1,480	236	2,232
Total	53,238	16,199	70,510	30,778	123,748	46,977

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 20. Unfilled Uranium Requirements of U.S. Utilities, 1996-2005
(Thousand Pounds U₃O₈ Equivalent)

Year	As of December 31, 1994		As of December 31, 1995	
	Annual	Cumulative	Annual	Cumulative
1996	12,293	12,293	5,063	5,063
1997	17,374	29,667	8,285	13,348
1998	24,816	54,483	15,709	29,057
1999	33,986	88,469	23,200	52,257
2000	30,233	118,702	34,497	86,754
2001	44,192	162,894	42,600	129,354
2002	44,950	207,844	43,184	172,538
2003	40,958	248,802	48,955	221,493
2004	44,583	293,385	48,715	270,208
2005	NR	--	43,759	313,967

NR=Not Reported. --=Not applicable.

Source: Energy Information Administration: 1994-1995-Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 21. Anticipated Uranium Market Requirements of U.S. Utilities, 1996-2005, as of December 31, 1995
(Thousand Pounds U₃O₈ Equivalent)

Year	Quantity of Uranium Under Purchase Contracts	Unfilled Requirements	Anticipated Market Requirements	Enrichment Feed Deliveries
1996	37,787	5,063	42,850	49,080
1997	33,286	8,285	41,571	42,182
1998	31,071	15,709	46,780	52,936
1999	18,989	23,200	42,189	37,733
2000	19,602	34,497	54,099	47,625
2001	10,966	42,600	53,566	35,066
2002	9,157	43,184	52,341	38,340
2003	4,350	48,955	53,305	36,206
2004	3,049	48,715	51,764	40,353
2005	2,468	43,759	46,227	30,373
Total	170,725	313,967	484,692	409,894

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 22. U.S. Utilities Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent)

Enrichment Plant Location	Actual Deliveries in 1994			Actual Deliveries in 1995		
	U.S.-Origin	Foreign-Origin	Total	U.S.-Origin	Foreign-Origin	Total
China	W	W	W	0	0	0
France	W	W	1,111	W	W	4,802
Germany	0	0	0	W	W	870
Netherlands	0	1,012	1,012	W	W	951
Russia	W	W	1,345	837	1,874	2,711
South Africa	0	0	0	0	0	0
United Kingdom	0	W	W	0	1,059	1,059
Foreign Total	51	4,059	4,110	1,390	9,003	10,393
United States	8,471	25,027	33,498	7,786	26,115	33,901
Total	8,522	29,086	37,608	9,176	35,118	44,294

W=Data withheld to avoid disclosure.

Sources: Energy Information Administration: 1994-Uranium Industry Annual 1994 (July 1995); 1995-Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 23. U.S. Utilities Deliveries of Uranium Feed for Enrichment by Origin Country and Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent)

Actual Deliveries of Feed by Origin Country	1994	1995
Australia	2,880	3,300
Brazil	W	W
Canada	14,868	17,719
China	1,429	W
France	W	W
Gabon	W	218
Germany	W	365
Kazakhstan	3,470	2,469
Kyrgyzstan	W	W
Mongolia	W	W
Namibia	804	738
Russia	1,764	7,008
South Africa	1,195	709
Spain	W	W
Tajikistan	0	805
Ukraine	W	401
United Kingdom	W	W
Uzbekistan	715	514
Foreign Total Quantity	29,086	35,118
United States	8,522	9,176
Total Quantity	37,608	44,294

W=Data withheld to avoid disclosure.

Source: Energy Information Administration: 1994-1995-Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 24. Shipments of Uranium by U.S. Utilities to Domestic and Foreign Enrichment Suppliers, 1996-2005
(Thousand Pounds U₃O₈ Equivalent)

Year of Shipment	Amount to be Shipped		Change from 1994 to 1995	
	As of December 31, 1994	As of December 31, 1995	Annual	Cumulative
1996	47,401	49,080	1,679	1,679
1997	42,169	42,182	13	1,692
1998	43,487	52,936	9,449	11,141
1999	43,202	37,733	-5,469	5,672
2000	40,917	47,625	6,708	12,380
2001	38,002	35,066	-2,936	9,444
2002	40,330	38,340	-1,990	7,454
2003	35,536	36,206	670	8,124
2004	36,046	40,353	4,307	12,431
2005	NR	30,373	--	--

NR=Not reported. --=Not applicable.

Source: Energy Information Administration: 1994-1995-Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 25. U.S. Utilities Purchases of Enrichment Services by Country and Delivery Year, 1994-1995
(Thousand Separative Work Units (SWU))

Actual Deliveries	1994	1995
Country where Enrichment Service was performed:		
China	237	0
France	549	867
Germany	W	W
Netherlands	W	W
Russia	421	1,108
South Africa	0	0
United Kingdom	W	460
Foreign Total	1,676	2,800
United States	7,521	6,741
Total	9,197	9,540

W=Data withheld to avoid disclosure.

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration: 1994-1995-Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 26. U.S. Utilities Purchases of Enrichment Services by Contract Type in Delivery Year 1995
(Thousand Separative Work Units (SWU))

Enrichment Service Contract Type	U.S. Enrichment	Foreign Enrichment	Total
Spot	0	365	365
Short-term	0	0	0
Medium-term	386	819	1,205
Long-term	6,355	1,615	7,970
Total	6,741	2,800	9,540

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 27. Uranium Loaded into Fuel Assemblies for Commercial Nuclear Reactors by Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent)

Origin of Uranium	1994	1995 ^P
Domestic-Origin Uranium	R9,302	11,146
Foreign-Origin Uranium	R31,098	39,972
Total	R40,400	51,118

P = Preliminary data. R = Revised data. Final 1994 fuel assembly data reported in the 1995 survey.

Notes: Includes only unirradiated uranium in new fuel assemblies loaded into reactors during the year. Does not include uranium removed from reactors that subsequently will be reloaded. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 28. Imports of Uranium by U.S. Suppliers, U.S. Utilities and Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Actual Deliveries	1994	1995
U.S. Suppliers:		
Foreign Purchases (Imports)	21,082	20,162
Weighted-Average Price	7.78	8.96
U.S. Utilities:		
Foreign Purchases (Imports)	15,536	21,139
Weighted-Average Price	10.53	11.39
U.S. Suppliers and U.S. Utilities:		
Foreign Purchases (Imports)	36,618	41,301
Weighted-Average Price	8.95	10.20

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 29. U.S. Brokers and Traders Purchases of Uranium by Material Origin, Supplier, and Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Actual Deliveries	1994	1995
Received by U.S. Brokers and Traders of U.S.-Origin Uranium:		
Purchases	4,792	3,356
Weighted-Average Price	9.75	11.51
Received by U.S. Brokers and Traders of Foreign-Origin Uranium:		
Purchases	26,011	19,593
Weighted-Average Price	8.02	9.20
Total Received by U.S. Brokers and Traders:		
Purchases	30,803	22,949
Weighted-Average Price	8.29	9.53
Received by U.S. Brokers and Traders from Foreign Suppliers:		
Purchases	22,328	18,311
Weighted-Average Price	7.87	9.02

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 30. Uranium Exports to Foreign Suppliers and Utilities by Origin and Delivery Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent; Dollars per Pound U₃O₈ Equivalent)

Actual Deliveries to Foreign Suppliers and Utilities	1994	1995
U.S.-Origin Uranium:		
Sales	5,941	4,713
Weighted-Average Price	18.41	17.34
Foreign-Origin Uranium:		
Sales	11,799	5,123
Weighted-Average Price	7.78	9.94
Total Exports:		
Sales	17,740	9,836
Weighted-Average Price	11.34	13.48
Exports by U.S. Producers, U.S. Utilities, and Other Suppliers:		
Sales	4,930	4,342
Weighted-Average Price	20.09	18.11
Exports by U.S. Brokers and Traders:		
Sales	12,810	5,494
Weighted-Average Price	7.98	9.83

Note: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table 31. Inventories of Natural and Enriched Uranium as of End of Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year	
	1994	1995 ^P
U.S. Utility Inventories	R65,410	56,214
Natural Uranium	R42,417	40,458
Enriched Uranium ^a	R22,993	15,756
U.S. Supplier Inventories	R21,469	13,916
Natural Uranium	R17,413	13,505
Enriched Uranium ^a	R4,056	411
Total Commercial Inventories	R86,879	70,129
DOE-Owned and USEC-Held Inventories^b	R85,210	110,792
Natural Uranium	R57,176	81,982
Enriched Uranium	R28,034	28,810

^aIncludes amounts reported as inventories of UF₆ at Enrichment Suppliers.
^bIncludes amounts reported as inventories by U.S. Department of Energy (DOE) and the United States Enrichment Corporation (USEC).
P = Preliminary data. R=Revised data. Final 1994 inventory data reported in the 1995 survey.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 32. Commercial Uranium Inventories by Type and Location at End of Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent)

Material Type and Location	U.S. Utilities		U.S. Suppliers		U.S. Utilities and Suppliers	
	1994	1995 ^P	1994	1995 ^P	1994	1995 ^P
U₃O₈ on hand, in off-site storage, or at conversion plants	R21,296	22,693	R13,084	11,593	R34,380	34,287
Natural UF₆	R21,121	17,764	R4,329	1,911	R25,450	19,676
on hand, in private off-site storage, or at conversion plants	W	W	W	W	R5,085	5,579
delivered to enrichment plants under usage agreements	W	W	W	W	R11,398	6,102
at enrichment suppliers	R6,989	6,975	R1,978	1,020	R8,967	7,995
Enriched UF₆	R22,993	15,756	R4,056	411	R27,049	16,167
at enrichment suppliers	W	W	W	113	R3,945	1,606
on hand, and/or in private storage	W	W	W	298	R8,874	6,828
as fabricated fuel not inserted into a reactor, on hand, and/or in private storage	R14,231	7,733	0	0	R14,231	7,733
Total Inventories	R65,410	56,214	R21,469	13,916	R86,879	70,129

P = Preliminary data. R = Revised data. Final 1994 inventory data reported in the 1995 survey. W = Data withheld to avoid disclosure.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table 33. Commercial Uranium Inventories by Type and Owner at End of Year, 1994-1995
(Thousand Pounds U₃O₈ Equivalent)

U.S. Firms	U ₃ O ₈		Natural and Enriched UF ₆		Total	
	1994	1995 ^P	1994	1995 ^P	1994	1995 ^P
Brokers and Traders	R7,480	5,404	R4,250	1,295	R11,729	6,698
Converter and Fabricators	0	0	R4,136	1,027	R4,136	1,027
Producers	R5,604	6,190	0	0	R5,604	6,190
Utilities	R21,296	22,693	R44,114	33,520	R65,410	56,214
Total Commercial Inventories	R34,380	34,287	R52,499	35,843	R86,879	70,129

P = Preliminary data. R = Revised data. Final 1994 inventory data reported in the 1995 survey.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Appendix A

Survey Methodology

Appendix A

Survey Methodology

Survey Design

The 12th comprehensive survey of the U.S. uranium industry was conducted in 1996 by the Energy Information Administration (EIA) using the “Uranium Industry Annual Survey,” Form EIA-858. EIA collected data from all companies involved in the U.S. uranium industry, mailing the survey form to these firms in December 1995. The data reported in this publication were developed from the 1995 survey and predecessor databases.

EIA asked respondents to the “Uranium Industry Annual Survey” to provide data current to the end of 1995 about the following:

Uranium raw materials activities, including: land holdings, exploration and development activities, uranium-bearing properties and reserves, uranium mines, uranium processing facilities, and uranium industry employment in the raw materials sector

Uranium marketing activities, including contracts, contract prices and delivery schedules, uranium inventories, enrichment feed deliveries, unfilled market requirements, uranium used in fuel assemblies, and purchases of enrichment services.

The data collected on Form EIA-858 are subject to various sources of error. These sources are: (1) coverage (the list of respondents might not be complete or, on the other hand, there might be double counting); (2) non-response (all units that are surveyed might not respond or not provide all the information requested); (3) respondents (respondents might commit errors in reporting the data); (4) processing (the data collection agency might omit or incorrectly transcribe a submission); (5) concept (the data collection elements might not measure the items they were intended to measure); and (6) adjustments (errors might be made in estimating values for missing data). Because the “Uranium Industry Annual Survey” is not a sample survey, the estimates shown in this report are not subject to sampling error.¹ Although it is not possible to present estimates of nonsampling error, precautionary steps were taken at each stage of the survey design to minimize the possible occurrence of these errors. The steps are described below, with the error they were designed to minimize shown in parenthesis.

Survey Universe and Frame (Coverage Errors)

The survey universe includes all companies involved in the U.S. uranium industry. The universe includes all firms meeting one or more of the following criteria: (1) are controllers or were controllers during any portion of 1995, or are identified in EIA records as the most recent controllers of uranium properties, mines, mills, or plant; (2) involved as controllers of uranium exploration and development ventures in the United States; (3) incurred uranium exploration expenditures in 1995 or plan such expenditures in 1996; (4) hold uranium reserves; (5) control uranium mining properties; (6) control commercial uranium extraction operations; and (7) purchase, sell, held, or own domestic- or foreign-origin uranium; offered uranium enrichment services; imported or exported uranium; and (utilities only) purchased uranium enrichment services from an enrichment supplier.

The respondent list used for the Form EIA-858 survey was developed from a frame of all establishments known to meet the selection criteria. The frame of potential respondents was compiled from previous surveys and from information in the public domain. The frame was intended to cover the following: all utilities owning nuclear-fueled generating stations; uranium converters, enrichers, and fuel fabricators; uranium traders and brokers; large and small companies actively engaged in exploration, development, or extraction in the U.S. uranium industry; and companies holding all large properties with uranium reserves. Companies meeting these criteria include: those involved in exploration, development, mining, milling, and trading of uranium; landowners; uranium converters, enrichers, and fabricators; and utilities with whole or partial ownership in operating or planned nuclear electric power plants.

Survey Procedures (Nonresponse)

The survey forms were sent via first class mail to ensure their receipt only by the proper respondent organization. If the U.S. Postal Service was unable to deliver the survey form, the corrected address was obtained where possible. In a few instances, businesses that had reported in

¹Sampling error is a measure of the variation that occurs by chance because a sample rather than a complete enumeration of units is surveyed.

earlier surveys were no longer operating. All known companies currently conducting business in the U.S. uranium industry were contacted during this survey.

Form EIA-858, "Uranium Industry Annual Survey," requests data about many areas of company operations. The scope of the questions is necessarily broad, and self-reporting of company-specific data is required.

Cooperation from industry on the 1995 survey was good. About 55 percent of respondents replied to the form within the specified deadline. Those that had not responded by the due date (March 1st for Schedules A and B) were telephoned to encourage submission of the forms, and those calls resulted in the submission of most of the remaining forms. Subsequently, telephone calls were made to obtain forms not yet submitted. In a few instances, company data were collected through telephone conversations.

Data Editing, Analysis, and Processing (Respondent and Processing Errors)

The survey forms are logged in and reviewed by agency personnel prior to data entry into the Uranium Industry Annual System, an automated database containing all current and historical data from each company's submissions. The database is maintained on the EIA computer facility in Washington, DC. After entry into the database, a copy of each part of the Form EIA-858 was distributed to the Analysis and Systems Division analyst responsible for that part. The submissions were checked for internal consistency, and the reported data were compared with previous collections of similar data. After reviewing these submissions, the analyst consulted with the reporting company, as needed, to resolve data problems and to confirm any corrections of the data.

Data areas that were reviewed and the corrections that were made differed from company to company. Most represented different interpretations of the data item definitions. No data in the database were changed without first consulting with the reporting company. Computer edits were also used to identify keypunch errors, out-of-range values, and unlikely data combinations. These also were either corrected to represent the data reported on the submissions or were changed only after confirming the corrected values by telephone conversations with company representatives. Data coding and entry errors were eliminated by proofing data after entry. All changes to reported data are documented.

Response Rates

For the 1995 Form EIA-858 survey, Schedule A, "Uranium Raw Materials Activities," was mailed to 48 firms and Schedule B, "Uranium Marketing Activities," was mailed to 87 firms. Response statistics are shown in Table A1. Overall, 100 percent of the firms responded to EIA with the data as requested for the survey sections as applicable to individual firms.

Table A1. Response Statistics for the 1995 Uranium Industry Annual Survey

Response Status	Schedule	
	A	B
Survey Schedules Mailed Out	48	87
Data Provided	45	84
Reported as Not Applicable	3	3

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Missing Data

Some omissions of data were identified during the prescreening and editing of the data. Most omitted data elements fell into two categories: particular data were unknown or inadvertent omissions. EIA contacted respondents to obtain omitted data or to verify that they could not be reported. Only confirmed company-reported data are contained in the database and included in this report.

Data Revisions

The Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, has adopted the following policy for review and correction (revision) of data it collects and publishes. The policy covers revisions to prior published data. This new policy was initially implemented with the publication of the *Uranium Industry Annual 1992*.

1. Annual survey data are published either as *preliminary* or *final* when they first appear in a data report. Data released as *preliminary* will be identified as such. When necessary, preliminary data will be revised and declared to be *final* at the next publication of that data.

2. Monthly and quarterly survey data are published initially as *preliminary* data. They will be revised only after the completion of the data collection cycle for the full 12-month survey period. Revisions will not be made to monthly or quarterly data prior to this time.

3. The magnitude of historical data revisions experienced will be included in each data report to inform the reader about the accuracy of the data presented.

4. Revisions to data published as *final* will be made only in the event that newly available information would result in a change to published data of more than 1 percent at the national level. Revisions for changes of lesser magnitudes will be made at the discretion of the Office Director.

All data, except for uranium inventory data and uranium fuel assembly data, are published as final. Data on uranium inventories and fuel assemblies for the survey year are published as preliminary because survey respondents are requested to make changes to their prior year data, if necessary, when reporting data for the current survey year. These revised data are indicated by an "R" in front of the revised table cell.

Changes to the prior year's total uranium inventory figures based on revisions reported on Form EIA-858 was for 1994, 0.6 million pounds U_3O_8 (0.1 percent). For uranium fuel assemblies, changes for 1994 was 1.4 million pounds U_3O_8 (3.5 percent).

Nondisclosure of Data

To protect the confidentiality of individual respondents' data, a policy was implemented to ensure that the reporting of survey data in this publication would not associate those data with a particular company. This is in compliance with EIA Standard No. 88-05-06, "Nondisclosure of Company Identifiable Data in Aggregate Cells." In tables where the nonzero value of a cell is composed of data from fewer than three companies or if a single company dominates a table-cell value so that the publication of the value would lead to identification of a company's data, then the EIA classifies the cell value as "sensitive," and the cell value is withheld ("W") from publication. Within a table with a sensitive cell value, selected values in other cells of the table are also withheld, as necessary, so that the sensitive cell value cannot be computed using the values in published cells. A sensitive table-cell value can be reported, if each company whose data contribute to the sensitivity, gives permission to publish the value and if the company believes that publishing it would not harm the company's competitive position. This is the only exception to the application of EIA Standard No. 88-05-06 in this report.

Appendix B

Resources and Reserves

Appendix B

Resources and Reserves

This section discusses the methodologies used to estimate the U.S. uranium resources. Three classes of resources are estimated: Reserves, Estimated Additional Resources (EAR), and Speculative Resources (SR). EAR and SR categories are undiscovered potential.

A diagram showing a comparison of nomenclatural schemes used by the EIA and DOE's predecessor agencies for reporting estimates of U.S. uranium resources since 1974 is provided in Figure B1.

Appraisal of Potential Resources

The appraisal of the National potential resources of uranium, which comprise the Estimated Additional Resources (EAR) and Speculative Resources (SR) categories, is based on extensive data collected under the uranium resource appraisal program of DOE and its predecessor agencies. These data include: chemical assays of core samples; data from geochemical surveys of groundwater, stream water and sediment; aerial radiometric surveys; limited selective drilling to fill voids in subsurface information; and geological studies of field areas throughout the United States.

Estimates of potential resources are based on data developed under the DOE National Uranium Resource Evaluation (NURE) program and under a Memorandum of Understanding signed in 1984 between EIA and the U.S. Geological Survey of the Department of Interior. Annual updating of the estimates by EIA was discontinued after 1994. Therefore, 1995 potential resources are the same as those reported for the previous year. Estimates of uranium resources in the EAR and SR classes for 1986 through 1995 are shown in Table B1. Resource quantities of

EAR and SR are summarized for principal resource regions and forward-cost categories in Table B2.

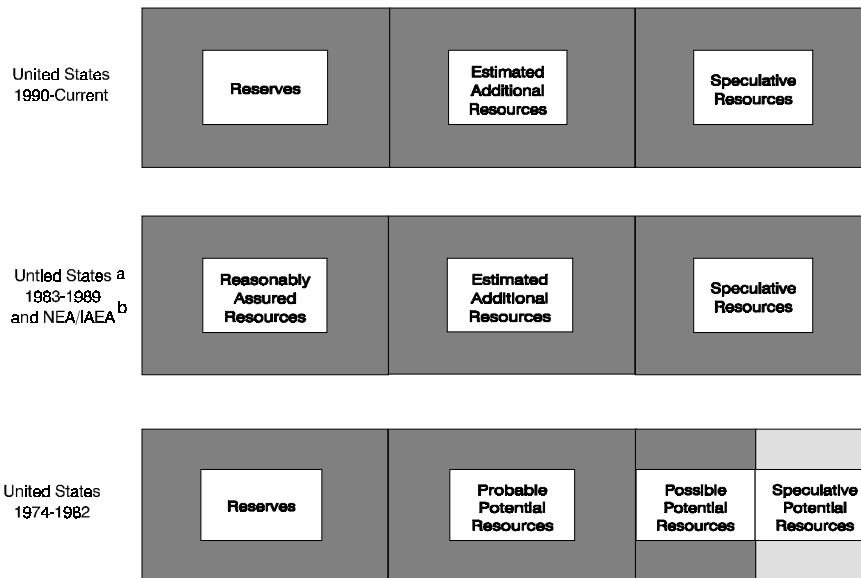
Estimation of Reserves

Uranium reserves are the estimated quantities of uranium that occur in known deposits of such grade, quantity, configuration, and depth that they can be recovered under current regulations at or below a specified cost with state-of-the-art mining and processing technology. Estimated reserves are based on direct radiometric and chemical measurements in drill hole samples. Ore grades and thickness, spatial relationships, depths, mining and reclamation methods, haulage distance, and amenability of ore within specific forward-cost levels are considered in the evaluation. Uranium reserves estimated by the DOE have been adjusted for appropriate mining dilution and mill recovery.

The costs used to categorize uranium reserves are forward costs (see Glossary) in current (year of estimate) dollars that would be incurred in producing the uranium. The costs include power and fuel, labor, materials, royalties, severance and ad valorem taxes, insurance, and applicable administrative costs. Previous expenditures (sunk costs) for such item as exploration and land acquisition are excluded. Also excluded are income taxes, profit, and the cost of money. The forward-cost categories are independent of the market price at which the uranium might be sold.

The current uranium reserve estimates are based on a combination of EIA-held historical property data, company-reported data, and independent reserve estimates. The estimates of national uranium reserves also are based on current knowledge about domestic deposits and on adjustments for depletion and erosion of specific cost category reserves due to production of ore from individual property. Current and historical estimates of reserves since 1986 are shown in Table B3. Reserve estimates of each forward-cost category are summarized for major States in Table B4.

Figure B1. Comparison of Historical and Current U.S. and NEA/IAEA Classification Nomenclatures for Uranium Resources



^aThis nomenclature was adopted in 1983 by the U.S. Department of Energy and was patterned after the Nuclear Energy Agency/International Atomic Energy Agency Standard.

The classifications shown for the United States prior to and after 1983 and the NEA/IAEA are not strictly comparable, because the criteria used in the individual systems are not identical. Precise correlations are not possible, particularly for the less assured resources. Nonetheless, based on the principal criterion of geological assurance of existence, this figure presents a reasonable approximation of uranium resources classification comparability.

^bNEA/IAEA: Nuclear Energy Agency/International Atomic Energy Agency.

Note: The NEA/IAEA separates the Estimated Additional Resources (EAR) into Categories I and II based primarily on geological inference. Categories I and II of EAR are not utilized for estimates of resources in the United States.

Source: Prepared by the Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels.

Figure B2. Uranium Resource Regions of the United States



Source: U.S. Department of Energy, *An Assessment Report on Uranium in the United States of America*, GJO-111(80) (Grand Junction, Colorado, October 1980).

Table B1. U.S. Potential Uranium Resources by Forward-Cost Category and Resource Class, 1986-1995
(Million Pounds U₃O₈)

Year	Forward-Cost Category					
	\$30 per pound		\$50 per pound		\$100 per pound	
	EAR ^a	SR ^b	EAR ^a	SR ^b	EAR ^a	SR ^b
1986	1,300	1,000	2,400	1,900	3,800	3,200
1987	1,300	1,000	2,300	2,000	3,700	3,200
1988	1,300	1,000	2,300	2,000	3,800	3,200
1989	2,300	1,400	3,400	2,300	5,000	3,500
1990	2,200	1,300	3,400	2,200	4,900	3,500
1991	2,200	1,400	3,400	2,300	4,900	3,600
1992	2,200	1,300	3,400	2,300	4,900	3,500
1993	2,200	1,330	3,340	2,250	4,880	3,510
1994	2,180	1,310	3,310	2,230	4,850	3,480
1995	2,180	1,310	3,310	2,230	4,850	3,480

^aEAR = Estimated Additional Resources.

^bSR = Speculative Resources.

Notes: Values shown are the mean values for the distribution of estimates for each forward-cost category: 1986-1992- rounded to the nearest 100 million pounds U₃O₈; 1993-1995- rounded to the nearest 10 million pounds U₃O₈. Estimates of uranium that could be recovered as a byproduct of other commodities are not included. Resource values in forward-cost categories are cumulative: that is, the quantity at each level of forward cost includes all resources at the lower cost in that category.

Sources: **1986-1988**-Estimates based on uranium resources data developed under the EOE National Uranium Resource Evaluation (NURE) program, 1974-1983, using methodology described in *An Assessment Report on Uranium in the United States of America* (October 1980) in U.S. Department of Energy, *Uranium Industry Seminar* (October 1980); and under U. S. Geological Survey (USGS) Uranium Resource Assessment Project. **1989-1995**-Estimates based on uranium resources data developed under the NURE program and USGS Uranium Resource Assessment Project using methodology described in *Uranium Resource Assessment by the Geological Survey: Methodology and Plan to Update the National Resource Base*, U.S. Geological Survey Circular 994 (1987). Estimates are updated annually by EIA using revised economic index values which reflect changes in the U.S. economy.

Table B2. U.S. Potential Uranium Resources by Forward-Cost Category and Resource Region, 1995
(Million Pounds U₃O₈)

Resource Region	Forward-Cost Category					
	\$30 per pound		\$50 per pound		\$100 per pound	
	EAR ^a	SR ^b	EAR ^a	SR ^b	EAR ^a	SR ^b
Colorado Plateau	1,330	480	1,900	770	2,540	1,210
Wyoming Basins	160	80	340	160	660	250
Coastal Plain	370	130	490	180	600	230
Northern Rockies	30	110	60	200	170	300
Colorado and Southern Rockies	140	90	180	140	220	190
Basin and Range	50	90	160	170	390	320
Other Regions ^c	110	330	180	610	270	990
Total	2,180	1,310	3,310	2,230	4,850	3,480

^aEAR = Estimated Additional Resources.

^bSR = Speculative Resources.

^cIncludes Appalachian Highlands, Great Plains, Pacific Coast and Sierra Nevada, Central Lowlands, and Columbia Plateau regions and Alaska.

Notes: Values shown are the mean values for the distribution of estimates for each forward-cost category, rounded to the nearest 10 million pounds U₃O₈. Estimates of uranium that could be recovered as a byproduct of other commodities are not included. Resource values in forward-cost categories are cumulative: that is, the quantity at each level of forward cost includes all resources at the lower cost in that category.

Sources: Prepared by the Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on uranium resources data developed under DOE *National Uranium Resource Evaluation (NURE) program* and the USGS Uranium Resource Assessment project, using methodology described in *Uranium Resource Assessment by the Geological Survey: Methodology and Plan to Update the National Resource Base*, U.S. Geological Survey Circular 994 (1987).

Table B3. U.S. Uranium Reserves by Forward-Cost Category, 1986-1995
(Million Pounds U₃O₈)

Year	\$30 per pound	\$50 per pound	\$100 per pound
1986	322	1,036	1,630
1987	304	1,005	1,592
1988	289	981	1,560
1989	277	962	1,537
1990	265	926	1,511
1991	304	975	1,542
1992	295	959	1,523
1993	292	952	1,511
1994	294	953	1,501
1995	290	947	1,493

Note: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in these reserves. Reserves values in forward-cost categories are cumulative; that is, the quantity at each level of forward cost includes all reserves at the lower costs.

Source: Estimated by the Energy Information Administration, Office of Coal, Nuclear, Electric and Alternated Fuels, based on U.S. Department of Energy, Grand Junction Projects Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986-1995).

Table B4. Forward-Cost Uranium Reserves by State, 1995

State(s)	\$30 per pound			\$50 per pound		
	Ore (million tons)	Grade ^a (percent U ₃ O ₈)	U ₃ O ₈ (million pounds)	Ore (million tons)	Grade ^a (percent U ₃ O ₈)	U ₃ O ₈ (million pounds)
New Mexico	15	0.278	84	111	0.157	350
Wyoming	45	0.131	117	247	0.078	387
Arizona, Colorado, Utah	7	0.293	43	45	0.133	119
Texas	6	0.099	11	22	0.068	29
Other ^b	9	0.203	35	27	0.111	61
Total	82	0.178	290	453	0.105	947

^aWeighted average percent U₃O₈ per ton of ore.

^bIncludes California, Idaho, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington.

Notes: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in this table. Reserves values in forward-cost categories are cumulative: that is, the quantity at each level of forward-cost includes all reserves at the lower costs. Totals may not equal sum of components because of independent rounding.

Sources: Estimated by Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Appendix C

Respondents to the Uranium Industry Annual Survey

Appendix C

Respondents to the Uranium Industry Annual Survey

Respondents to the Energy Information Administration's (EIA) 1995 Form EIA-858, "Uranium Industry Annual Survey," are listed alphabetically in Table C1. For each respondent, an industry-activity code (or codes) is shown. The activity code (codes) broadly describes the respondent's major industry activity from Form EIA-

858 and from publicly available information. Included in the listing are respondents that stated that no part of the Form EIA-858 was applicable to their operations as of the end of the survey year. The footnote at the end of Table C1 provides an explanation for the activity codes.

Table C1. Respondents to the 1995 Uranium Industry Annual Survey

Company Name	Industry Activity Code ^a	Company Name	Industry Activity Code ^a
Alabama Power Co. (Southern Nuclear)	UTL	Duquesne Light Company	UTL
Albuquerque Uranium Corporation	UPH, BRO	Energy Fuels Nuclear Inc.	UPH, MLG
American Electric Power Service Corp.	UTL	Enserch Exploration, Inc.	UPH
Arizona Public Service Company	UTL	Entergy Operations, Inc.	UTL
B & W Fuel Company	FAB	Everest Exploration, Inc.	MLG
B. B. Brooks Company	UPH	Florida Power Corporation	UTL
Baltimore Gas and Electric	UTL	Florida Power and Light	UTL
BGS Mining Company	UPH	General Electric Company	FAB
Boston Edison Company	UTL	Geomex Minerals, Inc.	UPH
Cameco U.S. Inc.	UPH	George S. Fender	UPH
Carolina Power & Light	UTL	Georgia Power Co. (Southern Nuclear)	UTL
Centerior Energy Corporation	UTL	GPU Nuclear Corporation	UTL
Cobb Resources Corporation	UPH	Graves and Hudspeth Company	UPH
Cogema, Inc.	BRO	Green Mountain Mining Venture	UPH, MLG
Cogema Mining Inc. (Total Minerals Corp.)	UPH, MLG	Homestake Mining Company	UPH
Combustion Engineering, Inc.	FAB	Houston Lighting & Power Co.	UTL
Commonwealth Edison	UTL	IES Utilities, Inc.	UTL
Consolidated Edison Co. of NY, Inc.	UTL	Illinois Power Company	UTL
Consumers Power Company	UTL	IMC Global Operations	MLG
ConverDyn	CON	Maine Yankee Atomic Power Co.	UTL
Cotter Corporation	UPH, MLG	Malapai Resources Company	UPH, MLG
Crow Butte Resources, Inc.	UPH, MLG	Marquez Development Corporation	UPH
Cycle Resources Investment Corp.	BRO	Melvin Staats Company	UPH
Dawn Mining Company	UPH,MLG	Mesa, Inc.	UPH
DOE, Office of Uranium Programs	ENR	Mining Unlimited, Inc.	UPH
Detroit Edison	UTL	Nebraska Public Power District	UTL
Duke Power Company	UTL	New Mexico Arizona Land Company	UPH

Table C1. Respondents to the 1995 Uranium Industry Annual Survey (Continued)

Company Name	Industry Activity Code ^a	Company Name	Industry Activity Code ^a
New York Power Authority	UTL	Section 2 Joint Venture-Continental Materials	UPH
New York Nuclear Corp. /NYNCO Trading	BRO	Sheep Mountain Partners	UPH
Niagara Mohawk Power Corporation	UTL	Siemens Power Corporation - Nuclear Div.	FAB
Noranda Exploration, Inc.	UPH	Simons Associates	UPH
North Atlantic Energy Service Corp.	UTL	South Carolina Electric & Gas	UTL
Northeast Utilities Service Co.	UTL	Southern California Edison Company	UTL
Northern States Power Company	UTL	Noah H. & Diane R. Taylor	UPH
Nuclear Fuel Services, Inc.	UPH	Tennessee Valley Authority	UTL
Nuexco Trading Corporation	TRA, BRO	Texas Utilities Electric Company	UTL
Nukem, Inc.	TRA, BRO	UG U.S.A., Inc.	TRA
Ohio Edison Co. and Pennsylvania Power	UTL	Umetco Minerals Corporation	UPH
Omaha Public Power District	UTL	Union Electric Company	UTL
Pacific Gas and Electric Company	UTL	United Nuclear Corporation	UPH
Pathfinder Mines Corp. (C/O Cogema Inc.)	UPH	United States Enrichment Corporation	ENR
PECO Energy Company	UTL	Uranerz USA, Inc.	UPH, BRO
Pennsylvania Power & Light Company	UTL	The Uranium Exchange Company	TRA, BRO
Petrotomics Company (C/O Texaco, Inc)	UPH	Uranium King Corporation	UPH
Power Resources, Inc.	UPH, MLG	Uranium Resources Incorporated	UPH, MLG
Public Service Electric & Gas	UTL	USX Corporation	UPH
Rajah Ventures, Limited	UPH	U.S. Energy Corp. (Plateau Resources, Ltd)	UPH, MLG
Rhone Poulenc, Inc.	MLG	Vermont Yankee Nuclear Power Corp.	UTL
Rio Algom Mining Corp.	UPH, MLG	Virginia Electric and Power Co.	UTL
Rio Grande Resources Corp.	UPH	Washington Public Power Supply System	UTL
Riverside Public Utility Dept.	UTL	Western Nuclear, Inc.	UPH
RME Partners, L. P.	UPH	Westinghouse Electric Corporation	FAB
Rochester Gas & Electric Corporation	UTL	Wisconsin Electric Power Company	UTL
Sacramento Municipal Utility Dist.	UTL	Wisconsin Public Service Corporation	UTL
San Diego Gas and Electric	UTL	Wold Nuclear Company, John S. Wold d/b/a	UPH
San Rafael Energy, Inc.	UPH	Wolf Creek Nuclear Operating Coporation	UTL

^aBRO = Uranium brokerage company; CON = Uranium conversion service supplier; ENR = Uranium enrichment service supplier; FAB = Uranium fuel fabrication service supplier; MLG = Uranium milling/processing company (can involve ownership of a uranium property); TRA = Uranium trading company; UPH = Uranium property holder (can include activities related to uranium exploration, reserves, reclamation, and/or mining); UTL = Nuclear electric utility company.

Source: Prepared by the Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on information reported on the Form EIA-858 "Uranium Industry Annual Survey" (1995).

Appendix D

U.S. Customary Units of Measurement, International System of Units (SI), and Selected Data Tables in SI Metric Units

Appendix D

U.S. Customary Units of Measurement, International System of Units (SI), and Selected Data Tables in SI Metric Units

Standard Factors for interconversion between U.S. customary units and the International System of Units (SI) are shown in Table D1. These factors are provided as a coherent and consistent set of units for the convenience

of the reader in making conversions between U.S. and metric units of measure for data published in this report. Conversion factors are provided only for the U.S. units of measurement quoted in this report.

Table D1. Conversion Factors for U.S. Customary Units and SI Metric Units of Measurement

To convert from:	To:	Multiply by: ^a
Area		
acre	meter ² (m ²)	4,046.9*
Length		
foot (ft)	meter (m)	0.304 801
yard (yd)	meter (m)	0.914 4*
Mass		
pound—avoirdupois (lb avdp)	kilogram (kg)	0.453 592
pound—avoirdupois U ₃ O ₈ ^b	kilogram U	0.384 647
ton, short (2,000 lb)	metric ton (t)	0.907 185

^aAn asterisk after the last digit indicates that the conversion factor is exact and that all subsequent digits are zero. All other conversion factors are rounded to six digits after the decimal.

^bThe factor of 1 pound U₃O₈ = 0.848 002 pounds U was used in this conversion.

Source: Table E1 is patterned after Table 3, "Conversion Factors for SI Metric Units and U.S. Customary Units of Measurement," in S.M. Long and A.M. Orellana, "The Metric System," in *Suggestions to Authors of the Reports of the United States Geological Survey*, Sixth Edition, U.S. Government Printing Office (Washington, DC, 1978) pp. 192-196.

Forward Cost and Average Price Conversions

The forward-cost categories of \$US80 through \$US260 per pound U shown on Table D3 to report uranium reserves quantities were converted from units of “\$ per pound U_3O_8 ” to “\$ per kilogram U” by multiplying by the standard factor of 2.6 and rounding the results to the nearest multiple of \$US10.

Selected Tables Converted to SI Metric Values

Sixteen principal tables of data from the Uranium Industry Annual 1995 (UIA) converted to equivalent metric values are shown on the following pages. The crosswalk given below shows the correlation between the tables of metric values and their corresponding tables in U.S. customary units in the main body of the UIA.

Appendix D Table Number	UIA Chapter and Table Number
D2.....	Chapter 1, Table 1
D3.....	Chapter 1, Table 3
D4.....	Chapter 1, Table 4
D5.....	Chapter 1, Table 5
D6.....	Chapter 2, Table 10
D7.....	Chapter 2, Table 11
D8.....	Chapter 2, Table 12
D9.....	Chapter 2, Table 14
D10.....	Chapter 2, Table 19
D11.....	Chapter 2, Table 21
D12.....	Chapter 2, Table 22
D13.....	Chapter 2, Table 27
D14.....	Chapter 2, Table 28
D15.....	Chapter 2, Table 29
D16.....	Chapter 2, Table 30
D17.....	Chapter 2, Table 31

Table D2. U.S. Uranium Land and Surface Drilling Activities, 1986-1995

Year	Land Exploration		Surface Drilling Exploration			Surface Drilling Development			Surface Drilling Exploration and Development		
	Square Meters Acquired during Year (millions)	Square Meters Held at End of Year (millions)	Number of Holes	Meters (thousand)	Cost ^a (thousand dollars)	Number of Holes	Meters (thousand)	Cost ^a (thousand dollars)	Number of Holes	Meters (thousand)	Cost ^a (thousand dollars)
1986	890	10,700	1,985	335	6,400	1,846	296	1,350	3,831	631	7,750
1987	364	7,900	1,820	338	5,900	1,994	262	1,060	3,814	600	6,960
1988	364	6,880	2,029	390	6,440	3,176	527	3,260	5,205	917	9,700
1989	113	6,188	2,087	436	5,820	1,753	244	3,120	3,840	680	8,940
1990	154	4,893	1,507	265	3,210	1,908	247	5,950	3,415	512	9,160
1991	130	4,290	1,624	297	2,832	1,573	265	8,114	3,197	561	10,946
1992	344	3,189	935	171	1,267	833	153	1,162	1,768	324	2,429
1993	263	1,843	355	68	983	1,665	270	4,754	2,020	338	5,737
1994	36	1,315	519	104	736	477	96	383	996	200	1,119
1995	28	1,048	584	123	790	1,728	289	1,799	2,312	411	2,589

^aCosts for 1986 through 1990 were rounded to the nearest \$10 thousand.

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995). **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table D3. Forward-Cost Uranium Reserves by Mining Method, 1995

Mining Method	Forward-Cost Category					
	\$30 per pound			\$50 per pound		
	Ore (million metric tons)	Grade ^a (percent U)	Uranium (thousand metric tons)	Ore (million metric tons)	Grade ^a (percent U)	Uranium (thousand metric tons)
Underground	23	0.232	53	130	0.138	179
Openpit	9	0.118	11	148	0.067	99
In Situ Leaching	42	0.113	47	119	0.067	80
Other ^c	< 1	0.224	< 1	14	0.042	6
Total	74	0.151	112	411	0.089	364

^aWeighted average percent U per metric ton of ore.

^bIncludes California, Idaho, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington.

^cIncludes heap leach, mine water, and low grade stockpiles.

Notes: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in this table. Reserves values in forward-cost categories are cumulative: That is, the quantity at each level of forward-cost includes all reserves at the lower costs. Totals may not equal sum of components because of independent rounding.

Sources: Estimated by Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table D4. U.S. Uranium Mine Production and Number of Mines and Sources, 1986-1995

Mining Method	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Underground (metric tons U)	2,500	1,900	2,100	2,000	W	W	W	0	0	0
Openpit (metric tons U)	W	W	W	W	724	972	W	0	0	0
In Situ Leaching (metric tons U)	W	W	W	W	W	W	W	W	942	1,297
Other ^a (metric tons U)	700	400	1,600	1,700	1,537	1,021	379	789	30	60
Total Mine Production (metric tons U)	3,200	2,300	3,700	3,700	2,260	1,993	379	789	972	1,357
Number of Mines Operated										
Underground	13	19	17	19	27	6	4	0	0	0
Openpit	4	2	4	2	2	2	1	0	0	0
In Situ Leaching	12	15	11	9	7	6	4	5	5	5
Other Sources ^b	2	1	0	2	3	1	8	7	7	7
Total Mines and Sources	31	37	32	32	39	15	17	12	12	12

^aFor 1986 through 1989, "Other" includes production from openpit, in situ leach, heap leach, mine water, and water-treatment plant solutions. Production quantities were rounded to the nearest 100 metric tons. For 1990 and 1991, "Other" includes production from underground, in situ leach, heap leach (1990), mine water, water treatment plant solutions (1990), and restoration. For 1992, "Other" includes production from underground, openpit, and in situ leach mines and uranium bearing water from mine workings, tailings ponds, and restoration. For 1993, the "Other" includes production from in situ leach mines and uranium bearing water from mine workings and restoration. For 1994 and 1995, "Other" includes uranium bearing water from mine workings and restoration.

^bOther Sources includes, in various years, heap leach, mine water, mill site cleanup and mill tailings, well field restoration, and low-grade stockpiles as sources of uranium.

W=Data withheld to avoid disclosure. The data are included in the total for "Other."

Notes: Totals may not equal sum of components because of independent rounding. Table does not include byproduct production and sources.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table D5. U.S. Uranium Concentrate Processing Operations, 1986-1995

Processing Operations	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Ore Fed to Process ^a (thousand metric tons)	1,187	1,307	1,101	1,120	655	580	232	0	0	151
Percent U ^b	0.285	0.241	0.244	0.274	0.248	0.168	0.194	--	--	0.441
Contained U ₃ O ₈ (metric tons)										
In Ore	3,378	3,150	2,692	3,068	1,626	973	451	0	0	669
Other Feed Materials ^c	100	182	195	165	187	69	70	16	30	63
Total Mill Feed (metric tons U)	3,478	3,333	2,887	3,233	1,812	1,042	520	16	30	732
In-Process Inventory Change (metric tons U)	- 25	- 81	52	- 90	- 94	- 47	- 10	4	9	60
Concentrate Produced at Mills (metric tons U)										
Theoretical ^d	3,503	3,413	2,834	3,323	1,906	1,089	530	12	21	671
Actual	3,405	3,283	2,706	3,144	1,788	1,003	523	12	18	621
Recovery as Percent of Total Mill Feed	97.2	96.2	95.5	94.6	93.8	92.2	98.7	96.8	85.2	92.6
Tailings and Unaccountable (metric tons U)	98	130	129	179	118	85	7	0	3	50
Other Processing ^e (metric tons U)	1,790	1,714	2,345	2,178	1,630	2,056	1,649	1,167	1,272	1,703
Total Concentrate Production ^f (metric tons U)	5,195	4,997	5,050	5,322	3,418	3,059	2,171	1,178	1,289	2,324
Total Concentrate Shipped From Mills and Plants (metric tons U)	4,093	4,446	4,920	5,696	4,984	3,245	2,636	1,298	2,431	2,116

^aUranium ore "fed to process" in any year can include: ore mined and shipped to a mill during the same year, ore that was mined during a prior year and later shipped from mine-site stockpiles, and/or ore obtained from drawdowns of stockpiles maintained at a mill site.

^bWeighted average percent U per metric ton of ore.

^cIncludes for various years uranium from low-grade ore, mill cleanup, mine water, tailings water, and heap leaching, except as footnoted below.

^dAt 100-percent recovery. This equals total mill feed minus in-process inventory change.

^eU₃O₈ concentrate production from in situ leaching and as a byproduct of other processing. The totals for 1986 through 1988 include U₃O₈ recovered from reclamation and mine water at some mills that did not report processing of uranium ore for those years.

^fTotal does not include uranium concentrate production from pilot projects or other research project sources.

--=Not applicable.

Note: Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1986-1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table D6. U.S. Utilities Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1994-1995
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995
Received by U.S. Utilities from U.S. Producers:		
Purchases	2,093	2,034
Weighted-Average Price	35.68	38.59
Received by U.S. Utilities from U.S. Brokers and Traders:		
Purchases	5,879	6,232
Weighted-Average Price	24.29	25.56
Received by U.S. Utilities from other U.S. Utilities:		
Purchases	0	0
Weighted-Average Price	--	--
Received by U.S. Utilities from other U.S. suppliers:		
Purchases	420	216
Weighted-Average Price	20.90	32.56
Received by U.S. Utilities from Foreign Suppliers:		
Purchases	6,332	8,227
Weighted-Average Price	27.11	29.63
Total Received by U.S. Utilities:		
Purchases	14,725	16,709
Weighted-Average Price	27.03	29.24

-- = Not applicable

Note: "Other U.S. suppliers" are U.S. converters, enrichers, and fabricators.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table D7. U.S. Utilities Contracted Uranium by Transaction Type and Delivery Year, 1994-1995
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995
Received by U.S. Utilities of U.S.-Origin Uranium:		
Purchases	2,969	2,018
Weighted-Average Price	31.39	36.93
Received by U.S. Utilities of Foreign-Origin Uranium:		
Purchases	11,756	14,692
Weighted-Average Price	25.92	28.18
Total:		
Purchases	14,725	16,709
Weighted-Average Price	27.03	29.24

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table D8. U.S. Utilities Purchases of Uranium by Origin Country and Delivery Year, 1994-1995
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Origin Country	Actual Deliveries in 1994		Actual Deliveries in 1995	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
Australia	1,082	25.70	1,711	28.54
Brazil	W	W	0	--
Canada	5,621	27.28	6,462	30.74
China	652	24.85	113	29.87
France	W	W	W	W
Gabon	W	W	W	W
Germany	W	W	W	W
Kazakhstan	1,068	23.25	1,191	23.36
Kyrgyzstan	W	W	W	W
Mongolia	W	W	W	W
Namibia	306	25.38	204	25.68
Netherlands	0	--	W	W
Niger	0	--	W	W
Russia	684	22.90	2,116	24.57
South Africa	425	25.07	385	32.68
Spain	0	--	W	W
Tajikistan	W	W	W	W
Ukraine	W	W	W	W
United Kingdom	W	W	W	W
Uzbekistan	1,365	21.70	1,498	22.37
Foreign Total Quantity	11,756	25.92	14,692	28.18
United States	2,969	31.39	2,018	36.93
Total Quantity	14,725	27.03	16,709	29.24

W=Data withheld to avoid disclosure.

--=Not applicable.

Sources: Energy Information Administration: **1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table D9. Average Price and Quantity for Purchases of Uranium by U.S. Utilities by Pricing Mechanisms and Delivery Year, 1994-1995
(Dollars per Kilogram U Equivalent; Metric Tons U Equivalent)

Pricing Mechanisms	Domestic Purchases		Foreign Purchases		Total Purchases	
	1994	1995	1994	1995	1994	1995
Contract-Specified Pricing						
Weighted-Average Price	27.76	27.50	30.98	33.69	28.34	29.02
Quantity with Reported Price	4,290	6,564	957	2,148	5,248	8,712
Market-Related Pricing						
No Floor Type						
Weighted-Average Price	25.38	26.48	23.94	28.22	24.60	27.86
Quantity with Reported Price	2,724	815	3,181	3,184	5,905	3,999
Floor Type						
Weighted-Average Price	52.07	46.42	30.68	28.19	33.55	30.69
Quantity with Reported Price	233	263	1,500	1,651	1,733	1,913
Total Market Related						
Weighted-Average Price	27.48	31.34	26.10	28.21	26.63	28.78
Quantity with Reported Price	2,958	1,078	4,680	4,835	7,638	5,912
Contract Specified and Market Related Pricing						
Weighted-Average Price	27.64	28.04	26.93	29.89	27.33	28.92
Quantity with Reported Price	7,248	7,642	5,638	6,982	12,886	14,624
Spot-Market Pricing						
Weighted-Average Price	24.37	23.59	--	26.68	24.37	25.74
Quantity with Reported Price	275	288	0	656	275	944
Other Pricing						
Weighted-Average Price	22.25	41.27	34.91	29.47	24.99	36.18
Quantity with Reported Price	1,226	649	338	492	1,564	1,141
All Pricing Mechanisms						
Weighted-Average Price	26.79	28.89	27.38	29.61	27.03	29.24
Quantity with Reported Price	8,749	8,578	5,976	8,131	14,725	16,709

--=Not applicable.

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table D10. U.S. Utilities Contracted Purchases of Uranium from Suppliers, in Effect at the End of 1995, by Delivery Year, 1996-2005
(Metric Tons U Equivalent)

Year of Delivery	Purchases from U.S. Suppliers		Purchases from Foreign Suppliers		Purchases from All Suppliers	
	Firm Deliveries	Optional Deliveries	Firm Deliveries	Optional Deliveries	Firm Deliveries	Optional Deliveries
1996	5,332	829	6,961	1,413	12,293	2,241
1997	4,331	1,174	5,530	1,788	9,841	2,962
1998	3,499	1,003	5,606	1,844	9,105	2,846
1999	1,948	422	3,120	1,503	5,068	1,924
2000	2,224	682	3,628	1,006	5,852	1,688
2001	1,318	292	1,369	1,225	2,686	1,517
2002	1,252	405	746	1,120	1,997	1,525
2003	297	520	54	802	351	1,322
2004	260	289	54	569	314	859
2005	37	289	54	569	91	859
Total	20,478	5,904	27,121	11,839	47,599	17,743

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table D11. Anticipated Uranium Market Requirements of U.S. Utilities, 1996-2005, as of December 31, 1995
(Metric Tons U Equivalent)

Year	Quantity of Uranium Under Purchase Contracts	Unfilled Requirements	Anticipated Market Requirements	Enrichment Feed Deliveries
1996	14,535	1,947	16,482	18,878
1997	12,803	3,187	15,990	16,225
1998	11,951	6,042	17,994	20,362
1999	7,304	8,924	16,228	14,514
2000	7,540	13,269	20,809	18,319
2001	4,218	16,386	20,604	13,488
2002	3,522	16,611	20,133	14,747
2003	1,673	18,830	20,504	13,927
2004	1,173	18,738	19,911	15,522
2005	949	16,832	17,781	11,683
Total	65,669	120,766	186,435	157,664

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table D12. U.S. Utilities Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1994-1995
(Metric Tons U Equivalent)

Enrichment Plant Location	Actual Deliveries in 1994			Actual Deliveries in 1995		
	U.S.-Origin	Foreign-Origin	Total	U.S.-Origin	Foreign-Origin	Total
China	W	W	W	0	0	0
France	W	W	427	W	W	1,741
Germany	0	0	0	W	W	335
Netherlands	0	W	389	W	W	366
Russia	W	W	517	322	721	1,043
South Africa	0	0	0	0	0	0
United Kingdom	0	W	W	0	407	407
Foreign Total	20	1,561	1,581	535	3,463	3,998
United States	3,258	9,627	12,885	2,995	10,045	13,040
Total	3,278	11,188	14,466	3,530	13,508	17,038

W=Data withheld to avoid disclosure.
Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration: **1994-Uranium Industry Annual 1994** (July 1995); **1995-Form EIA-858, "Uranium Industry Annual Survey"** (1995).

Table D13. Uranium Loaded into Fuel Assemblies for Commercial Nuclear Reactors by Year, 1994-1995
(Metric Tons U Equivalent)

Origin of Uranium	1994	1995 ^P
Domestic-Origin Uranium	R3,578	4,287
Foreign-Origin Uranium	R11,962	15,375
Total	R15,540	19,662

P = Preliminary data. R = Revised data. Final 1994 final assembly data reported in the 1995 survey.
Notes: Includes only unirradiated uranium in new fuel assemblies loaded into reactors during the year. Does not include uranium removed from reactors that subsequently will be reloaded. Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Table D14. Imports of Uranium by U.S. Suppliers, U.S. Utilities and Delivery Year, 1994-1995
(Metric Tons U Equivalent; Dollars per Kilograms U Equivalent)

Actual Deliveries	1994	1995
U.S. Suppliers:		
Foreign Purchases (Imports)	8,109	7,755
Weighted-Average Price	20.23	23.29
U.S. Utilities:		
Foreign Purchases (Imports)	5,976	8,131
Weighted-Average Price	27.38	29.61
U.S. Suppliers and U.S. Utilities:		
Foreign Purchases (Imports)	14,085	15,886
Weighted-Average Price	23.27	26.52

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table D15. U.S. Brokers and Traders Purchases of Uranium by Material Origin, Supplier, and Delivery Year, 1994-1995
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995
Received by U.S. Brokers and Traders of U.S.-Origin Uranium:		
Purchases	1,843	1,291
Weighted-Average Price	25.35	29.91
Received by U.S. Brokers and Traders of Foreign-Origin Uranium:		
Purchases	10,005	7,536
Weighted-Average Price	20.86	23.91
Total Received by U.S. Brokers and Traders:		
Purchases	11,848	8,827
Weighted-Average Price	21.56	24.79
Received by U.S. Brokers and Traders from Foreign Suppliers:		
Purchases	8,588	7,043
Weighted-Average Price	20.46	23.46

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table D16. Uranium Exports to Foreign Suppliers and Utilities by Origin and Delivery Year, 1994-1995
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries to Foreign Suppliers and Utilities	1994	1995
U.S.-Origin Uranium:		
Sales	2,285	1,813
Weighted-Average Price	47.86	45.07
Foreign-Origin Uranium:		
Sales	4,538	1,971
Weighted-Average Price	20.24	25.84
Total Exports:		
Sales	6,824	3,783
Weighted-Average Price	29.49	35.06
Exports by U.S. Producers, U.S. Utilities, and Other Suppliers:		
Sales	1,896	1,670
Weighted-Average Price	52.23	47.08
Exports by U.S. Brokers and Traders:		
Sales	4,927	2,113
Weighted-Average Price	20.73	25.55

Note: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1995).

Table D17. Inventories of Natural and Enriched Uranium as of End of Year, 1994-1995
(Metric Tons U Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year	
	1994	1995 ^P
U.S. Utility Inventories	R25,160	21,622
Natural Uranium	R16,316	15,562
Enriched Uranium ^a	R8,844	6,061
U.S. Supplier Inventories	R8,258	5,353
Natural Uranium	R6,698	5,195
Enriched Uranium ^a	R1,560	158
Total Commercial Inventories	R33,418	26,975
DOE-Owned and USEC-Held Inventories^b	R32,776	42,616
Natural Uranium	R21,993	31,534
Enriched Uranium	R10,783	11,081

^aIncludes amounts reported as inventories of UF₆ at Enrichment Suppliers.

^bAmounts reported as inventories by U.S. Department of Energy (DOE) and the United States Enrichment Corporation (USEC).

P = Preliminary data. R=Revised data. Final 1994 inventory data reported in the 1995 survey

Note: Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995).

Glossary

Glossary

Contract-specified price: The delivery price determined when a contract is signed. It can be a fixed price or a base price escalated according to a given formula.

Conventional mill (uranium): A facility engineered and built principally for processing of uraniferous ore materials mined from the earth and the recovery, by chemical treatment in the mill's circuits, of uranium and/or other valued coproduct components from the processed ore.

Cost model for undiscovered resources: A computerized algorithm that uses the uranium endowment estimated for a given geological area and selected industry economic indexes to develop random variables that describe the undiscovered resources ultimately expected to be discovered in that area at chosen forward-cost categories.

Cutoff grade: The lowest grade, in percent U_3O_8 , of uranium ore at a minimum specified thickness that can be mined at specified cost.

Development drilling: Drilling done to determine more precisely size, grade, and configuration of an ore deposit subsequent to the time the determination is made that the deposit can be commercially developed.

Domestic: Domestic means within the 50 States, District of Columbia, Puerto Rico, the Virgin Islands, Guam, and other U.S. possessions. The word "domestic" is used also in conjunction with data and information that are compiled to characterize a particular segment or aspect of the uranium industry in the United States.

Domestic purchase: A uranium purchase from a firm located in the United States.

Domestic sale: A uranium sale to a firm located in the United States.

Domestic uranium industry: Collectively, those businesses (whether U.S. or foreign-based) that operate under the laws and regulations pertaining to the conduct of commerce within the United States and its territories and possessions and that engage in activities within the United States, its territories, and possessions specifically directed toward uranium exploration, development, mining, and milling; marketing of uranium materials; enrichment; fabrication; or acquisition and management of uranium materials for use in commercial nuclear power plants.

Enriched uranium: Uranium in which the ^{235}U isotope concentration has been increased to greater than the 0.711 percent ^{235}U (by weight) present in natural uranium.

Enrichment feed deliveries: Uranium that is shipped under contract to a supplier of enrichment services for use in preparing enriched uranium product to a specified ^{235}U concentration and that ultimately will be used as fuel in a nuclear reactor.

Enrichment services: (See Separative Work Units).

Exploration drilling: Drilling done in search of new mineral deposits, on extensions of known ore deposits, or at the location of a discovery up to the time when the company decides that sufficient ore reserves are present to justify commercial exploitation. Assessment drilling is reported as exploration drilling.

Fabricated fuel: Fuel assemblies composed of an array of fuel rods loaded with pellets of enriched uranium dioxide.

Floor price: A price specified in a market-price contracts as the lowest purchase price of the uranium, even if the market price falls below the specified price. The floor price may be related to the seller's production costs.

Foreign purchase: A uranium purchase of foreign-origin uranium from a firm located outside of the United States.

Foreign sale: A uranium sale to a firm located outside the United States.

Forward cost: The operating and capital costs still to be incurred in the production of uranium from in-place reserves. By using forward costing, estimates of reserves for ore deposits in differing geological settings and status of development can be aggregated and reported for selected cost categories. Included are costs for labor, materials, power and fuel, royalties, payroll taxes, insurance, and applicable general and administrative costs. Excluded from forward cost estimates are prior expenditures, if any, incurred for property acquisition, exploration, mine development, and mill construction, as well as income taxes, profit, and the cost of money. Forward costs are neither the full costs of production nor the market price at which the uranium, when produced, might be sold.

Heap leach solutions: The separation, or dissolving-out, from mined rock of the soluble uranium constituents by the natural action of percolating a prepared chemical solution through mounded (heaped) rock material. The mounded material usually contains low grade mineralized material and/or waste rock produced from openpit or underground mines. The solutions are collected after percolation is completed and processed to recover the valued components.

In situ leach mining (ISL): The recovery, by chemical leaching, of the valuable components of an orebody without physical extraction of the ore from the ground. Also referred to as “solution mining.”

Long-term contract: One or more deliveries to occur after a period of at least 6 years following contract execution.

Market-related price: The prevailing price level in the market at a given time. It generally reflects a published spot price, is mutually agreed upon by the contracting parties, or is independently determined by an unbiased outside arbitrator.

Market-price contract: A contract in which the price of uranium is not specifically determined at the time the contract is signed but is based instead on the prevailing market price at the time of delivery. A market-price contract may include a floor price, that is, a lower limit on the eventual settled price. The floor price and the method of price escalation generally are determined when the contract is signed. The contract may also include a price ceiling or a discount from the agreed-upon market price reference.

Market-price settlement: The price paid for uranium delivery under a market-price contract. The price is commonly (but not always) determined at or sometime before delivery and may be related to a floor price, ceiling price, or discount.

Medium-term contract: One or more deliveries to occur over a period of 3 to 6 years following contract execution.

Milling of uranium: The processing of uranium from ore mined by conventional methods, such as underground or openpit methods, to separate the uranium from the undesired material in the ore.

National Uranium Resource Evaluation (NURE): A program begun by the U.S. Atomic Energy Commission (AEC) in 1974 to make a comprehensive evaluation of U.S. uranium resources and continued through 1983 by the AEC’s successor agencies, the Energy Research and Development Administration (ERDA) and the Department of Energy (DOE). The NURE program included aerial radiometric and magnetic surveys, hydrogeochemical and stream sediment surveys, geologic drilling in selected areas, geophysical logging of selected boreholes, and geologic studies to identify and evaluate geologic environments favorable for uranium.

Nonconventional plant (uranium): A facility engineered and built principally for processing of uranium solutions that are produced during in situ leach mining, from heap leaching, or in the manufacture of other commodities, and the recovery, by chemical treatment in the plant’s circuits, of uranium from the processed solutions.

Nuclear reactor: An apparatus in which a nuclear fission reaction, i.e., the splitting of atomic nuclei to release heat energy, can be initiated, controlled, and sustained at a specific rate. A reactor includes fuel (fissionable material), moderating materials to control the rate of fissioning, a heavy-walled pressure vessel to house reactor components, shielding to protect personnel, a system to conduct heat away from the reactor, and instrumentation for monitoring and controlling the reactor's systems.

Optional delivery commitment: A provision to allow the conditional purchase or sale of a specific quantity of material in addition to the firm quantity in the contract.

Processing of uranium: The recovery of uranium from solutions produced by nonconventional mining methods, i.e., in situ leach mining (ISL), a byproduct of copper or phosphate mining, or heap leaching.

Reclamation: Process of restoring surface environment to acceptable pre-existing conditions. Includes surface contouring, equipment removal, well plugging, revegetation, etc.

Restoration: The returning of all affected groundwater to its premining quality for its premining use by employing the best practical technology.

Separative Work Units (SWU): The standard measure of enrichment services. The effort expended in separating a mass F of feed of assay x_f into a mass P of product assay x_p and waste of mass W and assay x_w is expressed in terms of the number of separative work units needed, given by the expression $SWU = WV(x_w) + PV(x_p) - FV(x_f)$, where $V(x)$ is the "value function," defined as $V(x) = (1 - 2x) \ln((1 - x)/x)$.

Short-term contract: One or more deliveries to occur over a period of less than 3 years following contract execution.

Spot contract: A one-time delivery of the entire contract to occur within one year of contract execution.

Spot market: Buying and selling of uranium for immediate or very near-term delivery. It typically involves transactions for delivery of up to 500,000 pounds U_3O_8 within a year of contract execution.

Spot-market price: A transaction price concluded "on the spot," that is, on a one-time, prompt basis. The transaction usually involves only one specific quantity of product. This contrasts with a term-contract sale price, which obligates the seller to deliver a product at an agreed frequency and price over an extended period.

Unfilled requirements: Requirements not covered by usage of inventory or supply contracts in existence as of January 1 of the survey year.

Uranium: A heavy, naturally radioactive, metallic element (atomic number 92). Its two principally occurring isotopes are ^{235}U and ^{238}U . The isotope ^{235}U is indispensable to the nuclear industry because it is the only isotope existing in nature to any appreciable extent that is fissionable by thermal neutrons. The isotope ^{238}U is also important because it absorbs neutrons to produce a radioactive isotope that subsequently decays to the isotope ^{239}Pu , which also is fissionable by thermal neutrons.

Uranium concentrate: A yellow or brown powder produced from naturally occurring uranium minerals as a result of milling uranium ore or processing uranium-bearing solutions. Synonymous with yellowcake, U_3O_8 , or uranium oxide.

Uranium deposit: A discrete concentration of uranium mineralization that is of possible economic interest.

Uranium endowment: The uranium that is estimated to occur in rock with a grade of at least 0.01 percent U_3O_8 . The estimate of the uranium endowment is made before consideration of economic availability and any associated uranium resources.

Uranium hexafluoride (UF_6): A white solid obtained by chemical treatment of U_3O_8 and which forms a vapor at temperatures above 56 degrees Centigrade. UF_6 is the form of uranium required for the enrichment process.

Uranium ore: Rock containing uranium mineralization in concentrations that can be mined economically, (typically 1 to 4 pounds of U_3O_8 per ton or 0.05 to 0.20 percent U_3O_8).

Uranium oxide: Uranium concentrate or yellowcake. Abbreviated as U_3O_8 .

Uranium property: A specific piece of land with uranium reserves that is held for the ultimate purpose of economically recovering the uranium. The land can be developed for production or undeveloped.

Uranium reserves: Estimated quantities of uranium in known mineral deposits of such size, grade, and configuration that the uranium could be recovered at or below a specified production cost with currently proven mining and processing technology and under current law and regulations. Reserves are based on direct radiometric and chemical measurements of drill holes and other types of sampling of the deposits. Mineral grades and thickness, spatial relationships, depths below the surface, mining and reclamation methods, distances to milling facilities, and amenability of ores to processing are considered in the evaluation. The amount of uranium in ore that could be exploited within the chosen forward-cost levels are estimated in accordance with conventional engineering practices.

Uranium resources categories: Three categories of uranium resources are used to reflect differing levels of confidence in the resources reported. Reasonably assured resources (RAR), estimated additional resources (EAR), and speculative resources (SR) are described below.

Reasonably assured resources (RAR): The uranium that occurs in known mineral deposits of such size, grade, and configuration that it could be recovered within the given production cost ranges, with currently proven mining and processing technology. Estimates of tonnage and grade are based on specific sample data and measurements of the deposits and on knowledge of deposit characteristics. RAR correspond to DOE's uranium reserves category.

Estimated additional resources (EAR): The

uranium in addition to RAR that is expected to occur, mostly on the basis of direct geological evidence, in extensions of well-explored deposits, little explored deposits, and undiscovered deposits believed to exist along well-defined geological trends with known deposits, such that the uranium can subsequently be recovered within the given cost ranges. Estimates of tonnage and grade are based on available sampling data and on knowledge of the deposit characteristics, as determined in the best-known parts of the deposit or in similar deposits. EAR correspond to DOE's probable potential resources category.

Speculative resources (SR): Uranium in addition to EAR that is thought to exist, mostly on the basis of indirect evidence and geological extrapolations, in deposits discoverable with existing exploration techniques. The locations of deposits in this category can generally be specified only as being somewhere within given regions or geological trends. The estimates in this category are less reliable than estimates of RAR and EAR. The category of SR corresponds to DOE's possible potential resources plus speculative potential resources categories combined.

Usage Agreement: Contracts held by enrichment customers that allow feed material to be stored at the enrichment plant site in advance of need.

Yellowcake: (See uranium oxide).