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Preface

The *Uranium Industry Annual 1998* (UIA 1998) provides current statistical data on the U.S. uranium industry's activities relating to uranium raw materials and uranium marketing. The UIA 1998 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 1989 through 2008 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 1998, 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. For 1992 through 1995, this information was provided in a separate issue entitled Uranium Purchases Report, that is no longer being produced. The data is now contained in Chapter 2 (pages 11 and 13, Tables 12, 22, 23, and 25) of this report.

Data on uranium raw materials activities for 1989 through 1998, 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 2008, including purchases of uranium and enrichment services, enrichment feed deliveries, uranium fuel assemblies, filled and unfilled market requirements, and uranium inventories, are shown in Chapter 2.

The methodology used in the 1998 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. The Form EIA-858 "Uranium Industry Annual Survey" is shown in Appendix D. For the readers convenience, metric versions of selected tables from Chapters 1 and 2 are presented in Appendix E along with the standard conversion factors used. A glossary of technical terms is at the end of the report.

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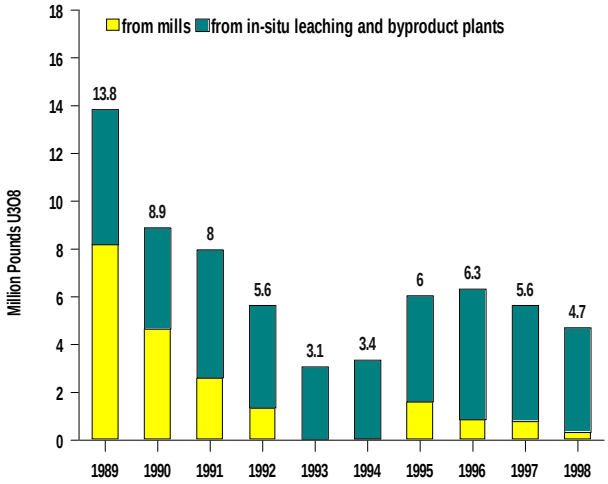
Highlights

Uranium Raw Material Activities

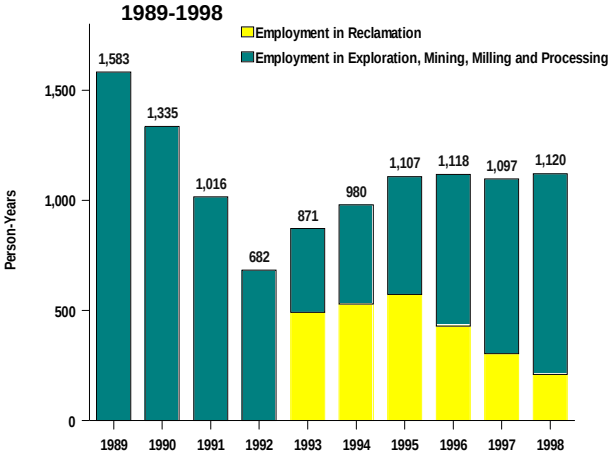
U.S. uranium production (in the form of uranium concentrate) in 1998 totaled 4.7 million pounds, a decrease of 17 percent from the 1997 level (Table H1). Ten uranium concentrate production facilities operated in the United States. Uranium production at U.S. uranium mills accounted for 7 percent; and in-situ leaching and as a byproduct of phosphate processing combined for 93 percent (Figure H1). Three mills produced uranium concentrate, not by conventional milling of uranium-bearing ore, but by processing uranium from other feed materials.

Figure H1. U.S. Uranium Concentrate Production, 1989-1998



Total exploration and development expenditures in 1998 were $21.7 million. Employment in the U.S. uranium raw materials industry totaled 1,120 person years (Figure H2), an increase in production employment sector was offset by a decrease in reclamation employment.

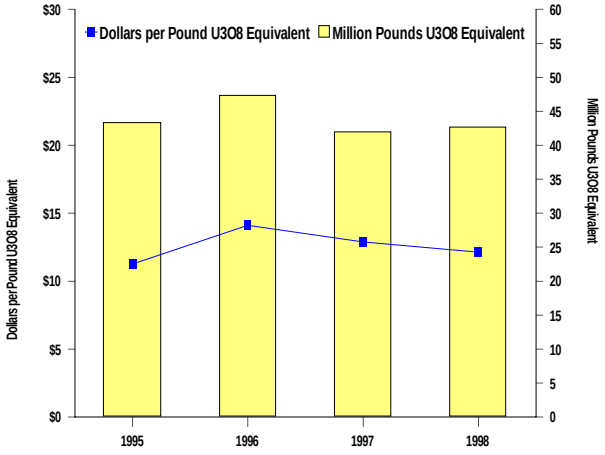
Figure H2. U.S. Uranium Raw Materials Employment, 1989-1998



Uranium Marketing Activities

U.S. utilities purchased from U.S. and foreign suppliers a total of 42.7 million pounds U_3O_8e (equivalent) of deliveries during 1998 (Table H2). The average price paid by the utilities was $12.14 per pound U_3O_8e, a decrease of 6 percent compared with the 1997 price (Figure H3).

Figure H3. Uranium Purchases by U.S. Utilities, 1995-1998



Fuel assemblies loaded into U.S. commercial nuclear power reactors during 1998 contained 38.3 million pounds U_3O_8e (Table H3). Uranium inventories owned at the end of the year by U.S. utilities in 1998 was 66.9 million pounds U_3O_8e. There has been a constant level of U.S. utilities uranium inventories since the end of 1996 (Figure H4).

Figure H4. Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors and Uranium Inventories of U.S. Utilities, 1995-1998

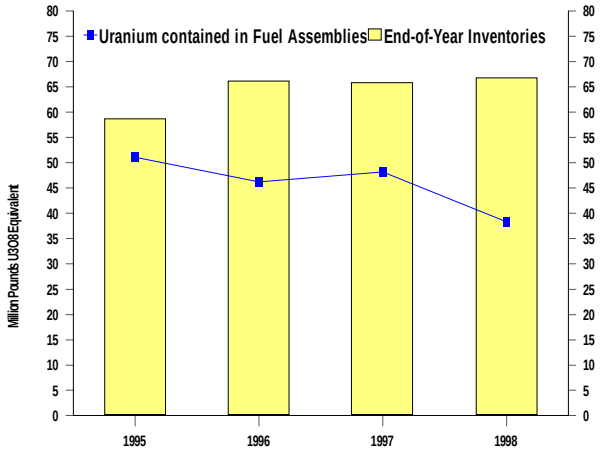


Table H1. Raw Materials Summary Statistics of the U.S. Uranium Industry, 1989-1998

Items	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Exploration and Development										
Surface Drilling (million feet)	2.2	1.7	1.8	1.1	1.1	0.7	1.3	3.0	4.9	4.6
(million meters)	0.7	0.5	0.6	0.3	0.3	0.2	0.4	0.9	1.5	1.4
Expenditures[a] (million dollars)	14.8	17.1	17.8	14.5	11.3	3.7	6.0	10.1	30.4	21.7
Reserves at End of Year										
(million pounds U_3O_8, $US30 per pound)	277	265	304	295	292	294	290	285	281	276
(thousand metric tons U, $US80 per kilogram)	107	102	117	114	112	113	112	110	108	106
Mine Production of Uranium										
(million pounds U_3O_8)	9.7	5.9	5.2	1.0	2.1	2.5	3.5	4.7	4.7	4.8
(thousand metric tons U)	3.7	2.3	2.0	0.4	0.8	1.0	1.4	1.8	1.8	1.8
Uranium Concentrate Production										
(million pounds U_3O_8)	13.8	8.9	8.0	5.6	3.1	3.4	6.0	6.3	5.6	4.7
(thousand metric tons U)	5.3	3.4	3.1	2.2	1.2	1.3	2.3	2.4	2.2	1.8
Uranium Concentrate Shipments										
(million pounds U_3O_8)	14.8	13.0	8.4	6.9	3.4	6.3	5.5	6.0	5.8	4.9
(thousand metric tons U)	5.7	5.0	3.2	2.6	1.3	2.4	2.1	2.3	2.2	1.9
Employment (person-years expended)	1,583	1,335	1,016	682	871	980	1,107	1,118	1,097	1,120

[a]Expenditures 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 1998, total employment includes reclamation employment.

Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annnual 1997* (April 1998); **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table H2. Transaction Summary Statistics of the U.S. Uranium Industry, 1995-1998

	1995		1996		1997		1998	
Actual Deliveries	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price
Purchases by U.S. Brokers and Traders								
(million pounds U_3O_8e; dollars per pound U_3O_8e)	22.9	9.53	25.3	12.61	19.7	11.00	24.4	11.10
(thousand metric tons U; dollars per kilogram U)	8.8	24.79	9.7	32.79	7.6	28.60	9.4	28.87
Purchases by U.S. Utilities								
(million pounds U_3O_8e; dollars per pound U_3O_8e)	43.4	11.25	47.3	14.12	42.0	12.88	42.7	12.14
(thousand metric tons U; dollars per kilogram U)	16.7	29.24	18.2	36.71	16.1	33.49	16.4	31.55
Foreign Purchases by U.S. Suppliers and Utilities								
(million pounds U_3O_8e; dollars per pound U_3O_8e)	41.3	10.20	45.4	13.15	43.0	11.81	43.7	11.19
(thousand metric tons U; dollars per kilogram U)	15.9	26.52	17.5	34.19	16.5	30.69	16.8	29.08
Foreign Sales by U.S. Suppliers and Utilities								
(million pounds U_3O_8e; dollars per pound U_3O_8e)	9.8	13.48	11.5	14.20	17.0	12.39	15.1	12.05
(thousand metric tons U; dollars per kilogram U)	3.8	35.06	4.4	36.92	6.5	32.22	5.8	31.33

U_3O_8e = U_3O_8 equivalent.

Note: Prices are in nominal U.S. dollars.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1998).

Table H3. Summary Statistics of Uranium Fuel and Commercial Inventories, 1995-1998

Items	1995	1996	1997	1998[P]
Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors				
(million pounds U_3O_8e)	51.1	46.2	48.2	38.3
(thousand metric tons U)	19.7	17.8	18.5	14.7
Commercial Inventories at the End of the Year				
U.S. Utility Inventories				
(million pounds U_3O_8e)	58.7	66.1	65.9	66.9
(thousand metric tons U)	22.6	25.4	25.3	25.7
U.S. Utility and Supplier Inventories				
(million pounds U_3O_8e)	72.5	80.0	106.2	137.6
(thousand metric tons U)	27.9	30.8	40.9	52.9

U_3O_8e = U_3O_8 equivalent.

P=Preliminary data. Final 1997 data reported in the 1998 survey.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

1. U.S. Uranium Raw Materials Industry

Introduction

The levels of activity in the U.S. uranium raw materials industry overall were lower during 1998, compared with 1997. Expenditures for exploration, drilling, and related activities reported for 1998 were lower than in 1997 (Figure 1), mine production of uranium remained constant (Figure 2), and total uranium concentrate production decreased in 1998 (Figure 3). Total employment for uranium exploration, mining, milling, and processing increased in 1998 compared with 1997 (Figure 4), but employment for reclamation activities continued to decline.

Uranium concentrate was produced in 1998 from in-situ leach methods and as a byproduct of phosphate processing. Also, 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 825 thousand acres for all exploration purposes at the end of 1998 (Table 1). About 6,000 acres were acquired for exploration at a total cost of $148,000 during 1998 (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 4.6 million feet in 6,601 holes (Table 1). Development drilling expenditures in 1998 was $15.8 million, while exploration drilling expenditures was $2.3 million (Figure 5).

Expenditures for Uranium Exploration and Development

Total U.S. uranium exploration and development expenditures in 1998 were $21.7 million, consisting of (in millions) $18.1 for surface drilling, $0.1 for land, and $3.5 for other exploration activities (Table 2) This total represents a 29 percent decrease of the 1997 level. Expenditure participation from foreign sources were $0.3 million in 1998, which represents only 1 percent of the total U.S. expenditures in 1998.

Estimates of U.S. Uranium Reserves

As of the end of 1998, the EIA's estimates of uranium reserves in the $30- and $50-per-pound categories were 276 and 923 million pounds, respectively. Underground mining reserves accounted for about one-half of the total reserves in each cost category (Table 3). The reserves decreases are based on 1998 mine production of uranium and reflect the combined effects of depletion and erosion on in-place ore quantities remaining at year end. Three States, New Mexico, Texas and Wyoming, contain about 74 percent of $30-per-pound U_3O_8 reserves (Appendix B, Table B4). Reserves 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.

Mine Production of Uranium

During 1998, a total of 4.8 million pounds U_3O_8 of uranium were produced by mining and is 2 percent more than the level of production in 1997 (Table 4). Production came from three new underground mines and continued at one underground mine during 1998. Uranium was also recovered from waste mine-water and from reclamation

and restoration activities at closed in situ mine sites. Compared with 1997, in situ leach mine production decreased 9 percent in 1998. Overall, there were 10 commercially operating uranium mines during part or all of 1998, two more than in 1997 (Table 4).

Concentrate Production and Shipments

Total U.S. uranium concentrate production in 1998 was 4.7 million pounds U_3O_8, 17 percent below the 1997 level (Table 5). Concentrate production from conventional mills was 0.3 million pounds.

Concentrate production in the "Other Processing" category includes production from in situ leaching and as a byproduct of phosphate processing. Compared with 1997, this category decreased 10 percent and totaled 4.4 million pounds U_3O_8 in 1998 (Table 5).

Shipments of uranium concentrate from domestic production facilities (mills, in situ and phosphate byproduct plants) totaled 4.9 million pounds in 1999 (Table 5). Shipments exceeded production for the last two years (Figure 6).

Status of Uranium Processing Facilities

At the end of 1998, all six U.S. mills were inactive based on their conventional milling capacity of 14,400 tones of ore per day (Table 6). However, three of the inactive conventional mills produced uranium concentrate from waste stream materials and from mine water during 1998.

Seven nonconventional uranium producing plants, consisting of six in-situ leach plants and one phosphate byproduct plants, were in commercial operation in the United States at the end of 1998. These plants had a combined rated capacity of 8.7 million pounds U_3O_8 per year (Table 7), including a reported increase at the Smith Ranch plant. Eight nonconventional plants were inactive at the end of 1998. Three of the five inactive in-situ leach plants had produced a small amount of uranium concentrate in 1998 from restoration activities. One of the two byproduct plants in Louisiana closed permanently at the end of 1998, and the other one is closing early 1999.

The locations of active and inactive U.S. uranium concentrate production facilities, along with the locations of major uranium reserve areas, are shown in Figure 7.

Employment

Employment in the U.S. uranium raw materials industry in 1998 was reported as 1,120 person-years expended (Table 8). Compared with 1997, 1998 employment overall increased by 2 percent. However, employment levels in individual categories changed significantly: mining employment rose by 25 percent and processing by 16 percent, while milling employment declined by 9 percent and reclamation by 31 percent. Exploration employment remained the same. Three States, Colorado, Texas and Wyoming, accounted for 72 percent of the total employment in 1998 (Table 9).

Figure 1. U. S. Uranium Exploration and Development Expenditures, 1989-1998

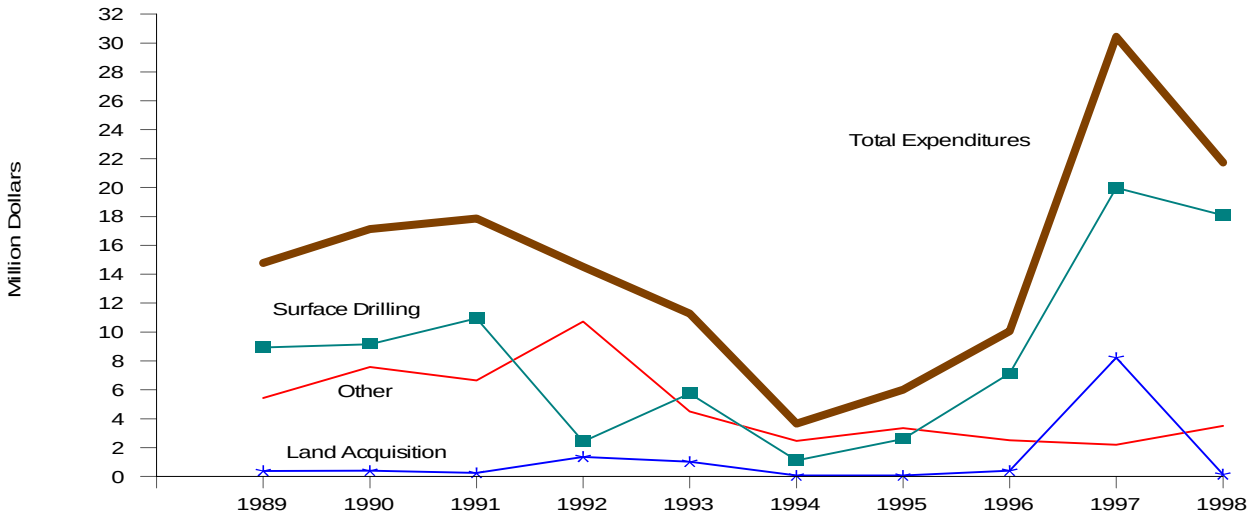


Figure 2. U.S. Uranium Mine Production, 1989-1998

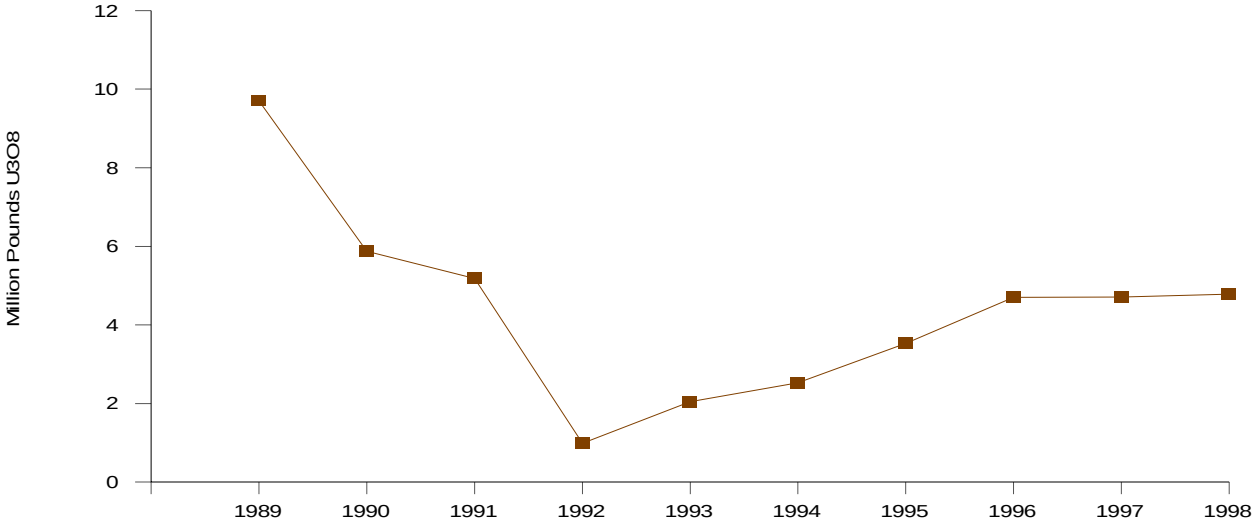
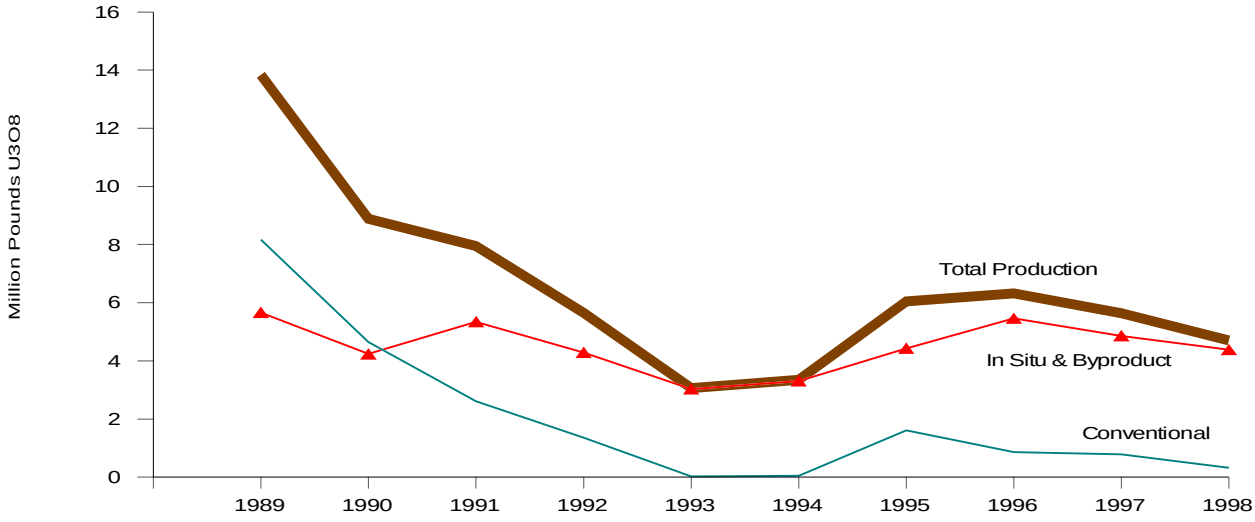


Figure 3. U.S. Uranium Concentrate Production, 1989-1998



Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annual 1997* (April 1998). **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Figure 4. Employment - U.S. Uranium Raw Materials Sector, 1989-1998

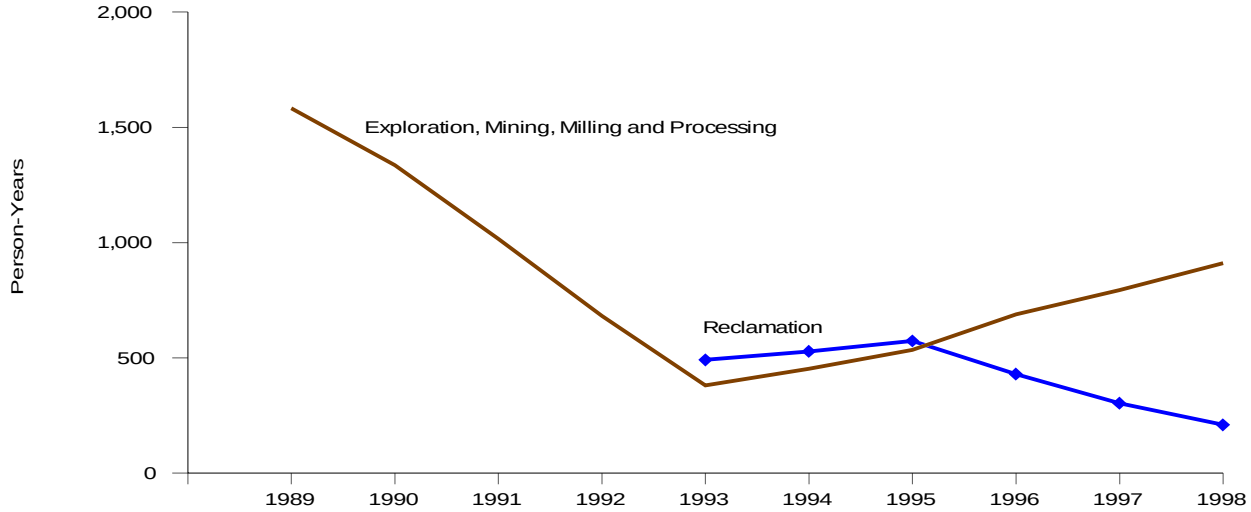


Figure 5. U.S. Uranium Exploration and Development Surface Drilling Expenditures, 1989-1998

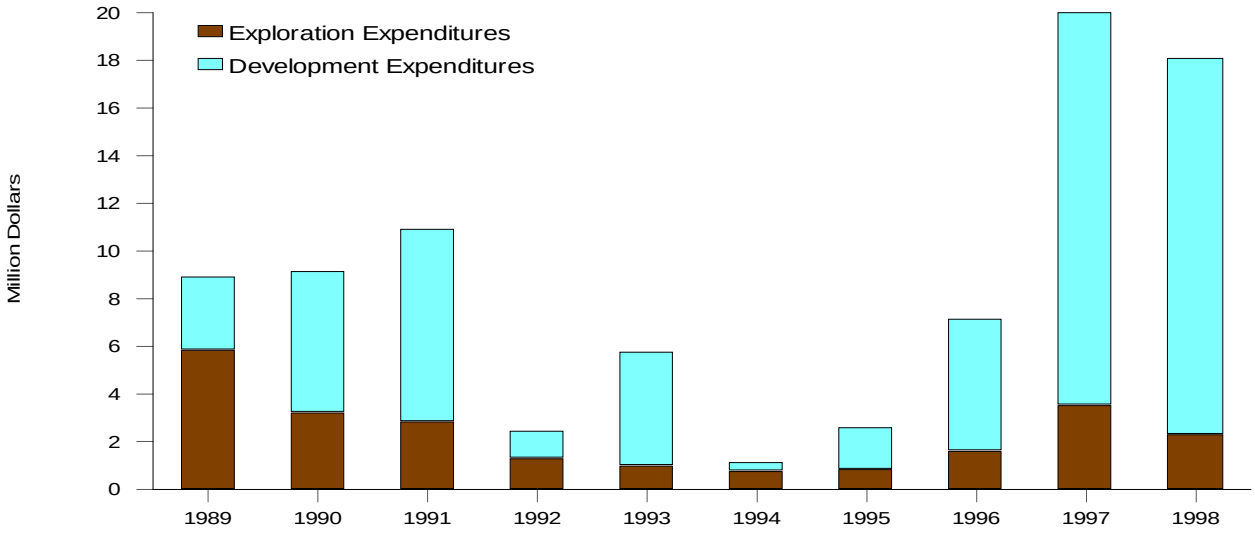
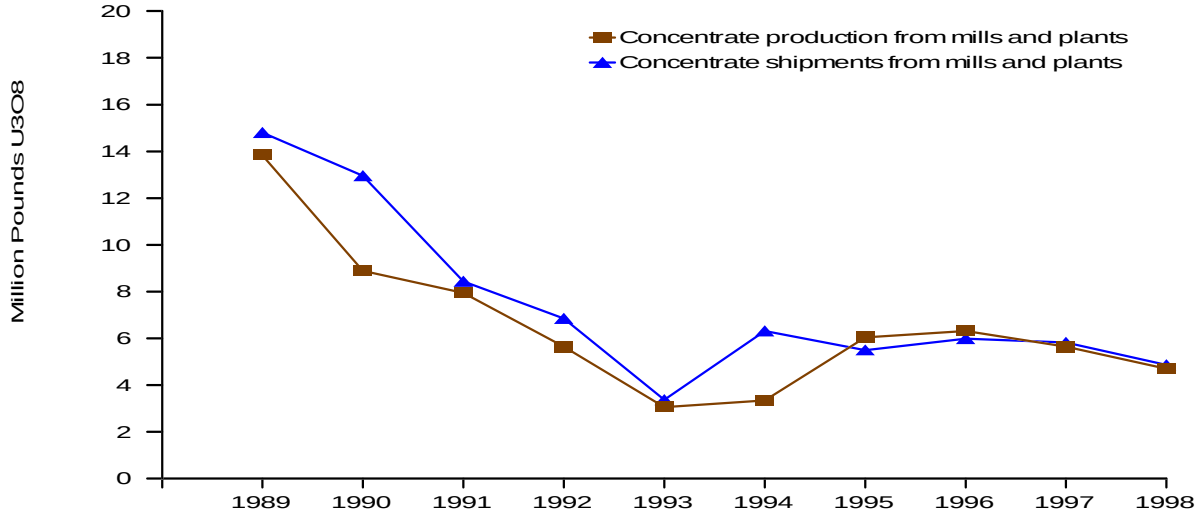


Figure 6. U.S. Uranium Concentrate Production and Shipments, 1989-1998



Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annual 1997* (April 1998). **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 1. U.S. Uranium Land and Surface Drilling Activities, 1989-1998

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)
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
1996	36	288	1,118	883	1,602	3,577	2,163	5,549	4,695	3,046	7,150
1997	550	840	1,935	1,327	3,544	5,858	3,555	16,448	7,793	4,882	19,992
1998	6	825	1,370	888	2,261	5,231	3,754	15,814	6,601	4,643	18,075

Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annual 1997* (April 1998). **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 2. Expenditures for Exploration and Development of Uranium in the United States, 1989-1998
(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
1989	8,940	390	5,430	14,770	6,100	41
1990	9,160	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	6,009	2,078	35
1996	7,150	403	2,500	10,054	4,416	44
1997	19,992	8,226	2,207	30,426	4,254	14
1998	18,075	148	3,501	21,724	271	1

Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annual 1997* (April 1998). **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 3. Forward-Cost Uranium Reserves by Mining Method, 1998

Mining Method	Forward-Cost Category					
	$30 per pound			$50 per pound		
	Ore (million tons)	Grade[a] (percent U_3O_8)	U_3O_8 (million pounds)	Ore (million tons)	Grade[a] (percent U_3O_8)	U_3O_8 (million pounds)
Underground	25	0.272	138	143	0.163	464
Openpit	10	0.139	29	163	0.079	257
In Situ Leaching	42	0.130	109	123	0.076	187
Other[b]	< 1	0.264	< 1	15	0.050	15
Total	**78**	**0.178**	**276**	**444**	**0.104**	**923**

[a]Weighted average percent U_3O_8 per ton of ore.

[b]Includes 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."

Table 4. U.S. Uranium Mine Production and Number of Mines and Sources, 1989-1998

Mining Method	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Underground (thousand pounds U_3O_8)	5,300	W	W	W	0	0	0	W	W	W
Openpit (thousand pounds U_3O_8)	W	1,881	2,528	W	0	0	0	0	0	0
In Situ Leaching (thousand pounds U_3O_8)	W	W	W	W	W	2,448	3,372	4,379	4,084	3,721
Other[a] (thousand pounds U_3O_8)	4,400	3,995	2,654	986	2,050	78	156	326	626	1,062
Total Mine Production (thousand pounds U_3O_8)	**9,700**	**5,876**	**5,182**	**986**	**2,050**	**2,526**	**3,528**	**4,705**	**4,710**	**4,782**
Number of Mines Operated										
Underground	19	27	6	4	0	0	0	1	1	4
Openpit	2	2	2	1	0	0	0	0	0	0
In Situ Leaching	9	7	6	4	5	5	5	6	7	6
Other Sources[b]	2	3	1	8	7	7	7	6	6	5
Total Mines and Sources	**32**	**39**	**15**	**17**	**12**	**12**	**12**	**13**	**14**	**15**

[a]For 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. For 1996 through 1998, "Other" includes production from underground mines and uranium bearing water from mine workings and restoration.

[b]Other 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: **1989-1997-***Uranium Industry Annnual 1997* (April 1998); **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 5. U.S. Uranium Concentrate Processing Operations, 1989-1998

Processing Operations	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Ore Fed to Process[a] (thousand tons)	1,235	722	639	256	0	0	167	44	0	0
Percent U_3O_8[b]	0.323	0.293	0.198	0.229	—	—	0.520	0.500	—	—
Contained U_3O_8 (thousand pounds)										
In Ore	7,977	4,227	2,529	1,171	0	0	1,739	444	0	0
Other Feed Materials[c]	429	485	179	181	42	78	163	409	911	387
Total Mill Feed (thousand pounds U_3O_8) ..	8,406	4,712	2,708	1,353	42	78	1,902	853	911	387
In-Process Inventory Change ..... (thousand pounds U_3O_8)	-234	-244	-122	-25	10	24	157	-137	52	-7
Concentrate Produced at Mills (thousand pounds U_3O_8)										
Theoretical[d]	8,640	4,956	2,830	1,377	31	54	1,744	990	859	393
Actual	**8,175**	**4,649**	**2,608**	**1,359**	**30**	**46**	**1,615**	**860**	**784**	**323**
Recovery as Percent of Mill Feed	94.6	93.8	92.2	98.7	—	—	92.6	86.8	91.2	82.2
Tailings and Unaccountable (thousand pounds U_3O_8)	465	307	222	18	1	8	130	130	76	70
Other Processing[e] (thousand pounds U_3O_8)	**5,662**	**4,237**	**5,344**	**4,286**	**3,033**	**3,306**	**4,428**	**5,461**	**4,859**	**4,381**
Total Uranium Concentrate Production (thousand pounds U_3O_8)	**13,837**	**8,886**	**7,952**	**5,645**	**3,063**	**3,352**	**6,043**	**6,321**	**5,643**	**4,705**
Total Concentrate Shipped From Mills and Plants (thousand pounds U_3O_8)	**14,808**	**12,957**	**8,437**	**6,853**	**3,374**	**6,319**	**5,500**	**5,982**	**5,817**	**4,863**

[a]Uranium 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.
[b]Weighted average percent U_3O_8 per ton of ore.
[c]Includes for various years uranium from low-grade ore, mill cleanup, mine water, tailings water, heap leaching, and waste stream materials.
[d]At 100-percent recovery.
[e]U_3O_8 concentrate production from in situ leaching and as a byproduct of phosphate processing.
— = Not applicable.
Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annnual 1997* (April 1998); **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 6. Operating Status of Conventional Uranium Mills, End of the Year, 1995-1998

Mill Owner	Name	Milling Capacity[a] (short tons of ore per day)	Operating Status at End of the Year			
			1995	1996	1997	1998
Cotter	Canon City	1,200	I	I	I	I
Dawn Mining	Ford	450	I	I	I	I
Green Mountain Mining Venture	Sweetwater	3,000	I	I	I	I
International Uranium (USA)	White Mesa	2,000	O	I	I	I
Rio Algom Mining	Ambrosia Lake	7,000	I	I	I	I
U.S. Energy/Plateau Resources	Shootaring	750	I	I	I	I
Summary of Mill Status						
Number of Mills						
Operating[b]	--	--	1	0	0	0
Inactive	--	--	5	6	6	6
Total	--	--	6	6	6	6
Available Milling Capacity						
Operating (tons of ore per day)	--	--	2,000	0	0	0
Inactive (tons of ore per day)	--	--	12,400	14,400	14,400	14,400
Total Available Capacity (tons of ore per day)	--	--	14,400	14,400	14,400	14,400
Average Daily Mill Feed (tons of ore per day)[c]	--	--	476	127	0	0
Percent of Total Available Capacity[d]	--	--	3	1	0	0

[a]Milling capacity based on historical data and data reported on Form EIA-858 for 1998.
[b]Number that milled uranium-bearing ore at the end of year.
[c]Rounded value. Based on 350 workdays per year and total ore fed to process during the year shown in Table 5.
[d]Rounded 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: **1995-1997-***Uranium Industry Annual 1997* (April 1998). **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 7. Operating Status of Nonconventional Uranium Plants, 1998

Plant Owner	Name	Plant Type	Rated Capacity[a] (thousand pounds U_3O_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	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	I
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	I
Malapai Resources	Irigaray	In Situ Leach	350	I
Malapai Resources	O'Hern	In Situ Leach	[c]0	I
Rio Algom Mining	Smith Ranch	In Situ Leach	2,000	O
Uranium Resources	Kingsville Dome	In Situ Leach	1,300	O
Uranium Resources	Rosita	In Situ Leach	1,000	O

[a]Milling capacity based on data reported on Form EIA-858 for 1998.
[b]O=Operating at the end of the year; I=Inactive at the end of the year.
[c]Malapai Resources did not report a rated capacity for the O'Hern plant.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 8. Employment in the U.S. Uranium Industry by Category, 1989-1998
(Person-Years)

Year	Employment Categories					Total
	Exploration	Mining	Milling	Processing	Reclamation[a]	
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
1996	27	333	155	175	429	1,118
1997	30	413	175	175	303	1,097
1998	30	518	160	203	209	1,120

[a]Data 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: **1989-1997-***Uranium Industry Annual 1997* (April 1998); **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 9. Employment in the U.S. Uranium Industry by State, 1998
(Person-Years)

State(s)	Total	Percent of Total
Wyoming	441	39
Texas	139	12
Colorado	230	21
Arizona, New Mexico, Utah	175	16
Other[a]	134	12
**Total ..... **	**1,120**	**100**

[a]Includes Florida, Illinois, Louisiana, Nebraska, and Washington.
Notes: Totals may not equal sum of components because of independent rounding. Total employment includes 209 person years for reclamation.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

2. Uranium Marketing Activities in the United States

Introduction

Movement of both natural and enriched uranium materials illustrates, for 1998, the commercial market transactions used by U.S. suppliers and utilities to procure and dispose of uranium (Figure 8). The uranium quantities throughout this chapter are expressed as U_3O_8 equivalent (U_3O_8e). U.S. utilities purchase uranium each year both from U.S. suppliers (domestic purchases) and foreign suppliers (foreign purchases). U.S. suppliers are U.S.-based firms that exchange, loan, purchase, or sell uranium within and outside the U.S. uranium market. They can include uranium brokers, converters, enrichers, fabricators, traders, producers, and uranium property holders. Foreign suppliers are non-U.S. based firms that market uranium into and from the United States.

Uranium market activities of U.S. utilities include purchases of uranium from domestic and foreign sources (origins), 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 commercial nuclear power reactors, and the year-end 1998 status of uranium inventories.

Uranium Market Activity of U.S. Utilities

Uranium Purchases

In 1998, U.S. utilities received a total of 42.7 million pounds U_3O_8e (Figure 9), and the average price was $12.14 per pound (Table 10 and Figure 10). Compared with 1997, the quantity is an increase of 2 percent, but a decrease in price of 6 percent. Foreign-origin uranium accounted for 35.6 million pounds (83 percent) of the deliveries (Figure 11) at an average price of $11.90 per pound (Table 11). Approximately 34 percent of all uranium purchased by U.S. utilities was Canadian origin (Table 12), while only 17 percent was of domestic origin. In rank order, the next four foreign country origins were Russia (14 percent), Australia (13 percent), South Africa and Uzbekistan (each 6 percent) (Figure 12).

The 30 sellers of uranium to U.S. utilities with 1998 deliveries are shown in the following list. Eight of the 30 firms (designated with an asterisk) had contracts signed in 1998.

Uranium Sellers to U.S. Utilities

Cameco Corporation*
COGEMA, Inc.
COGEMA Mining, Inc.
Comurhex S. A.
Connecticut Yankee Atomic Power
ConverDyn
Energy Resources of Australia
Framatome Cogema Fuels*
General Electric Company
Geomex Minerals, Inc.
Global Nuclear Services & Supply Ltd.*
International Uranium Corp.*
New York Nuclear Corp.*
Nuclear Electric Ltd.
Nuclear Fuels Corp. of South Africa
NUKEM, Inc.*
Power Resources, Inc.
Rio Algom Mining Corporation
RTZ Minerals Services Limited
Sheep Mountain Partners
Siemens Power Corporation*
The Uranium Exchange Company
U.S. Enrichment Corporaton (USEC)
UG U.S.A., Inc.*
Uranerz Exploration & Mining Ltd.
Uranerz U.S.A., Inc.
Urangesellschaft Mbh
Uranium Resources, Inc.
Western Mining Corp. (Olympic Dam)
World Wide Minerals Ltd.

The utilities purchased uranium of several material types (Table 13). Uranium concentrate (U_3O_8) accounted for 74 percent of the purchases, uranium hexafluoride (UF_6) was 17 percent, and enriched uranium was 9 percent (Figure 13).

Domestic purchases of uranium (both U.S. and foreign-origin) in 1998 totaled 20.3 million pounds U_3O_8e, 1.6 million pounds more than the deliveries for 1997 (Table 14). The average price of these domestic purchases in 1998 was $12.31 per pound.

Foreign purchases of uranium (only foreign-origin) from foreign suppliers in 1998 totaled 19.8 million pounds U_3O_8e, 2.7 million pounds less than the deliveries for 1997. The average price of these foreign purchases in 1998 was $11.96 per pound.

Uranium Price Distributions and Contract Types

A pricing mechanism was reported for each price of a uranium delivery. One mechanism, contract-specified pricing which includes fixed prices and base-escalated prices, was dominant for deliveries in 1996 through 1998 (Table 14). Average prices declined for each type of pricing mechanism compared with 1997.

The octile price distributions (Table 15) provides an average-price range without publishing the actual lowest and highest prices. For the quartile distributions, each contain a group of U.S. utilities, sorted in increasing order by their overall average price for its deliveries, and provides the aggregated quantity and its average price for each distribution.

During 1998, 23 percent of the deliveries to utilities involved spot and short-term contracts, and the remaining 77 percent involved medium-term and long-term contracts (Table 16). The average price for spot contracts was $10.56 per pound, but for medium-term contracts it was $13.04 per pound. Most deliveries were made under medium-term contracts in 1998, and long-term contracts were second in deliveries (Figure 14).

New Purchases

The quantity of uranium delivered in 1998, under 15 purchase contracts signed in 1998, was 4.5 million pounds U_3O_8e, and the average price was $10.38 per pound (Table 17). Thirteen new spot contracts accounted for 77 percent of the 1998 deliveries for these new purchase contracts.

Future deliveries reported for 1999 through 2008, for contracts signed in 1998, total 27.1 million pounds. Of this quantity, firm deliveries amount to 18.7 million pounds (Table 18).

Anticipated Uranium Market Requirements

Future deliveries for 1999-2008, based on U.S. utility contracts reported in effect at the end of 1998, for all reported purchase contracts consisted of 129.9 million pounds for firm deliveries and 46.8 million pounds for optional deliveries (Table 19). Foreign suppliers would provide 60 percent of the existing firm deliveries to U.S. utilities through 2008 (Figure 15 and Table 19).

At the end of 1998, cumulative unfilled uranium requirements for commercial nuclear reactors for 1999 through 2008 were reported to be 327.5 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 176.7 million pounds (Table 21). These contracted deliveries and unfilled requirements combined represent U.S. utilities anticipated market requirements of uranium. The total 10-year requirements of U.S. utilities, as of year-end of 1998, was 504.3 million pounds.

The unfilled requirements category, as reported at the end of 1998, constitutes a small portion of anticipated market requirements in 1999 (Figure 16). However, it increases to 70 percent of total anticipated requirements by 2003 and to 100 percent by 2008. For the years 1999 and 2000, U.S. utilities anticipated market requirements do not meet their projected enrichment feed deliveries. However, for the years 2001 through 2008, the utilities' reported enrichment feed deliveries are less than their anticipated market requirements, indicating perhaps a period of uranium inventory buildup or an expectation of enriched uranium product purchases (Figure 17).

Uranium Feed for Enrichment

In 1998, U.S. utilities delivered 40.6 million pounds U_3O_8e of natural uranium feed to domestic and foreign enrichment suppliers (Table 22). U.S.-origin uranium accounted for 5.8 million pounds (14 percent) of the feed deliveries (Table 23). Deliveries to U.S. enrichment plants accounted for 29.8 million pounds, or 73 percent of the total, and deliveries to foreign enrichment plants was 10.8 million pounds, 27 percent of total feed deliveries in 1998.

As of the end of 1998, the U.S. utilities projected that the amount of natural uranium feed to be shipped for enrichment for the years 1999 through 2008 will vary between 40 million and 55 million pounds annually (Table 24).

Purchases of Enrichment Services

In 1998, 10.1 million separative work units (SWU) were purchased by U.S. utilities under enrichment services contracts (Table 25.) U.S. uranium enrichment plants provided 56 percent of the utilities' SWU and foreign enrichment plants the remaining 44 percent. In comparison, for 1997 U.S. enrichment plants provided 68 percent of the utilities' enrichment needs.

Enrichment services by Russia accounts for 54 percent of foreign purchases and 23 percent of the total U.S. utilities' needs in 1998. In comparison, for 1994 Russia supplied only 5 percent of the total.

The 11 firms that were reported as the sellers of enrichment services for these SWU deliveries in 1998 are shown in the following list.

Enrichment Service Sellers to U.S. Utilities

COGEMA, Inc.
Global Nuclear Service & Supply, Ltd.
Nuclear Electric Limited
Nuexco Trading Corp. (NTC) Liquidating Trust
NUKEM, Inc.
Siemens Power Corp.
The Uranium Exchange Company
UG U.S.A., Inc.
Union Electric
United States Enrichment Corporation (USEC)
Urenco, Ltd.

The long-term enrichment service contracts were dominant in 1998, and represented 67 percent of SWU deliveries that were provided at both U.S. and foreign enrichment plants (Table 26). In contrast, the spot and short-term enrichment service contracts represents only 4 percent of SWU deliveries.

Fuel Assemblies

The total amount of uranium contained in fuel assemblies loaded into U.S. commercial nuclear reactors during 1998 was 38.3 million pounds U_3O_8e (Table 27). This was 9.9 million pounds less than in 1997 (Figure 18). These quantities do not include uranium in fuel assemblies removed from reactors that were reloaded.

Foreign Purchases of Uranium

The U.S. utilities and U.S. suppliers, i.e., primarily U.S. producers and U.S. brokers and traders, purchased from foreign suppliers 43.7 million pounds U_3O_8e that was received in 1998 (Table 28). The average price for these foreign purchases was $11.19 per pound U_3O_8e. This is 5 percent lower than the 1997 average price of $11.81 per pound.

U.S. brokers and traders, a primary supplier of uranium, purchased 24.4 million pounds U_3O_8e of deliveries during 1998 at an average price of $11.10 per pound (Table 29). Most of the uranium (21.7 million pounds or 89 percent) was from foreign suppliers. In 1997, by comparison, U.S. brokers and traders purchased 19.7 million pounds U_3O_8e at an average price of $11.00 per pound (Figure 19).

Foreign Sales of Uranium

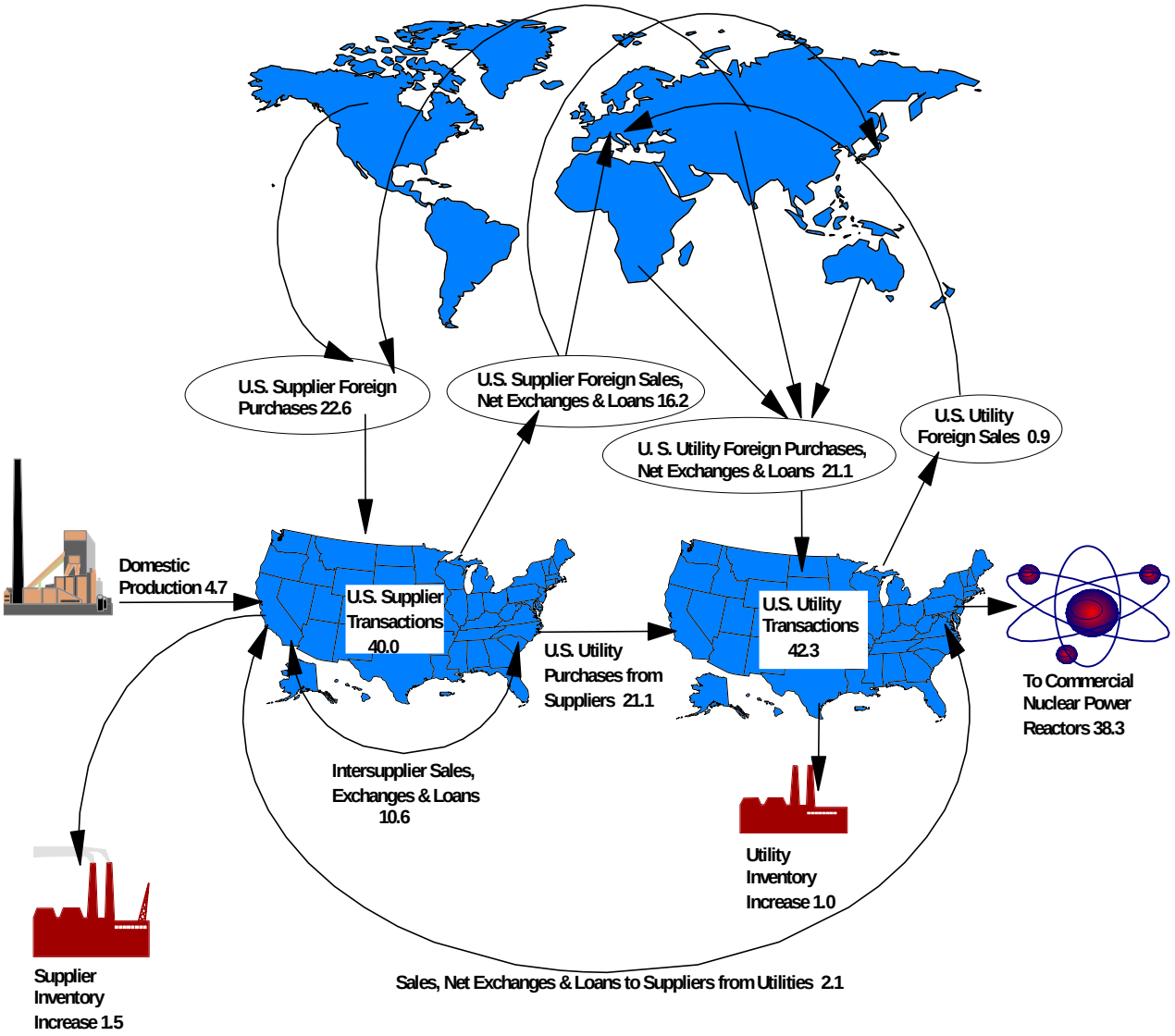
In 1998, uranium sold to foreign suppliers and foreign utilities totaled 15.1 million pounds U_3O_8e, 11 percent less than in 1997. The average price was $12.05 per pound, 3 percent less than in 1997 (Table 30 and Figure 20). Of the foreign sales, 74 percent was foreign-origin and 26 percent was U.S.-origin uranium. U.S. brokers and traders sold 10.5 million pounds at an average price of $11.04 per pound in 1998.

Uranium Inventories

Total commercial inventories, as of December 31, 1998, were 137.6 million pounds U_3O_8e, an increase of 57.5 million pounds from end of 1996 (Table 31). The large increase in U.S. supplier commercial inventories is because of the addition of the U.S. Enrichment Corporation (USEC), previously a wholly-owned U.S. government corporation, which was privatized in 1998. The U.S. utility inventory level has remained constant, about 66 million pounds since end of 1996 (Figure 21), but their enriched uranium level fluctuates the most (Figure 22).

Commercial natural and enriched UF_6 inventories at the end of 1998 totaled 108.0 million pounds U_3O_8e (Table 32), with more now owned by U.S. suppliers (63.2 million pounds) than by U.S. utilities (44.8 million pounds) (Table 33).

Figure 8. Uranium Marketing Activity During 1998



Note: Quantities are in million pounds U_3O_8 equivalent.
Source: Prepared by the Energy Information Administration, Office of Coal Nuclear, Electric and Alternate Fuels, based on data reported on Form EIA-858 for 1998.

Figure 9. Quantity of U.S. Utility Purchases of Uranium by Supplier and Delivery Year, 1994-1998

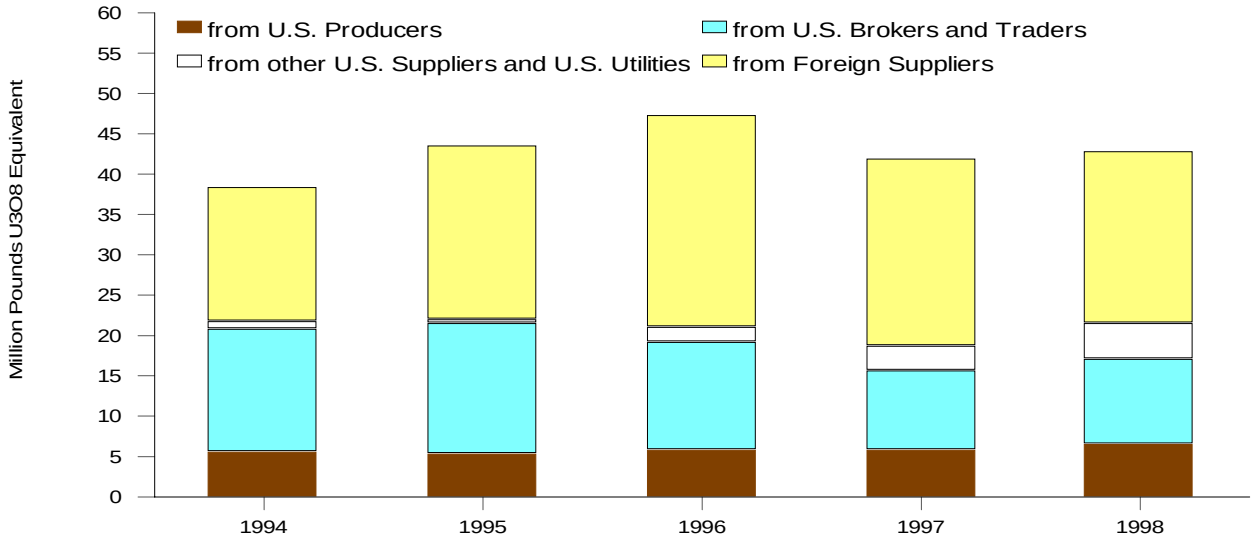


Figure 10. Weighted-Average Price of U.S. Utility Purchases of Uranium by Supplier and Delivery Year, 1994-1998

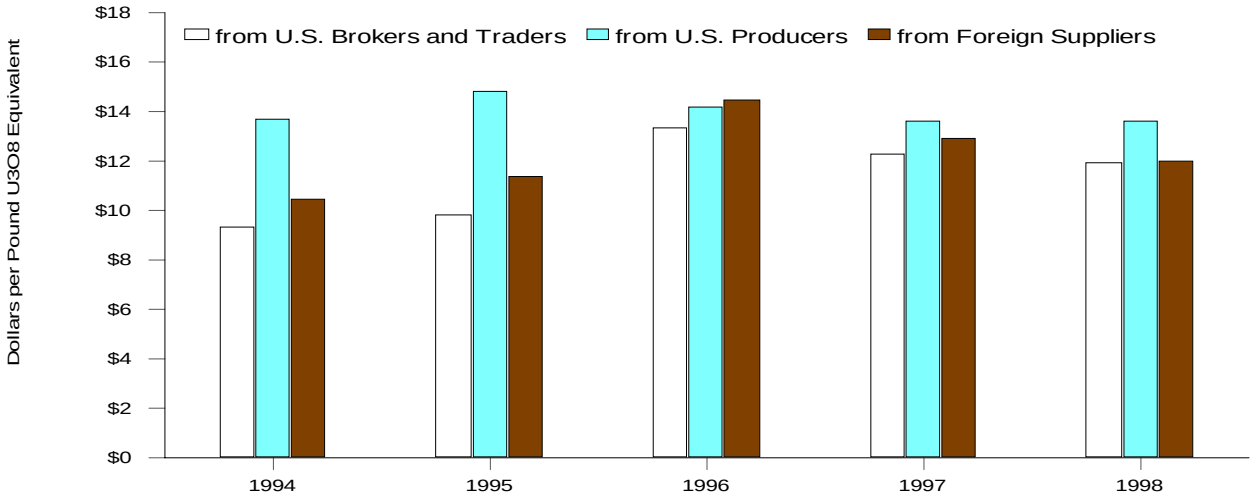
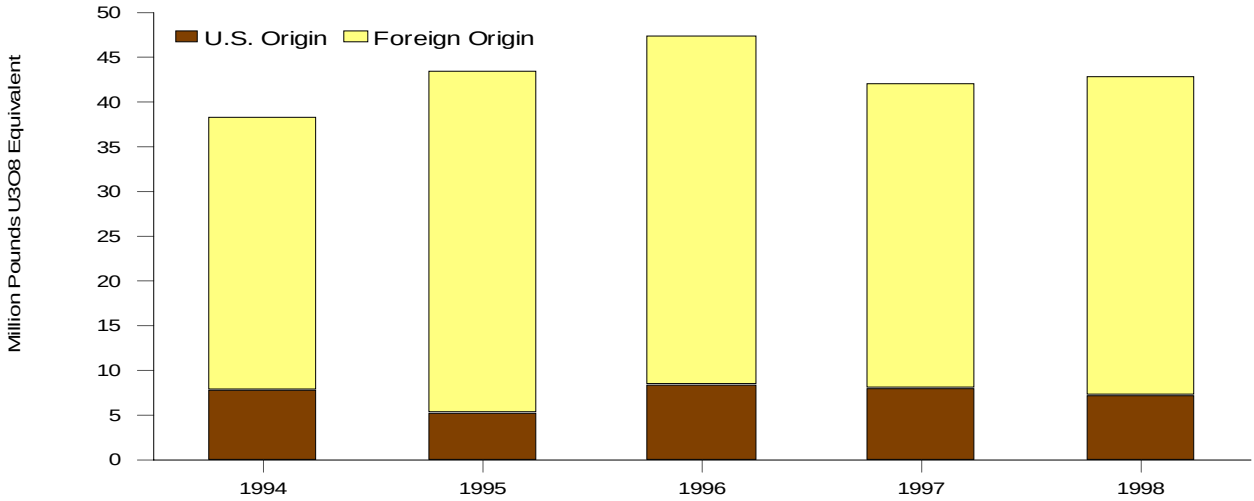


Figure 11. Quantity of U.S. Utility Purchases of Uranium by Origin and Delivery Year, 1994-1998



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Figure 12. U.S. Utility Purchases of Uranium by Selected Country Origin, 1998 Deliveries

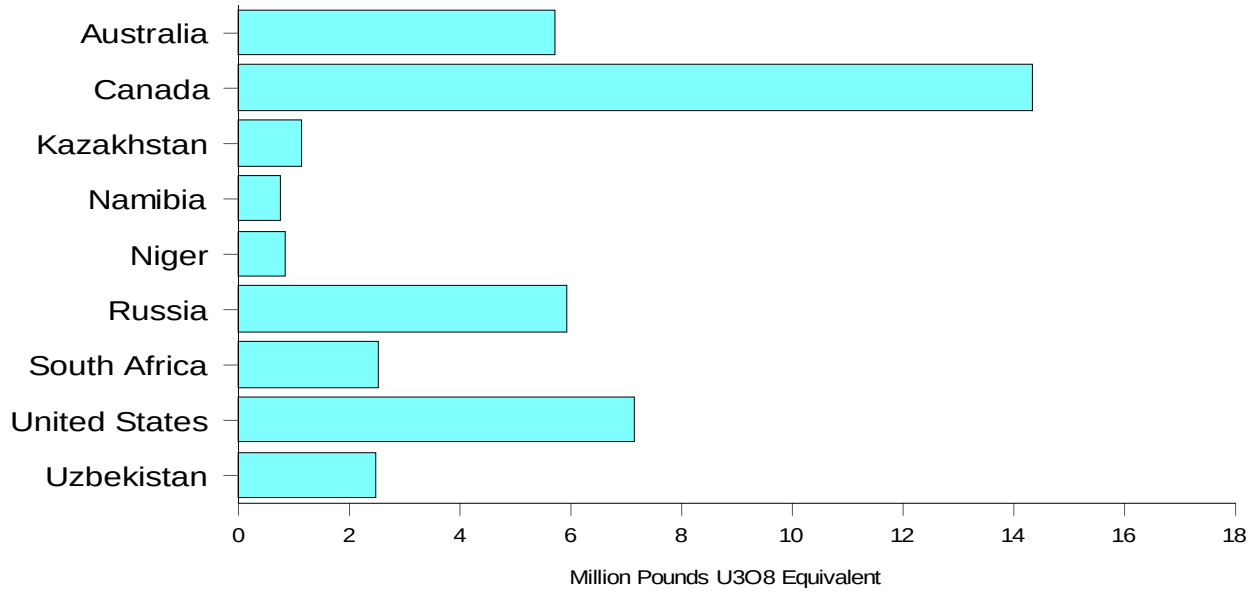


Figure 13. U.S. Utility Purchases of Uranium by Material Type and Delivery Year, 1994-1998

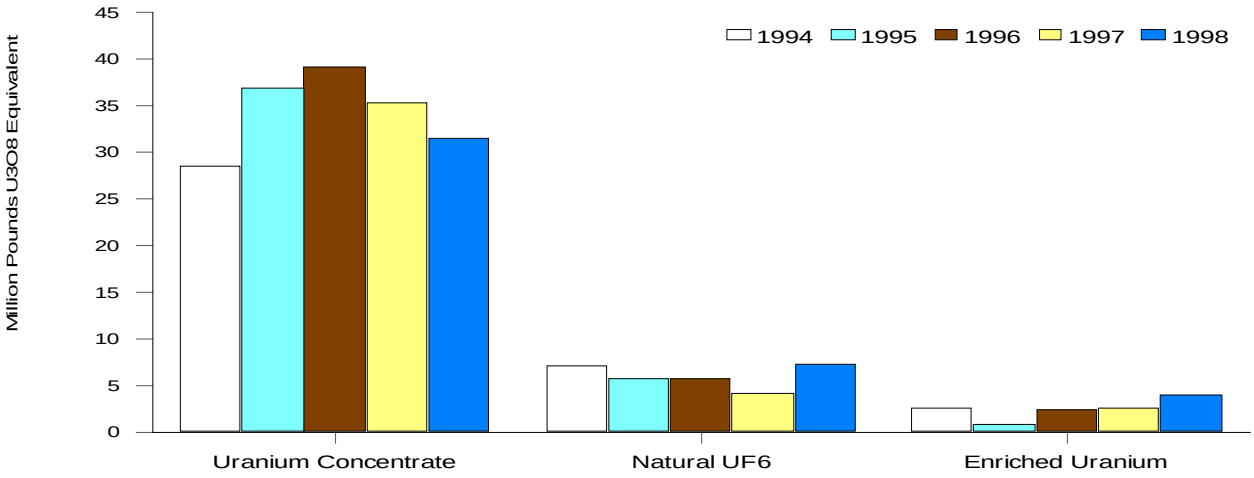
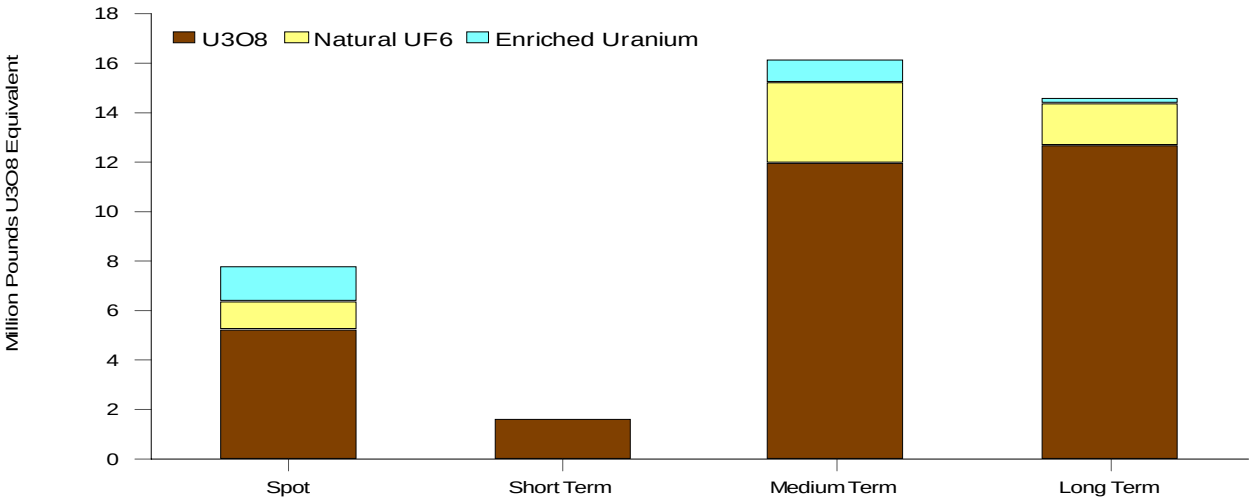


Figure 14. U.S. Utility Purchases of Uranium by Contract Type and Material Type, 1998 Deliveries



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Figure 15. U.S. Utility Contracted Purchases of Uranium by Supplier, Firm Deliveries, and Delivery Year, 1999-2008

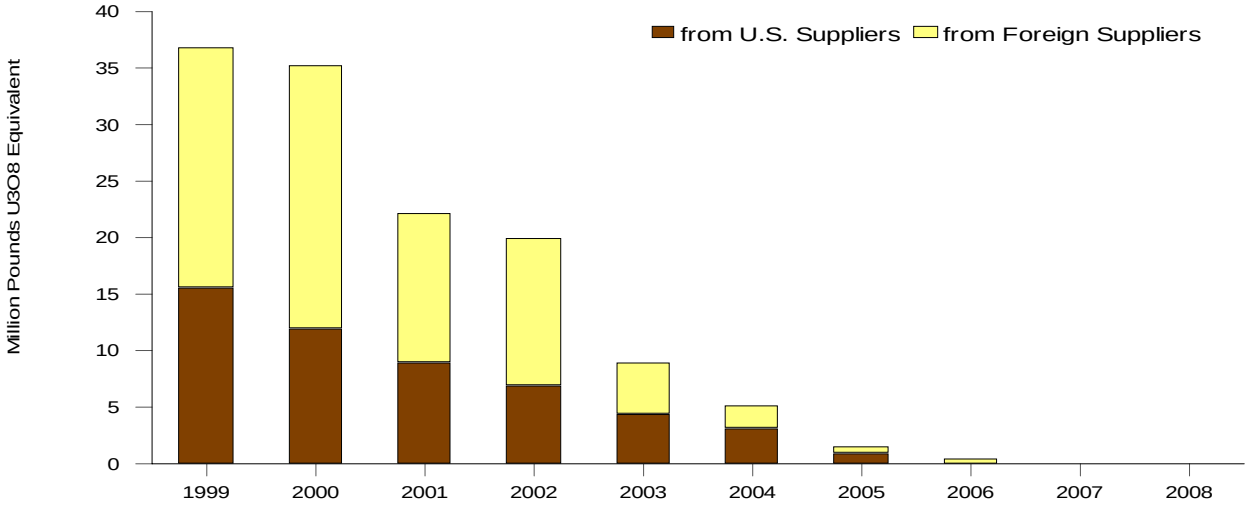


Figure 16. U.S. Utility Annual Unfilled Uranium Requirements, 1999-2007

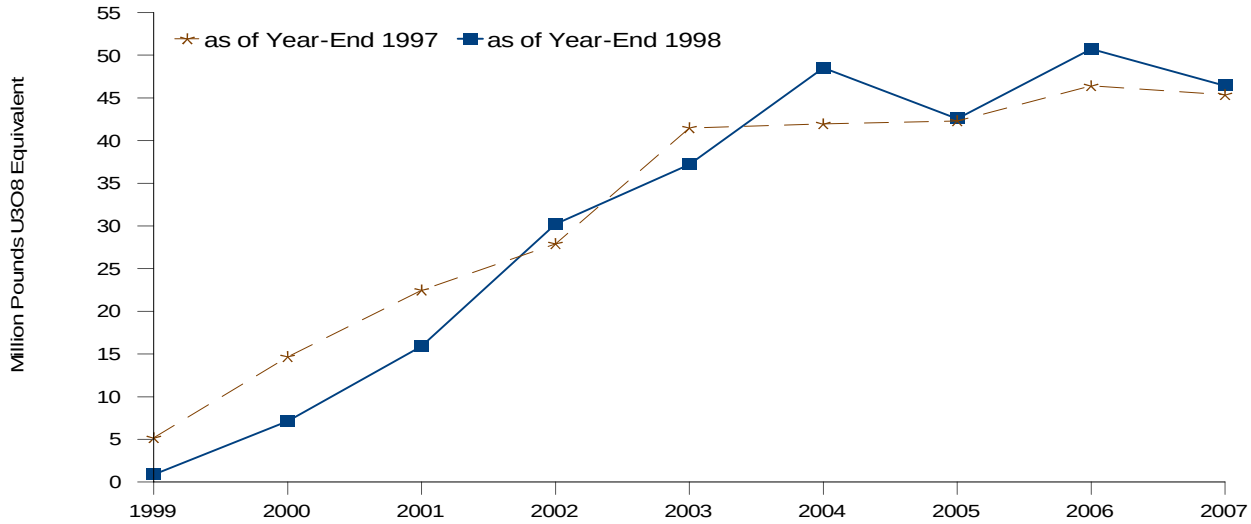
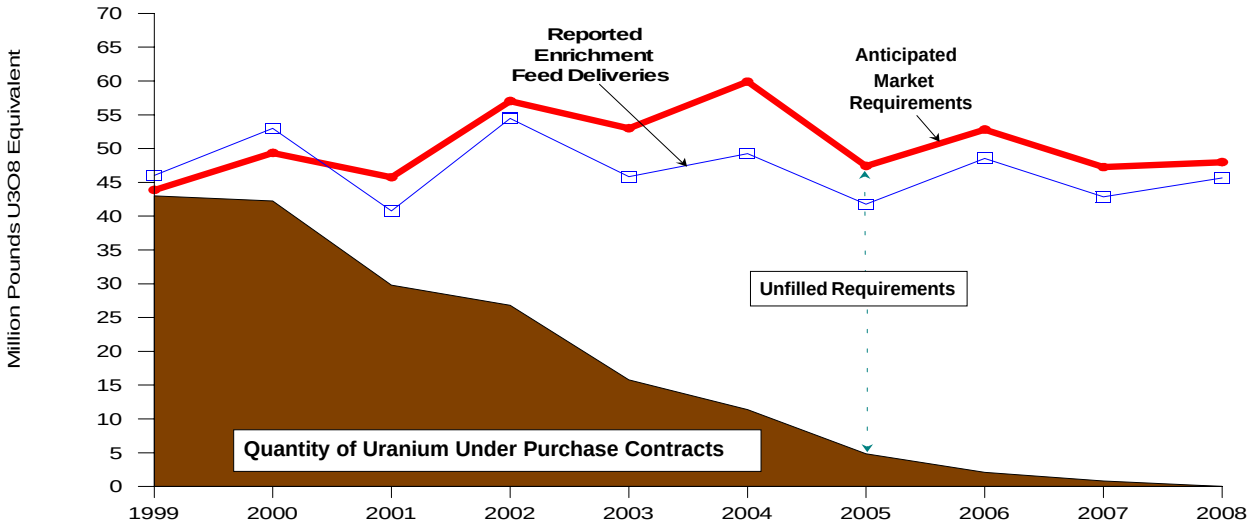


Figure 17. Anticipated Uranium Market Requirements of U.S. Utilities, 1999-2008



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Figure 18. Uranium in Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors by Year, 1994-1998

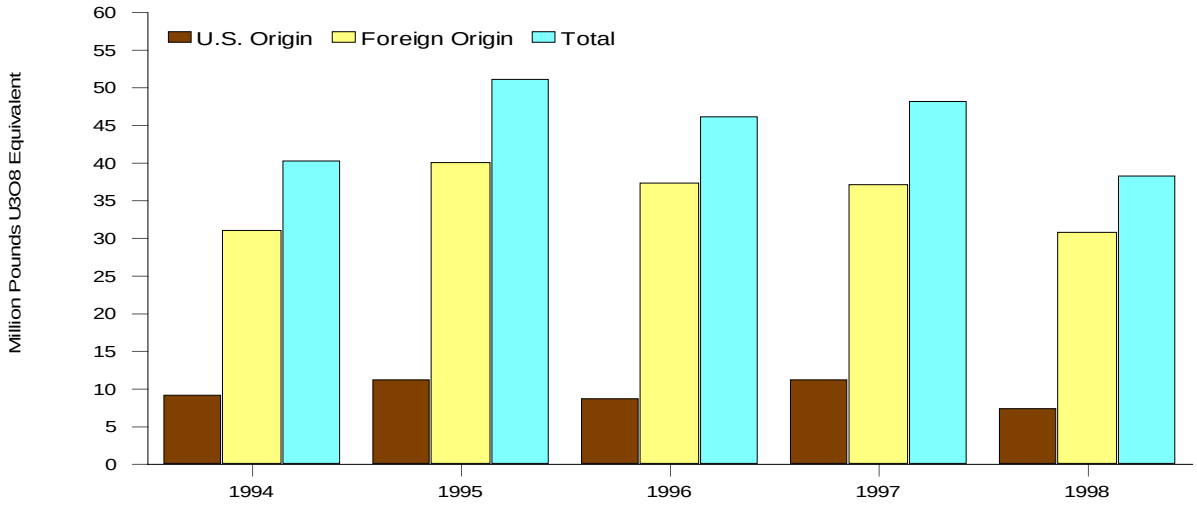


Figure 19. U. S. Broker and Trader Purchases of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1994-1998

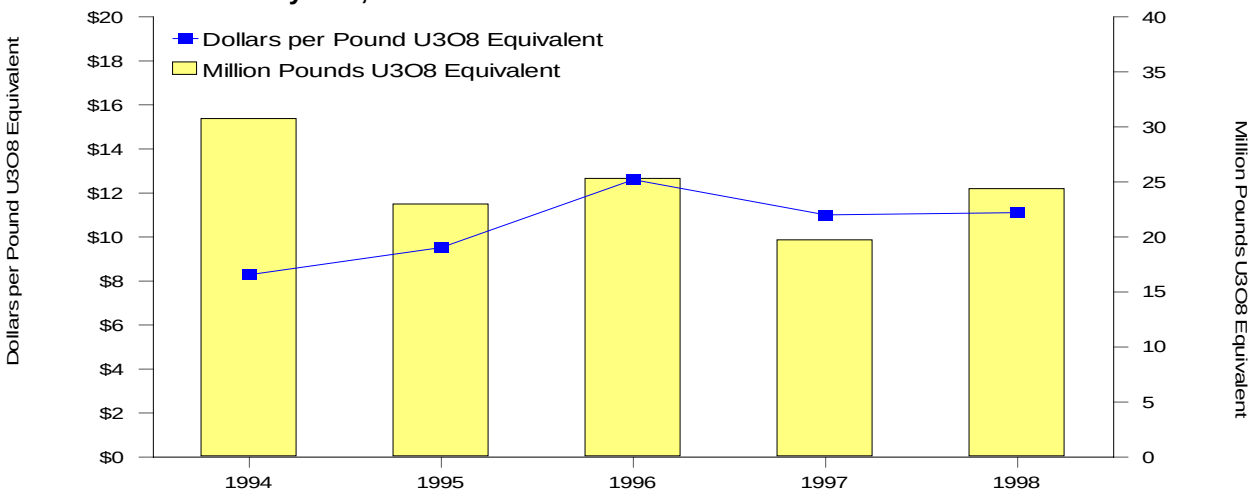
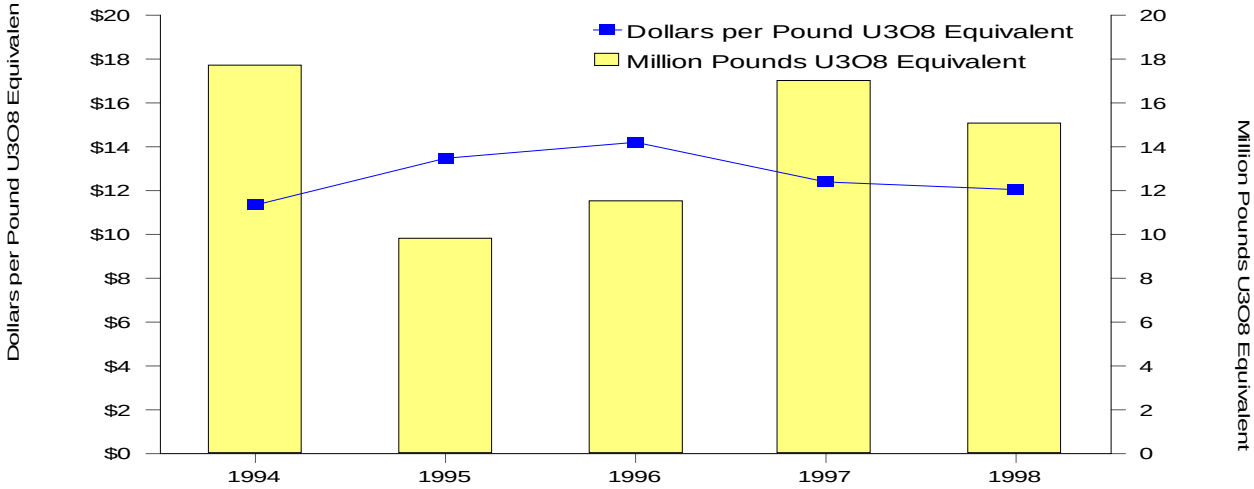


Figure 20. Foreign Sales of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1994-1998



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Figure 21. Commercial Uranium Inventories at End of the Year, 1994-1998

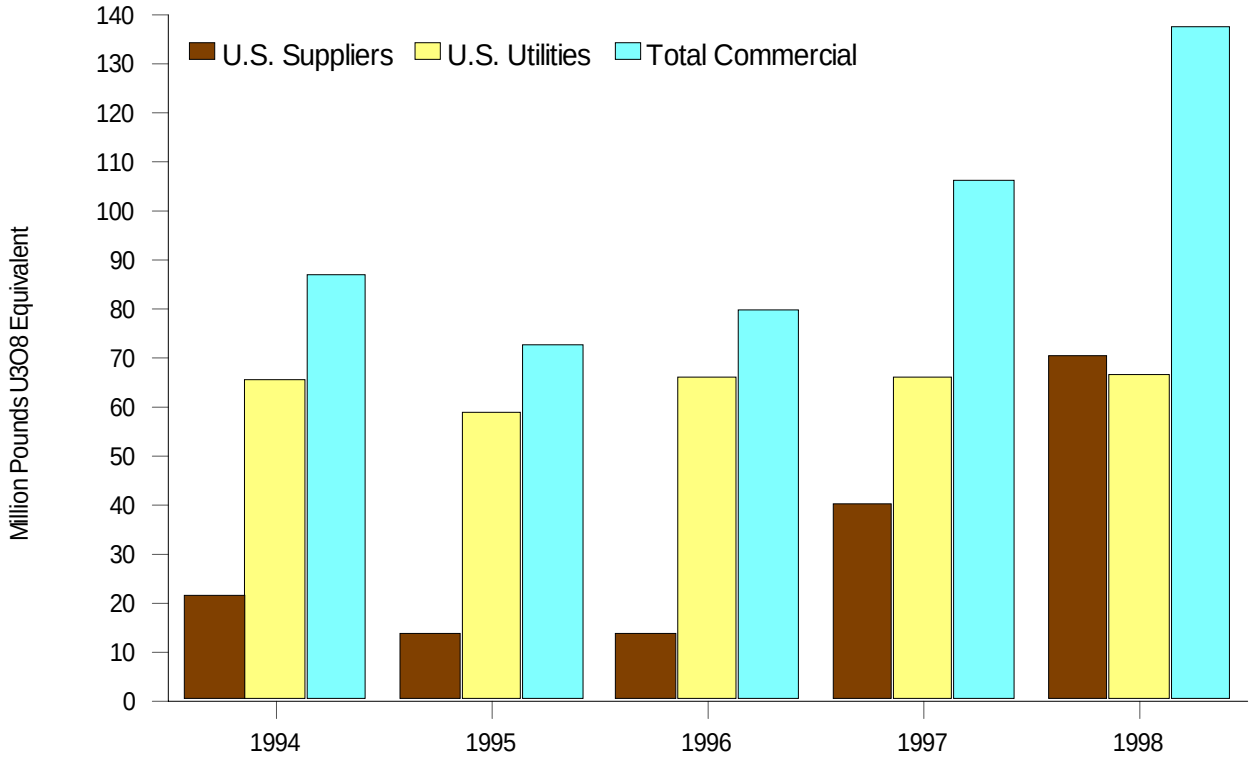
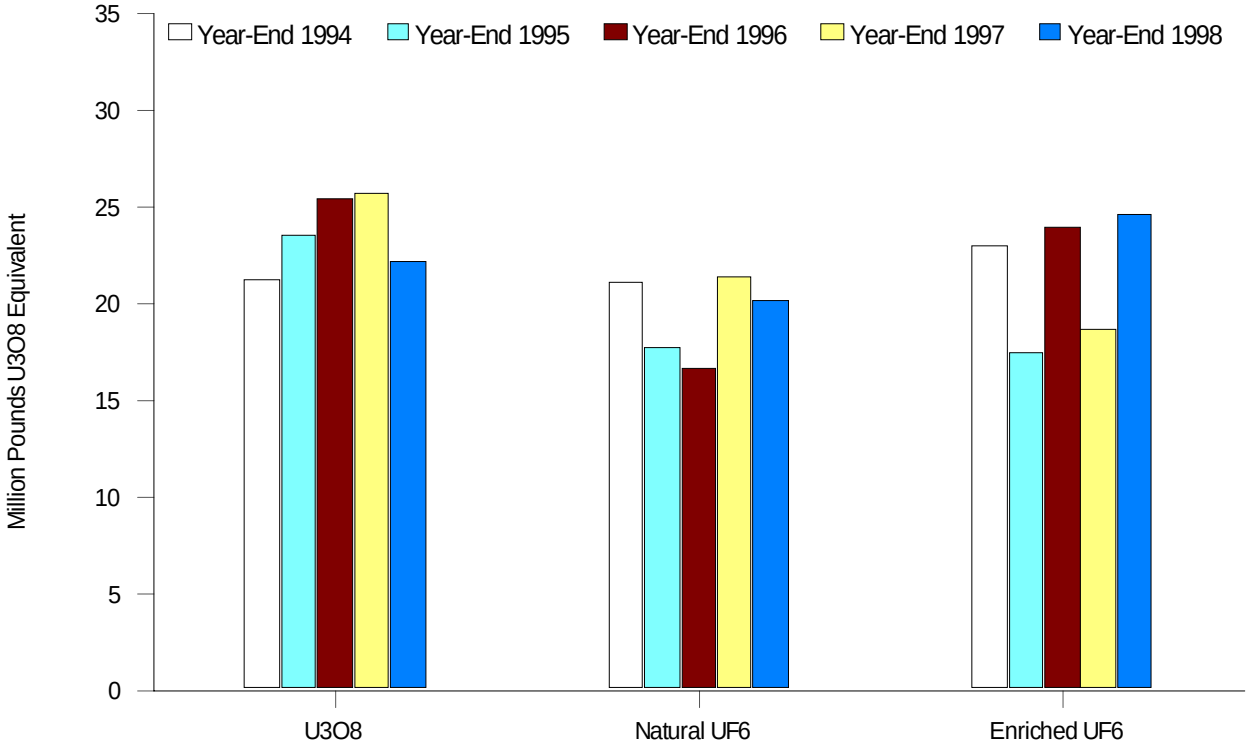


Figure 22. U.S. Utility Uranium Inventories at End of the Year, 1994-1998



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1998).

Table 10. U.S. Utility Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1994-1998

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
Received by U.S. Utilities from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	5,442	5,289	5,766	5,732	6,488
Weighted-Average Price	13.72	14.84	14.20	13.60	13.61
Received by U.S. Utilities from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	15,284	16,202	13,322	9,890	10,467
Weighted-Average Price	9.34	9.83	13.36	12.31	11.95
Received by U.S. Utilities from other U.S. Utilities:					
Purchases	0	0	0	W	W
Weighted-Average Price	—	—	—	W	W
Received by U.S. Utilities from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	1,092	561	1,885	W	W
Weighted-Average Price	8.04	12.52	14.98	W	W
Received by U.S. Utilities from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	16,463	21,389	26,360	23,361	21,252
Weighted-Average Price	10.43	11.40	14.45	12.91	11.97
Total Received by U.S. Utilities:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	**38,281**	**43,441**	**47,333**	**41,961**	**42,743**
Weighted-Average Price	**10.40**	**11.25**	**14.12**	**12.88**	**12.14**

— = Not applicable.
W=Data withheld to avoid disclosure.
Note: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table 11. U.S. Utility Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1994-1998

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
Received by U.S. Utilities of U.S.-Origin Uranium:					
Purchases	7,718	5,246	8,299	8,072	7,181
Weighted-Average Price	12.08	14.20	14.62	13.36	13.37
Received by U.S. Utilities of Foreign-Origin Uranium:					
Purchases	30,563	38,195	39,034	33,889	35,562
Weighted-Average Price	9.97	10.84	14.02	12.78	11.90
Total:					
Purchases	**38,281**	**43,441**	**47,333**	**41,961**	**42,743**
Weighted-Average Price	**10.40**	**11.25**	**14.12**	**12.88**	**12.14**

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table 12. U.S. Utility Purchases of Uranium by Origin Country and Delivery Year, 1996-1998

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Origin Country	Actual Deliveries in 1996		Actual Deliveries in 1997		Actual Deliveries in 1998	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
All Purchases:						
Australia	4,558	14.66	4,351	13.11	5,768	11.43
Brazil	0	—	0	—	W	W
Canada	19,093	14.35	16,713	12.78	14,366	11.51
China	371	15.31	231	17.62	W	W
France	W	W	0	—	0	—
Gabon	W	W	W	W	W	W
Germany	968	13.54	W	W	W	W
Kazakhstan	1,495	14.63	1,934	12.73	1,189	10.82
Kyrgyzstan	0	—	W	W	0	—
Mongolia	W	W	W	W	W	W
Namibia	W	W	774	14.63	780	14.36
Netherlands	W	W	0	—	0	—
NIger	W	W	0	—	856	15.53
Russia	5,434	12.69	3,594	12.63	5,959	13.27
Slovakia	W	W	0	—	0	—
South Africa	1,671	13.36	2,573	11.52	2,544	12.34
Tajikistan	W	W	0	—	W	W
Ukraine	991	13.59	W	W	W	W
United Kingdom	0	—	0	—	W	W
Uzbekistan	3,462	13.51	2,756	13.19	2,499	11.45
Yugoslavia	0	—	0	—	W	W
Total Foreign	**39,034**	**14.02**	**33,889**	**12.78**	**35,562**	**11.90**
United States	8,299	14.62	8,072	13.36	7,181	13.37
Total Purchases	**47,333**	**14.12**	**41,961**	**12.88**	**42,743**	**12.14**
Domestic Purchases:						
Australia	807	15.47	702	12.62	1,287	12.08
Brazil	0	—	0	—	W	W
Canada	3,335	13.49	4,025	12.36	3,017	11.61
China	371	15.31	W	W	W	W
France	W	W	0	—	0	—
Gabon	W	W	0	—	W	W
Germany	W	W	W	W	W	W
Kazakhstan	256	14.52	519	12.51	W	W
Mongolia	W	W	0	—	0	—
Namibia	W	W	W	W	W	W
Netherlands	W	W	0	—	0	—
Niger	W	W	0	—	W	W
Russia	4,350	12.81	2,438	12.74	2,572	12.71
Slovakia	W	W	0	—	0	—
South Africa	896	12.69	866	10.82	1,956	11.96
Tajikistan	0	—	0	—	W	W
Ukraine	991	13.59	0	—	W	W
United Kingdom	0	—	0	—	W	W
Uzbekistan	W	W	2,296	13.18	2,499	11.45
Yugoslavia	0	—	0	—	W	W
United States	8,299	14.62	8,072	13.36	7,181	13.37
Total Domestic Purchases	**23,657**	**13.81**	**19,416**	**12.87**	**21,641**	**12.31**
Foreign Purchases:						
Australia	3,751	14.48	3,649	13.21	4,481	11.30
Canada	15,758	14.52	12,688	12.91	11,349	11.49
China	0	—	W	W	0	—
Gabon	W	W	W	W	0	—
Germany	W	W	0	—	0	—
Kazakhstan	1,239	14.66	1,415	12.81	W	W
Kyrgyzstan	0	—	W	W	0	—
Mongolia	0	—	W	W	W	W
Namibia	0	—	745	14.79	W	W
Niger	0	—	0	—	W	W
Russia	1,084	12.22	1,156	12.40	3,387	13.83
South Africa	775	14.14	1,707	11.88	588	13.59
Tajikistan	W	W	0	—	0	—
Ukraine	0	—	W	W	0	—
Uzbekistan	W	W	460	13.25	0	—
Total Foreign Purchases	**23,676**	**14.41**	**22,545**	**12.89**	**21,102**	**11.96**

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table 13. U.S. Utility Purchases of Uranium by Origin and Material Type, 1998 Deliveries

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Actual Deliveries	U_3O_8	Natural UF_6	Enriched Uranium	Total
Received by U.S. Utilities of U.S.-Origin Uranium:				
Purchases	4,495	576	2,110	7,181
Weighted-Average Price	14.15	11.40	11.62	13.37
Received by U.S. Utilities of Foreign-Origin Uranium:				
Purchases	26,910	6,778	1,874	35,562
Weighted-Average Price	11.73	13.06	10.48	11.90
Total:				
Purchases	**31,405**	**7,354**	**3,984**	**42,743**
Weighted-Average Price	**12.08**	**12.90**	**11.06**	**12.14**

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 14. Average Price and Quantity for Purchases of Uranium by U.S. Utilities by Pricing Mechanisms and Delivery Year, 1996-1998

(Dollars per Pound U_3O_8 Equivalent; Thousand Pounds U_3O_8 Equivalent)

Pricing Mechanisms	Domestic Purchases[a]			Foreign Purchases[b]			Total Purchases		
	1996	1997	1998	1996	1997	1998	1996	1997	1998
Contract-Specified Pricing									
Weighted-Average Price	13.40	13.33	12.53	13.98	14.21	14.08	13.55	13.65	12.99
Quantity with Reported Price	16,657	13,091	17,951	5,988	7,349	7,581	22,645	20,440	25,532
Market-Related Pricing									
No Floor Type									
Weighted-Average Price	13.66	11.20	9.33	14.75	12.44	10.09	14.45	12.03	9.92
Quantity with Reported Price	2,208	1,878	1,048	5,669	3,814	3,452	7,877	5,692	4,500
Floor Type									
Weighted-Average Price	16.13	14.52	13.50	14.64	11.96	10.93	14.92	12.21	11.07
Quantity with Reported Price	2,249	707	325	9,766	6,582	5,529	12,015	7,289	5,854
Market Related Total									
Weighted-Average Price	14.91	12.11	10.31	14.68	12.14	10.61	14.73	12.13	10.57
Quantity with Reported Price	4,457	2,585	1,373	15,435	10,396	8,981	19,892	12,981	10,354
Contract Specified and Market Related Total									
Weighted-Average Price	13.72	13.13	12.37	14.48	13.00	12.20	14.10	13.06	12.29
Quantity with Reported Price	21,114	15,676	19,324	21,423	17,745	16,562	42,537	33,421	35,886
Spot-Market Pricing									
Weighted-Average Price	14.90	11.03	10.66	14.26	12.39	10.43	14.61	11.80	10.49
Quantity with Reported Price	1,689	2,497	813	1,428	3,249	2,404	3,117	5,746	3,217
Other Pricing[c]									
Weighted-Average Price	15.88	14.09	12.21	12.89	12.75	11.78	13.22	13.07	11.85
Quantity with Reported Price	100	481	151	825	1,551	854	925	2,032	1,005
All Pricing Mechanisms									
Weighted-Average Price	**13.81**	**12.87**	**12.31**	**14.41**	**12.89**	**11.96**	**14.12**	**12.88**	**12.14**
Quantity with Reported Price	**22,903**	**18,654**	**20,288**	**23,676**	**22,545**	**19,820**	**46,579**	**41,199**	**40,108**

[a]Uranium of both U.S. and foreign origin.
[b]Uranium of foreign origin only.
[c]Category used to report pricing mechanisms that are different from the other categories.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table 15. Price Distributions of Uranium Purchases by U.S. Utilities by Delivery Year, 1996-1998
(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Distributions	Actual Deliveries in 1996		Actual Deliveries in 1997		Actual Deliveries in 1998	
	Quantity with Reported Price	Weighted-Average Price	Quantity with Reported Price	Weighted-Average Price	Quantity with Reported Price	Weighted-Average Price
Octile[a]:						
First	5,822	10.72	5,150	9.85	5,014	8.99
Second	5,822	11.93	5,150	10.53	5,014	10.09
Third	5,822	12.62	5,150	11.37	5,014	10.52
Fourth	5,822	13.70	5,150	12.29	5,014	10.78
Fifth	5,822	14.65	5,150	12.89	5,014	11.81
Sixth	5,822	15.23	5,150	13.81	5,014	12.94
Seventh	5,822	15.76	5,150	15.04	5,014	14.46
Eighth	5,822	18.34	5,150	17.29	5,014	17.51
Total	**46,579**	**14.12**	**41,199**	**12.88**	**40,108**	**12.14**
Quartile[b]:						
First	12,352	12.61	7,442	11.18	7,609	10.16
Second	18,626	13.92	16,808	12.27	7,791	11.58
Third	10,926	14.73	10,035	13.29	15,540	12.53
Fourth	4,675	17.50	6,914	15.63	9,168	13.58
Total	**46,579**	**14.12**	**41,199**	**12.88**	**40,108**	**12.14**

[a]Octile 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.
[b]Quartile 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.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table 16. U.S. Utility Uranium Purchases by Contract Type and Material Type, 1998 Deliveries
(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 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_3O_8	5,217	10.45	1,590	14.00	11,929	12.73	12,669	11.90	31,405	12.08
Natural UF_6	1,133	10.68	0	—	W	W	W	W	6,072	12.90
Enriched Uranium	1,449	10.86	0	—	W	W	W	W	2,631	11.06
Total	**7,799**	**10.56**	**1,590**	**14.00**	**16,127**	**13.04**	**14,592**	**11.78**	**40,108**	**12.14**

W=Data withheld to avoid disclosure.
— = Not applicable.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 17. Contracts Signed by U.S. Utilities in 1998 by Contract Type with 1998 Deliveries
(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Purchase Contract Type	Quantity of Actual Deliveries Received in 1998	Weighted-Average Price	Number of Purchase Contracts
Spot	3,501	10.15	13
Short-term	W	W	1
Medium-term	W	W	1
Long-term	0	—	0
Total	**4,531**	**10.38**	**15**

W=Data withheld to avoid disclosure.
— = Not applicable.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 18. U.S. Utility Contracted Purchases of Uranium, Signed in 1998, by Delivery Year, 1999-2008
(Thousand Pounds U_3O_8 Equivalent)

Year of Delivery	Firm Deliveries	Optional Deliveries	Total Deliveries
1999	4,019	774	4,793
2000	4,155	1,394	5,549
2001	3,776	1,382	5,158
2002	4,010	1,434	5,444
2003	2,390	1,819	4,209
2004	360	1,230	1,590
2005	0	360	360
2006	0	0	0
2007	0	0	0
2008	0	0	0
Total	**18,710**	**8,393**	**27,103**

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 19. U.S. Utility Contracted Purchases of Uranium from Suppliers, in Effect at the End of 1998, by Delivery Year, 1999-2008
(Thousand Pounds U_3O_8 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
1999	15,567	1,965	21,231	4,240	36,798	6,205
2000	11,879	2,037	23,296	5,021	35,175	7,058
2001	8,943	2,885	13,152	4,837	22,095	7,722
2002	6,927	2,135	12,947	4,802	19,874	6,937
2003	4,339	3,296	4,537	3,613	8,876	6,909
2004	3,130	2,391	1,985	3,878	5,115	6,269
2005	894	852	637	2,444	1,531	3,296
2006	0	752	421	899	421	1,651
2007	0	0	0	800	0	800
2008	0	0	0	0	0	0
Total	**51,679**	**16,313**	**78,206**	**30,534**	**129,885**	**46,847**

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 20. Unfilled Uranium Requirements of U.S. Utilities, 1999-2008
(Thousand Pounds U_3O_8 Equivalent)

Year	As of December 31, 1997		As of December 31, 1998	
	Annual	Cumulative	Annual	Cumulative
1999	5,179	5,179	863	863
2000	14,671	19,850	7,111	7,974
2001	22,464	42,314	15,922	23,896
2002	27,911	70,225	30,212	54,108
2003	41,490	111,715	37,194	91,302
2004	41,959	153,674	48,508	139,810
2005	42,314	195,988	42,577	182,387
2006	46,416	242,404	50,734	233,121
2007	45,370	287,774	46,441	279,562
2008	NR	—	47,986	327,548

NR=Not Reported. — = Not applicable.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1998).

Table 21. Anticipated Uranium Market Requirements of U.S. Utilities, 1999-2008, as of December 31, 1998

(Thousand Pounds U_3O_8 Equivalent)

Year	Quantity of Uranium Under Purchase Contracts	Unfilled Requirements	Anticipated Market Requirements	Enrichment Feed Deliveries
1999	43,003	863	43,866	46,033
2000	42,233	7,111	49,344	52,976
2001	29,817	15,922	45,739	40,764
2002	26,811	30,212	57,023	54,467
2003	15,785	37,194	52,979	45,843
2004	11,384	48,508	59,892	49,276
2005	4,827	42,577	47,404	41,760
2006	2,072	50,734	52,806	48,562
2007	800	46,441	47,241	42,840
2008	0	47,986	47,986	45,662
Total	**176,732**	**327,548**	**504,280**	**468,183**

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 22. U.S. Utility Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1996-1998

(Thousand Pounds U_3O_8 Equivalent)

Enrichment Plant Location	Actual Deliveries in 1996			Actual Deliveries in 1997			Actual Deliveries in 1998		
	U.S.-Origin	Foreign-Origin	Total	U.S.-Origin	Foreign-Origin	Total	U.S.-Origin	Foreign-Origin	Total
China	0	0	0	0	0	0	0	0	0
France	378	6,026	6,404	W	W	2,998	W	W	3,091
Germany	W	W	W	0	W	W	W	W	2,497
Netherlands	W	W	W	0	0	0	W	W	1,457
Russia	248	1,543	1,791	W	W	2,886	0	1,442	1,442
United Kingdom	W	W	598	W	W	W	W	W	2,300
Foreign Total	**700**	**9,728**	**10,428**	**515**	**7,496**	**8,011**	**1,167**	**9,620**	**10,787**
United States	8,306	30,345	38,651	6,195	26,096	32,291	4,668	25,175	29,843
Total	**9,006**	**40,073**	**49,079**	**6,710**	**33,592**	**40,302**	**5,835**	**34,795**	**40,630**

W=Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table 23. U.S. Utility Deliveries of Uranium Feed for Enrichment by Origin Country and Delivery Year, 1996-1998

(Thousand Pounds U_3O_8 Equivalent)

Origin Country of Feed	Actual Deliveries in 1996			Actual Deliveries in 1997			Actual Deliveries in 1998		
	To U.S. Enrichers	To Foreign Enrichers	Total	To U.S. Enrichers	To Foreign Enrichers	Total	To U.S. Enrichers	To Foreign Enrichers	Total
Australia	5,058	723	5,781	3,732	654	4,386	4,135	608	4,743
Brazil	0	0	0	0	0	0	0	0	0
Canada	17,469	2,959	20,428	12,366	1,988	14,354	12,233	3,520	15,753
China	W	W	120	203	0	203	W	W	146
France	0	0	0	0	0	0	0	0	0
Gabon	W	W	21	0	W	W	0	0	0
Germany	W	W	801	W	0	W	W	0	W
Kazakhstan	1,531	563	2,094	W	W	993	1,587	0	1,587
Kyrgyzstan	0	0	0	W	0	W	0	0	0
Mongolia	W	0	W	286	0	286	484	0	484
Namibia	W	W	282	415	0	415	W	W	911
Niger	0	W	W	0	W	W	W	W	665
Russia	1,952	1,333	3,285	4,305	952	5,257	3,412	1,056	4,468
South Africa	1,364	644	2,008	1,837	479	2,316	1,465	104	1,569
Tajikistan	W	0	W	W	W	W	W	0	W
Ukraine	0	W	W	0	0	0	W	W	2,665
United Kingdom	W	0	W	0	0	0	0	0	0
Uzbekistan	1,587	2,273	3,860	1,785	2,256	4,041	376	1,303	1,679
Yugoslavia	0	0	0	0	0	0	0	0	0
Foreign Total	**30,345**	**9,728**	**40,073**	**26,096**	**7,496**	**33,592**	**25,175**	**9,620**	**34,795**
United States	8,306	700	9,006	6,195	515	6,710	4,668	1,167	5,835
Total	**38,651**	**10,428**	**49,079**	**32,291**	**8,011**	**40,302**	**29,843**	**10,787**	**40,630**

W=Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table 24. Shipments of Uranium by U.S. Utilities to Domestic and Foreign Enrichment Suppliers, 1999-2008

(Thousand Pounds U_3O_8 Equivalent)

Year of Shipment	Amount to be Shipped		Change from 1997 to 1998	
	As of December 31, 1997	As of December 31, 1998	Annual	Cumulative
1999	46,038	46,033	-5	-5
2000	47,970	52,976	5,006	5,001
2001	47,858	40,764	-7,094	-2,093
2002	45,029	54,467	9,438	7,345
2003	50,410	45,843	-4,567	2,778
2004	46,238	49,276	3,038	5,816
2005	45,025	41,760	-3,265	2,551
2006	47,385	48,562	1,177	3,728
2007	46,290	42,840	-3,450	278
2008	NR	45,662	—	—

NR=Not reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1998).

Table 25. U.S. Utility Purchases of Enrichment Services by Origin Country and Delivery Year, 1994-1998
(Thousand Separative Work Units (SWU))

Actual Deliveries	1994	1995	1996	1997	1998
Country where Enrichment Service was performed:					
China	237	0	W	W	W
France	549	867	1,507	734	696
Germany	W	W	W	W	W
Netherlands	W	W	167	0	323
Russia	421	1,108	1,073	1,765	2,364
United Kingdom	W	460	278	119	376
Foreign Total	**1,676**	**2,800**	**3,154**	**2,865**	**4,401**
United States	7,521	6,741	8,004	6,013	5,677
Total	**9,197**	**9,540**	**11,159**	**8,878**	**10,079**

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" (1994-1998).

Table 26. U.S. Utility Purchases of Enrichment Services by Contract Type in Delivery Year, 1998
(Thousand Separative Work Units (SWU))

Enrichment Service Contract Type	U.S. Enrichment	Foreign Enrichment	Total
Spot	W	W	W
Short-term	W	W	W
Medium-term	1,796	1,089	2,885
Long-term	3,598	3,151	6,748
Total	**5,677**	**4,401**	**10,079**

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table 27. Uranium in Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors by Year, 1994-1998
(Thousand Pounds U_3O_8 Equivalent)

Origin of Uranium	1994	1995	1996	1997	1998[P]
Domestic-Origin Uranium	9,302	11,146	8,820	11,135	7,386
Foreign-Origin Uranium	31,098	39,972	37,330	37,069	30,918
Total	**40,400**	**51,118**	**46,151**	**48,204**	**38,304**

P = Preliminary data. Final 1997 fuel assembly data reported in the 1998 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" (1995-1998).

Table 28. Foreign Purchases of Uranium by U.S. Suppliers and U.S. Utilities by Delivery Year, 1994-1998

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
U.S. Suppliers:					
Foreign Purchases	21,082	20,162	21,746	20,425	22,605
Weighted-Average Price	7.78	8.96	11.78	10.61	10.50
U.S. Utilities:					
Foreign Purchases	15,536	21,139	23,676	22,545	21,102
Weighted-Average Price	10.53	11.39	14.41	12.89	11.96
U.S. Suppliers and U.S. Utilities:					
Foreign Purchases	36,618	41,301	45,422	42,970	43,707
Weighted-Average Price	8.95	10.20	13.15	11.81	11.19

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table 29. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1994-1998

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
Received U.S.-Origin Uranium:					
Purchases	4,792	3,356	4,725	3,162	2,732
Weighted-Average Price	9.75	11.51	13.90	12.78	13.50
Received Foreign-Origin Uranium:					
Purchases	26,011	19,593	20,529	16,501	21,686
Weighted-Average Price	8.02	9.20	12.32	10.66	10.80
Total Received by U.S. Brokers and Traders:					
Purchases	**30,803**	**22,949**	**25,254**	**19,663**	**24,418**
Weighted-Average Price	**8.29**	**9.53**	**12.61**	**11.00**	**11.10**
Received from Foreign Suppliers:					
Purchases	22,328	18,311	17,816	15,703	21,651
Weighted-Average Price	7.87	9.02	11.78	10.71	10.77

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table 30. Foreign Sales of Uranium from U.S. Suppliers and U.S. Utilities by Origin and Delivery Year, 1994-1998

(Thousand Pounds U_3O_8 Equivalent; Dollars per Pound U_3O_8 Equivalent)

Actual Deliveries to Foreign Suppliers and Foreign Utilities	1994	1995	1996	1997	1998
U.S.-Origin Uranium:					
Foreign Sales	5,941	4,713	4,962	6,472	3,904
Weighted-Average Price	18.41	17.34	17.22	14.81	15.75
Foreign-Origin Uranium:					
Foreign Sales	11,799	5,123	6,542	10,517	11,170
Weighted-Average Price	7.78	9.94	11.91	10.90	10.76
Total Sent:					
Foreign Sales	**17,740**	**9,836**	**11,504**	**16,989**	**15,074**
Weighted-Average Price	**11.34**	**13.48**	**14.20**	**12.39**	**12.05**
From U.S. Producers, U.S. Utilities, and other U.S. Suppliers:					
Foreign Sales	4,930	4,342	5,539	8,584	4,565
Weighted-Average Price	20.09	18.11	15.69	13.05	14.39
From U.S. Brokers and Traders:					
Foreign Sales	12,810	5,494	5,965	8,405	10,509
Weighted-Average Price	7.98	9.83	12.82	11.72	11.04

Note: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table 31. Inventories of Natural and Enriched Uranium as of End of Year, 1994-1998

(Thousand Pounds U_3O_8 Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1994	1995	1996	1997	1998[P]
U.S. Utility Inventories	**65,410**	**58,730**	**66,089**	**65,877**	**66,900**
Natural Uranium	42,417	41,227	42,194	47,123	42,325
Enriched Uranium[a]	22,993	17,504	23,895	18,753	24,575
U.S. Supplier Inventories[b]	**21,469**	**13,740**	**13,949**	**40,360**	**70,655**
Natural Uranium	17,413	13,218	12,969	10,276	34,804
Enriched Uranium[a]	4,056	521	980	30,085	35,851
Total Commercial Inventories	**86,879**	**72,470**	**80,038**	**106,237**	**137,555**
DOE-Owned and USEC-Held Inventories[c]	**85,210**	**110,797**	**108,491**	**53,238**	**24,454**
Natural Uranium	57,176	81,987	83,211	53,238	24,454
Enriched Uranium	28,034	28,810	25,280	0	0

[a]Includes amounts reported as inventories of enriched UF_6 at enrichment suppliers.
[b]Includes inventories owned by the 1998 privatized USEC, Inc. (United States Enrichment Corporation) for year-end 1997 and 1998 only.
[c]DOE-owned inventories reported by the Office of Nuclear Energy, Science and Technology; U.S. Department of Energy. For year-end 1994 through 1996, includes the held inventories of the United States Enrichment Corporation (USEC), then a wholly-owned U.S. government corporation. After privatization in July 1998, USEC Incorporated reported its owned inventories in the 1998 survey, for year-end 1997 and year-end 1998, and are included with the commercial inventories of U.S. suppliers.
P=Preliminary data. Final 1997 inventory data reported in the 1998 survey.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1998).

Table 32. Commercial Uranium Inventories by Type and Location at End of Year, 1996-1998
(Thousand Pounds U_3O_8 Equivalent)

Material Type and Location	U.S. Utilities			U.S. Suppliers			U.S. Utilities and U.S. Suppliers		
	1996	1997	1998[P]	1996	1997	1998[P]	1996	1997	1998[P]
U_3O_8 on hand, in off-site storage, or at conversion plants	**25,472**	**25,746**	**22,152**	**11,597**	**9,402**	**7,416**	**37,069**	**35,148**	**29,568**
Natural UF_6	**16,721**	**21,377**	**20,173**	**1,372**	**874**	**27,388**	**18,094**	**22,251**	**47,561**
on hand, in private off-site storage, or at conversion plants	W	W	6,761	W	W	1,080	3,665	3,031	7,841
delivered to enrichment plants under usage agreements	W	W	W	W	W	W	9,364	10,217	4,569
at enrichment suppliers	4,217	8,554	W	848	449	W	5,065	9,003	35,151
Enriched UF_6	**23,895**	**18,753**	**24,575**	**980**	**30,085**	**35,851**	**24,875**	**48,838**	**60,427**
at enrichment suppliers	W	W	0	W	W	W	1,080	W	W
on hand, and/or in private storage	W	W	8,892	W	W	W	14,026	W	W
as fabricated fuel not inserted into a reactor, on hand, and/or in private storage	9,769	7,741	15,683	0	0	0	9,769	7,741	15,683
Total Commercial Inventories	**66,089**	**65,877**	**66,900**	**13,949**	**40,360**	**70,655**	**80,038**	**106,237**	**137,555**

P = Preliminary data. Final 1997 inventory data reported in the 1998 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" (1997-1998).

Table 33. Commercial Uranium Inventories by Type and Owner at End of Year, 1996-1998
(Thousand Pounds U_3O_8 Equivalent)

U.S. Firms	U_3O_8			Natural and Enriched UF_6			Total		
	1996	1997	1998[P]	1996	1997	1998[P]	1996	1997	1998[P]
Brokers and Traders	W	3,085	1,136	W	678	1,110	5,213	3,762	2,246
Converter, Fabricators, Enricher[a]	W	0	0	W	30,281	62,129	1,517	30,281	62,129
Producers	7,219	6,317	6,280	0	0	0	7,219	6,317	6,280
Utilities	25,472	25,746	22,152	40,617	40,130	44,748	66,089	65,877	66,900
Total Commercial Inventories	**37,069**	**35,148**	**29,568**	**42,969**	**71,089**	**107,987**	**80,038**	**106,237**	**137,555**

P = Preliminary data. Final 1997 inventory data reported in the 1998 survey. W=Data withheld to avoid disclosure.
[a]Includes inventories owned by the United States Enrichment Corporation (USEC) for year-end 1997 and 1998 only.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1998).

Appendix A

Survey Methodology

Appendix A

Survey Methodology

Survey Design

The 15th comprehensive survey of the U.S. uranium industry was conducted in 1999 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 1998. The data reported in this publication were developed from the 1998 survey and predecessor databases.

EIA asked respondents to the "Uranium Industry Annual Survey" to provide data current to the end of 1998 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 1998, 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 1998 or plan such expenditures in 1999; (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.

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

In a few instances, businesses that had reported in 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 the U.S. uranium industry on the 1998 survey was better than the 1997 survey. Approximately 60 percent of the forms were received by the specified deadline (March 1st). Those that had not responded by the due date were telephoned to encourage submission of the forms, and those calls resulted in the receipt of most of the remaining forms. Subsequent telephone calls were made to obtain forms not yet received. In a few instances, company data were collected through telephone conversations. All companies surveyed did respond before the end of March.

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 1998 Form EIA-858 survey, Schedule A,"Uranium Raw Materials Activities," was mailed to 41 firms and Schedule B, "Uranium Marketing Activities," was mailed to 86 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 1998 Uranium Industry Annual Survey

	Schedule	
Response Status	A	B
Survey Schedules Mailed Out	41	86
Data Provided	39	79
Reported as Not Applicable	2	7

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

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.

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, 1998 potential resources are the same as those reported for the previous year. Estimates of uranium resources in the EAR and SR classes for 1989 through 1998 are shown in Table B1. Resource quantities of EAR and SR are summarized for principal resource regions (Figure B2) and forward-cost categories in Table B2.

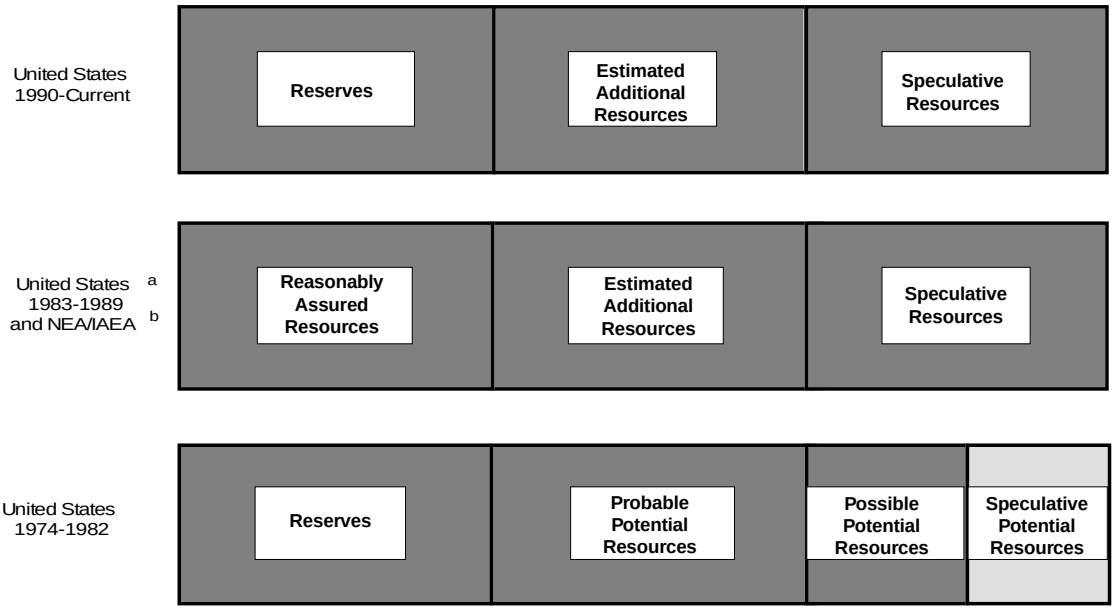
Estimation of Reserves

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. Estimates reserves are based on direct radiometric and chemical measurements in drill hole samples. Ore grades and thickness, spacial 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 anticipated to 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 items 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 reserves estimates are based on a combination of company-reported data, EIA-held historical reserves data, and independent reserve estimates. The estimates of national uranium reserves reflect currently available data for domestic deposits and include adjustments for depletion and erosion of specific cost category reserves due to production of ore from individual properties. Current and historical estimates of reserves since 1989 are shown in Table B3. Reserves estimates for 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 Nomenclature for Uranium Resources



[a]This 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 1983 and after 1989 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.

[b]NEA/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, 1989-1998

(Million Pounds U_3O_8)

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]
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[c]	2,180	1,310	3,310	2,230	4,850	3,480
1996[c]	2,180	1,310	3,310	2,230	4,850	3,480
1997[c]	2,180	1,310	3,310	2,230	4,850	3,480
1998[c]	2,180	1,310	3,310	2,230	4,850	3,480

[a]EAR = Estimated Additional Resources.

[b]SR = Speculative Resources.

[c]Annual updating of the estimates by the Energy Information Administration was suspended after 1994. Potential resource estimates remain unchanged after 1994.

Notes: Values shown are the mean values for the distribution of estimates for each forward-cost category: 1989-1992- rounded to the nearest 100 million pounds U_3O_8; 1993-1998- rounded to the nearest 10 million pounds U_3O_8. 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: **1989-1994-**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).

Table B2. U.S. Potential Uranium Resources by Forward-Cost Category and Resource Region, 1998

(Million Pounds U_3O_8)

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**

[a]EAR = Estimated Additional Resources.

[b]SR = Speculative Resources.

[c]Includes 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 U_3O_8. 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, 1989-1998
(Million Pounds U_3O_8)

Year	$30 per pound	$50 per pound	$100 per pound
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
1996	285	939	1,480
1997	281	931	1,466
1998	276	923	1,452

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" (1989-1998).

Table B4. Forward-Cost Uranium Reserves by State, 1998

State(s)	$30 per pound			$50 per pound		
	Ore (million tons)	**Grade**[a] (percent U_3O_8)	**U_3O_8** (million pounds)	**Ore** (million tons)	**Grade**[a] (percent U_3O_8)	**U_3O_8** (million pounds)
New Mexico	15	0.279	84	111	0.157	350
Wyoming	44	0.130	113	243	0.077	377
Arizona, Colorado, Utah	7	0.290	42	45	0.132	118
Texas	4	0.080	7	19	0.065	24
Other[b]	8	0.201	30	26	0.106	55
Total	**78**	**0.178**	**276**	**444**	**0.104**	**923**

[a]Weighted average percent U_3O_8 per ton of ore.

[b]Includes 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" (1998).

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) 1998 Form EIA-858, "Uranium Industry Annual Survey," are listed alphabetically in Table C1. For each respondent, an industry-activity code is shown. The activity code broadly describes the respondent's major industry activity from Form EIA-858. 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 1998 Uranium Industry Annual Survey

Company Name	Industry Activity Code[a]	Company Name	Industry Activity Code[a]
Alabama Power Co. (Southern Nuclear)	UTL	Everest Exploration, Inc.	UPH
Anaconda Uranium Corporation	UPH	Florida Power Corporation	UTL
Arizona Public Service Company	UTL	Florida Power & Light	UTL
Aspen Exploration Corporation	UPH	Framatome Cogema Fuels	FAB
B. B. Brooks Company	UPH	General Electric Company	FAB
Baltimore Gas & Electric	UTL	Geomex Minerals, Inc.	UPH
Boston Edison Company	UTL	Georgia Power Co. (Southern Nuclear)	UTL
Cameco Resources (U.S.) Inc.	UPH	GPU Nuclear, Inc.	UTL
Carolina Power & Light	UTL	William H. B. Graves	UPH
Centerior Energy Corporation	UTL	Green Mountain Mining Venture	UPH
Cobb Resources Corporation	UPH	Hanson Exploration, Inc.	UPH
COGEMA, Inc.	BRO	Homestake Mining Company	UPH
COGEMA Mining Inc. (Total Minerals Corp.)	MLG	IES Utilities, Inc. - Duane Arnold Energy Center	UTL
Combustion Engineering, Inc.	FAB	Illinois Power Company	UTL
Commonwealth Edison	UTL	IMC - Agrico Company	MLG
Consolidated Edison Co. of NY, Inc.	UTL	Indiana Michigan Power	UTL
Consumers Energy/Palisades Nuclear Plant	UTL	International Uranium (USA) Corporation	MLG
ConverDyn	CON	Maine Yankee Atomic Power Co.	UTL
Cotter Corporation	UPH	Malapai Resources Company	MLG
Crow Butte Resources, Inc.	MLG	Marquez Development Corporation	UPH
Cycle Resources Investment Corp.	BRO	Mining Unlimited, Inc.	UPH
Dawn Mining Company	UPH	Nebraska Public Power District	UTL
Detroit Edison	UTL	New York Power Authority	UTL
Duke Power Company	UTL	New York Nuclear Corp. / NYNCO Trading	BRO
Duquesne Light Company	UTL	Niagara Mohawk Power Corporation	UTL
Enserch Processing, Inc.	UPH	North Atlantic Energy Service Corp.	UTL
Entergy Operations, Inc.	UTL	Northeast Utilities Service Co.	UTL

Table C1. Respondents to the 1998 Uranium Industry Annual Survey (Continued)

Company Name	Industry Activity Code[a]	Company Name	Industry Activity Code[a]
Northern States Power Company	UTL	South Texas Project Nuclear Operating Co.	UTL
Nuclear Fuel Resources, Inc.	TRA	Southern California Edison Company	UTL
Nuexco Trading Corp. Liquidating Trust	TRA	Strathmore Resources	UPH
NUKEM, Inc.	TRA	Tennessee Valley Authority	UTL
NZU, Inc.	UPH	Texas Utilities Electric Company	UTL
Office of Nuclear Energy (DOE)	ENR	UG U.S.A., Inc.	TRA
Ohio Edison Co. and Pennsylvania Power	UTL	Umetco Minerals Company	UPH
Omaha Public Power District	UTL	Union Electric Company	UTL
Pacific Gas & 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
Pennsylvania Power & Light Company	UTL	The Uranium Exchange Company	TRA
Petrotomics Company (c/o Texaco, Inc)	UPH	Uranium King Corporation	UPH
Power Resources, Inc.	MLG	Uranium Resources Incorporated	MLG
Public Service Electric & Gas	UTL	USX Corporation, Texas Uranium Operations	UPH
Rio Algom Mining Corp.	MLG	U.S. Energy Corp. (Plateau Resources, Ltd)	UPH
Rio Grande Resources Corp.	UPH	Vermont Yankee Nuclear Power Corp.	UTL
Riverside Public Utility Dept.	UTL	Virginia Electric and Power Company	UTL
RME Partners, L. P.	UPH	Washington Public Power Supply System	UTL
Rochester Gas & Electric Corporation	UTL	Western Nuclear, Inc.	UPH
San Diego Gas & Electric	UTL	Westinghouse Electric Corporation, CNFD	FAB
Section 2 Joint Venture-Continental Materials	UPH	Wisconsin Electric Power Company	UTL
Sheep Mountain Partners	UPH	Wisconsin Public Service Corporation	UTL
Siemens Power Corporation	FAB	Wolf Creek Nuclear Operating Corporation	UTL
Simons Associates	UPH	Yellow Stone Fuels Corp.	UPH
South Carolina Electric & Gas	UTL		

[a]BRO = 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" (1998).

Appendix D

Form EIA-858: Uranium Industry Annual Survey

Appendix E

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

Appendix E

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 E1. 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 E1. 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_3O_8[b]	kilogram U	0.384 647
ton, short (2,000 lb)	metric ton (t)	0.907 185

[a]An 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.

[b]The factor of 1 pound U_3O_8 = 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 $US130 per pound U shown on Table E3 to report uranium reserves quantities were converted from units of "$ 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 1998 (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 E Table Number	UIA Chapter and Table Number
E2	Chapter 1, Table 1
E3	Chapter 1, Table 3
E4	Chapter 1, Table 4
E5	Chapter 1, Table 5
E6	Chapter 2, Table 10
E7	Chapter 2, Table 11
E8	Chapter 2, Table 12
E9	Chapter 2, Table 14
E10	Chapter 2, Table 19
E11	Chapter 2, Table 21
E12	Chapter 2, Table 22
E13	Chapter 2, Table 27
E14	Chapter 2, Table 28
E15	Chapter 2, Table 29
E16	Chapter 2, Table 30
E17	Chapter 2, Table 31

Table E2. U.S. Uranium Land and Surface Drilling Activities, 1989-1998

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)
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	1,841	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	122	790	1,728	289	1,799	2,312	411	2,589
1996	146	1,166	1,118	269	1,602	3,577	659	5,549	4,695	928	7,150
1997	2,226	3,399	1,935	405	3,544	5,858	1,083	16,448	7,793	1,488	19,992
1998	26	3,339	1,370	271	2,261	5,231	1,144	15,814	6,601	1,415	18,075

[a]Costs for 1989 and 1990 were rounded to the nearest $10 thousand.

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

Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annual 1997* (April 1998). **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table E3. Forward-Cost Uranium Reserves by Mining Method, 1998

Mining Method	Forward-Cost Category					
	$80 per kilogram			$130 per kilogram		
	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	0.231	53	130	0.138	178
Openpit	9	0.118	11	148	0.067	99
In Situ Leaching	38	0.110	42	112	0.064	72
Other[b]	< 1	0.224	< 1	14	0.042	6
Total	**71**	**0.151**	**106**	**403**	**0.088**	**355**

[a]Weighted average percent U per metric ton of ore.

[b]Includes 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."

Table E4. U.S. Uranium Mine Production and Number of Mines and Sources, 1989-1998

Mining Method	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Underground										
(metric tons U)	2,000	W	W	W	0	0	0	W	W	W
Openpit										
(metric tons U)	W	724	972	W	0	0	0	0	0	0
In Situ Leaching										
(metric tons U)	W	W	W	W	W	942	1,297	1,684	1,571	1,431
Other[a]										
(metric tons U)	1,700	1,537	1,021	379	789	30	60	125	241	408
Total Mine Production										
(metric tons U)	**3,700**	**2,260**	**1,993**	**379**	**789**	**972**	**1,357**	**1,810**	**1,812**	**1,840**
Number of Mines Operated										
Underground	19	27	6	4	0	0	0	1	1	4
Openpit	2	2	2	1	0	0	0	0	0	0
In Situ Leaching	9	7	6	4	5	5	5	6	7	6
Other Sources[b]	2	3	1	8	7	7	7	6	6	5
Total Mines and Sources	**32**	**39**	**15**	**17**	**12**	**12**	**12**	**13**	**14**	**15**

[a]For 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 urainum bearing water from mine workings and restoration. For 1994 and 1995, "Other" includes production from uranium bearing water from mine workings and restoration. For 1996 through 1998, "Other" includes production from an underground mine and uranium bearing water from mine workings and restoration.

[b]Other 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: **1989-1997-***Uranium Industry Annnual 1997* (April 1998); **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table E5. U.S. Uranium Concentrate Processing Operations, 1989-1998

Processing Operations	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Ore Fed to Process[a] (thousand metric tons)	1,120	655	580	232	0	0	151	40	0	0
Percent U[b]	0.274	0.248	0.168	0.194	—	—	0.441	0.424	—	—
Contained U (metric tons)										
In Ore	3,068	1,626	973	451	0	0	669	171	0	0
Other Feed Materials[c]	165	187	69	70	16	30	63	157	350	149
Total Mill Feed (metric tons U)	3,233	1,812	1,042	520	16	30	732	328	350	149
In-Process Inventory Change (metric tons U)	- 90	- 94	- 47	- 10	4	9	60	- 53	20	- 3
Concentrate Produced at Mills (metric tons U)										
Theoretical[d]	3,323	1,906	1,089	530	12	21	671	381	330	151
Actual	**3,144**	**1,788**	**1,003**	**523**	**12**	**18**	**621**	**331**	**302**	**124**
Recovery as Percent of Mill Feed	94.6	93.8	92.2	98.7	—	—	92.6	86.8	91.2	82.2
Tailings and Unaccountable (metric tons U)	179	118	85	7	0	3	50	50	29	27
Other Processing[e] (metric tons U)	**2,178**	**1,630**	**2,056**	**1,649**	**1,167**	**1,272**	**1,703**	**2,101**	**1,869**	**1,685**
Total Uranium Concentrate Production (metric tons U)	**5,322**	**3,418**	**3,059**	**2,171**	**1,178**	**1,289**	**2,324**	**2,431**	**2,171**	**1,810**
Total Concentrate Shipped From Mills and Plants (metric tons U)	**5,696**	**4,984**	**3,245**	**2,636**	**1,298**	**2,431**	**2,116**	**2,301**	**2,237**	**1,871**

[a]Uranium 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.
[b]Weighted average percent U per metric ton of ore.
[c]Includes for various years uranium from low-grade ore, mill cleanup, mine water, tailings water, heap leaching, solution mining, and waste stream, except as footnoted below.
[d]At 100-percent recovery. This equals total mill feed minus in-process inventory change.
[e]U_3O_8 concentrate production from in situ leaching and as a byproduct of phosphate processing.
— = Not applicable.
Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration: **1989-1997-***Uranium Industry Annnual 1997* (April 1998); **1998-**Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table E6. U.S. Utility Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1994-1998

(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
Received by U.S. Utilities from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	2,093	2,034	2,218	2,205	2,496
Weighted-Average Price	35.68	38.59	36.91	35.35	35.38
Received by U.S. Utilities from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	5,879	6,232	5,124	3,804	4,026
Weighted-Average Price	24.29	25.56	34.73	32.01	31.07
Received by U.S. Utilities from other U.S. Utilities:					
Purchases	0	0	0	W	W
Weighted-Average Price	—	—	—	W	W
Received by U.S. Utilities from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	420	216	725	W	W
Weighted-Average Price	20.90	32.56	38.95	W	W
Received by U.S. Utilities from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	6,332	8,227	10,139	8,986	8,175
Weighted-Average Price	27.11	29.63	37.57	33.56	31.11
Total Received by U.S. Utilities:					
Purchases of U.S.-Origin and Foreign-Origin Uranium	**14,725**	**16,709**	**18,206**	**16,140**	**16,441**
Weighted-Average Price	**27.03**	**29.24**	**36.71**	**33.49**	**31.55**

— = Not applicable.
W=Data withheld to avoid disclosure.
Notes: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators. Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table E7. U.S. Utility Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1994-1998

(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
Received by U.S. Utilities of U.S.-Origin Uranium:					
Purchases	2,969	2,018	3,192	3,105	2,762
Weighted-Average Price	31.39	36.93	38.01	34.73	34.76
Received by U.S. Utilities of Foreign-Origin Uranium:					
Purchases	11,756	14,692	15,014	13,035	13,679
Weighted-Average Price	25.92	28.18	36.45	33.23	30.94
Total:					
Purchases	**14,725**	**16,709**	**18,206**	**16,140**	**16,441**
Weighted-Average Price	**27.03**	**29.24**	**36.71**	**33.49**	**31.55**

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table E8. U.S. Utility Purchases of Uranium by Origin Country and Delivery Year, 1996-1998

(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Origin Country	Actual Deliveries in 1996		Actual Deliveries in 1997		Actual Deliveries in 1998	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
All Purchases:						
Australia	1,753	38.10	1,674	34.09	2,219	29.72
Brazil	0	—	0	—	W	W
Canada	7,344	37.30	6,429	33.21	5,526	29.93
China	143	39.79	89	45.82	W	W
France	W	W	0	—	0	—
Gabon	W	W	W	W	W	W
Germany	372	35.21	W	W	W	W
Kazakhstan	575	38.04	744	33.10	457	28.14
Kyrgyzstan	0	—	W	W	0	—
Mongolia	W	W	W	W	W	W
Namibia	W	W	298	38.04	300	37.34
Netherlands	W	W	0	—	0	—
Niger	W	W	0	—	329	40.38
Russia	2,090	32.99	1,382	32.84	2,292	34.50
Slovakia	W	W	0	—	0	—
South Africa	643	34.75	990	29.96	979	32.07
Tajikistan	W	W	0	—	W	W
Ukraine	381	35.33	W	W	W	W
United Kingdom	0	—	0	—	W	W
Uzbekistan	1,332	35.11	1,060	34.30	961	29.77
Yugoslavia	0	—	0	—	W	W
Total Foreign	**15,014**	**36.45**	**13,035**	**33.23**	**13,679**	**30.94**
United States	3,192	38.01	3,105	34.73	2,762	34.76
Total Purchases	**18,206**	**36.71**	**16,140**	**33.49**	**16,441**	**31.55**
Domestic Purchases:						
Australia	310	40.21	270	32.80	495	31.41
Brazil	0	—	0	—	W	W
Canada	1,283	35.07	1,548	32.13	1,160	30.18
China	143	39.79	W	W	W	W
France	W	W	0	—	0	—
Gabon	W	W	0	—	W	W
Germany	W	W	W	W	W	W
Kazakhstan	98	37.74	200	32.52	W	W
Mongolia	W	W	0	—	0	—
Namibia	W	W	W	W	W	W
Netherlands	W	W	0	—	0	—
Niger	W	W	0	—	W	W
Russia	1,673	33.29	938	33.13	989	33.05
Slovakia	W	W	0	—	0	—
South Africa	345	33.00	333	28.12	752	31.09
Tajikistan	0	—	0	—	W	W
Ukraine	381	35.33	0	—	W	W
United Kingdom	0	—	0	—	W	W
Uzbekistan	W	W	883	34.28	961	29.77
Yugoslavia	0	—	0	—	W	W
United States	3,192	38.01	3,105	34.73	2,762	34.76
Total Domestic Purchases	**9,100**	**35.91**	**7,468**	**33.46**	**8,324**	**31.99**
Foreign Purchases:						
Australia	1,443	37.65	1,404	34.34	1,724	29.37
Canada	6,061	37.76	4,880	33.56	4,365	29.87
China	0	—	W	W	0	—
Gabon	W	W	W	W	0	—
Germany	W	W	0	—	0	—
Kazakhstan	477	38.11	544	33.31	W	W
Kyrgyzstan	0	—	W	W	0	—
Mongolia	0	—	W	W	W	W
Namibia	0	—	287	38.46	W	W
Niger	0	—	0	—	W	W
Russia	417	31.77	445	32.24	1,303	35.95
South Africa	298	36.77	657	30.90	226	35.33
Tajikistan	W	W	0	—	0	—
Ukraine	0	—	W	W	0	—
Uzbekistan	W	W	177	34.45	0	—
Total Foreign Purchases	**9,107**	**37.47**	**8,672**	**33.52**	**8,117**	**31.10**

W=Data withheld to avoid disclosure. — = 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" (1996-1998).

Table E9. Average Price and Quantity for Purchases of Uranium by U.S. Utilities by Pricing Mechanisms and Delivery Year, 1996-1998

(Dollars per Kilogram U Equivalent; Metric Tons U Equivalent)

Pricing Mechanisms	Domestic Purchases			Foreign Purchases			Total Purchases		
	1996	1997	1998	1996	1997	1998	1996	1997	1998
Contract-Specified Pricing									
Weighted-Average Price	34.83	34.65	32.58	36.33	36.95	36.60	35.23	35.48	33.77
Quantity with Reported Price	6,407	5,035	6,905	2,303	2,827	2,916	8,710	7,862	9,821
Market-Related Pricing									
No Floor Type									
Weighted-Average Price	35.52	29.12	24.24	38.35	32.35	26.24	37.56	31.29	25.78
Quantity with Reported Price	849	722	403	2,181	1,467	1,328	3,030	2,189	1,731
Floor Type									
Weighted-Average Price	41.93	37.76	35.09	38.06	31.09	28.42	38.78	31.73	28.79
Quantity with Reported Price	865	272	125	3,756	2,532	2,127	4,622	2,804	2,252
Market Related Total									
Weighted-Average Price	38.76	31.48	26.81	38.16	31.55	27.58	38.30	31.54	27.48
Quantity with Reported Price	1,714	994	528	5,937	3,999	3,455	7,651	4,993	3,983
Contract Specified and Market Related Total									
Weighted-Average Price	35.66	34.13	32.17	37.65	33.79	31.71	36.66	33.95	31.96
Quantity with Reported Price	8,121	6,030	7,433	8,240	6,826	6,371	16,362	12,855	13,803
Spot-Market Pricing									
Weighted-Average Price	38.74	28.69	27.73	37.08	32.21	27.11	37.98	30.68	27.26
Quantity with Reported Price	650	960	313	549	1,250	925	1,199	2,210	1,237
Other Pricing[a]									
Weighted-Average Price	41.28	36.63	31.75	33.52	33.15	30.63	34.36	33.98	30.80
Quantity with Reported Price	38	185	58	317	597	328	356	782	387
All Pricing Mechanisms									
Weighted-Average Price	**35.91**	**33.46**	**31.99**	**37.47**	**33.52**	**31.10**	**36.71**	**33.49**	**31.55**
Quantity with Reported Price	**8,810**	**7,175**	**7,804**	**9,107**	**8,672**	**7,624**	**17,916**	**15,847**	**15,427**

[a]Category used to report pricing mechanisms that are different from the other categories.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table E10. U.S. Utility Contracted Purchases of Uranium from Suppliers, in Effect at the End of 1998, by Delivery Year, 1999-2008

(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
1999	5,988	756	8,166	1,631	14,154	2,387
2000	4,569	784	8,961	1,931	13,530	2,715
2001	3,440	1,110	5,059	1,861	8,499	2,970
2002	2,664	821	4,980	1,847	7,644	2,668
2003	1,669	1,268	1,745	1,390	3,414	2,658
2004	1,204	920	764	1,492	1,967	2,411
2005	344	328	245	940	589	1,268
2006	0	289	162	346	162	635
2007	0	0	0	308	0	308
2008	0	0	0	0	0	0
Total	**19,878**	**6,275**	**30,082**	**11,745**	**49,960**	**18,020**

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table E11. Anticipated Uranium Market Requirements of U.S. Utilities, 1999-2008, as of December 31, 1998
(Metric Tons U Equivalent)

Year	Quantity of Uranium Under Purchase Contracts	Unfilled Requirements	Anticipated Market Requirements	Enrichment Feed Deliveries
1999	16,541	332	16,873	17,706
2000	16,245	2,735	18,980	20,377
2001	11,469	6,124	17,593	15,680
2002	10,313	11,621	21,934	20,951
2003	6,072	14,307	20,378	17,633
2004	4,379	18,658	23,037	18,954
2005	1,857	16,377	18,234	16,063
2006	797	19,515	20,312	18,679
2007	308	17,863	18,171	16,478
2008	0	18,458	18,458	17,564
Total	**67,979**	**125,990**	**193,970**	**180,085**

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998).

Table E12. U.S. Utility Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1996-1998
(Metric Tons U Equivalent)

Enrichment Plant Location	Actual Deliveries in 1996			Actual Deliveries in 1997			Actual Deliveries in 1998		
	U.S.-Origin	Foreign-Origin	Total	U.S.-Origin	Foreign-Origin	Total	U.S.-Origin	Foreign-Origin	Total
China	0	0	0	0	0	0	0	0	0
France	145	2,318	2,463	W	W	1,153	W	W	1,189
Germany	W	W	W	0	W	W	W	W	960
Netherlands	W	W	W	0	0	0	W	W	560
Russia	95	594	689	W	W	1,110	0	555	555
United Kingdom	W	W	230	W	W	W	W	W	885
Foreign Total	**269**	**3,742**	**4,011**	**198**	**2,883**	**3,081**	**449**	**3,700**	**4,149**
United States	3,195	11,672	14,867	2,383	10,038	12,421	1,796	9,683	11,479
Total	**3,464**	**15,414**	**18,878**	**2,581**	**12,921**	**15,502**	**2,244**	**13,384**	**15,628**

W=Data withheld to avoid disclosure.
Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1998).

Table E13. Uranium in Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors by Year, 1994-1998
(Metric Tons U Equivalent)

Origin of Uranium	1994	1995	1996	1997	1998[P]
Domestic-Origin Uranium	3,578	4,287	3,393	4,283	2,841
Foreign-Origin Uranium	11,962	15,375	14,359	14,258	11,892
Total	**15,540**	**19,662**	**17,752**	**18,542**	**14,734**

P = Preliminary data. Final 1997 fuel assembly data reported in the 1998 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" (1995-1998).

Table E14. Foreign Purchases of Uranium by U.S. Suppliers and U.S. Utilities by Delivery Year, 1994-1998

(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
U.S. Suppliers:					
Foreign Purchases	8,109	7,755	8,365	7,856	8,695
Weighted-Average Price	20.23	23.29	30.62	27.58	27.29
U.S. Utilities:					
Foreign Purchases	5,976	8,131	9,107	8,672	8,117
Weighted-Average Price	27.38	29.61	37.47	33.52	31.10
U.S. Suppliers and U.S. Utilities:					
Foreign Purchases	14,085	15,886	17,471	16,528	16,812
Weighted-Average Price	23.27	26.52	34.19	30.69	29.08

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table E15. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1994-1998

(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1994	1995	1996	1997	1998
Received U.S.-Origin Uranium:					
Purchases	1,843	1,291	1,817	1,216	1,051
Weighted-Average Price	25.35	29.91	36.15	33.23	35.09
Received Foreign-Origin Uranium:					
Purchases	10,005	7,536	7,896	6,347	8,341
Weighted-Average Price	20.86	23.91	32.02	27.71	28.08
Total Received by U.S. Brokers and Traders:					
Purchases	**11,848**	**8,827**	**9,714**	**7,563**	**9,392**
Weighted-Average Price	**21.56**	**24.79**	**32.79**	**28.60**	**28.87**
Received from Foreign Suppliers:					
Purchases	8,588	7,043	6,853	6,040	8,328
Weighted-Average Price	20.46	23.46	30.62	27.84	28.01

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table E16. Foreign Sales of Uranium from U.S. Suppliers and U.S. Utilities by Origin and Delivery Year, 1994-1998

(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries to Foreign Suppliers and Foreign Utilities	1994	1995	1996	1997	1998
U.S.-Origin Uranium:					
Foreign Sales	2,285	1,813	1,909	2,489	1,502
Weighted-Average Price	47.86	45.07	44.76	38.51	40.94
Foreign-Origin Uranium:					
Foreign Sales	4,538	1,971	2,516	4,045	4,297
Weighted-Average Price	20.24	25.84	30.98	28.35	27.98
Total Sent:					
Foreign Sales	**6,824**	**3,783**	**4,425**	**6,535**	**5,798**
Weighted-Average Price	**29.49**	**35.06**	**36.92**	**32.22**	**31.33**
From U.S. Producers, U.S. Utilities, and other U.S. Suppliers:					
Foreign Sales	1,896	1,670	2,131	3,302	1,756
Weighted-Average Price	52.23	47.09	40.80	33.94	37.41
From U.S. Brokers and Traders:					
Foreign Sales	4,927	2,113	2,294	3,233	4,042
Weighted-Average Price	20.73	25.55	33.32	30.46	28.70

Notes: "other U.S. Suppliers" are U.S. converters, enrichers, and fabricators. Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1994-1998).

Table E17. Inventories of Natural and Enriched Uranium as of End of Year, 1994-1998

(Metric Tons U Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1994	1995	1996	1997	1998[P]
U.S. Utility Inventories	**25,160**	**22,590**	**25,421**	**25,339**	**25,733**
Natural Uranium	16,316	15,858	16,230	18,126	16,280
Enriched Uranium[a]	8,844	6,733	9,191	7,213	9,453
U.S. Supplier Inventories[b]	**8,258**	**5,285**	**5,365**	**15,524**	**27,177**
Natural Uranium	6,698	5,084	4,989	3,952	13,387
Enriched Uranium[a]	1,560	201	377	11,572	13,790
Total Commercial Inventories	**33,418**	**27,875**	**30,786**	**40,864**	**52,910**
DOE-Owned and USEC-Held Inventories[c]	**32,776**	**42,618**	**41,731**	**20,478**	**9,406**
Natural Uranium	21,993	31,536	32,007	20,478	9,406
Enriched Uranium	10,783	11,081	9,724	0	0

[a]Includes amounts reported as inventories of enriched UF_6 at enrichment suppliers.
[b]Includes inventories owned by the 1998 privatized USEC, Inc. (United States Enrichment Corporation) for year-end 1997 and 1998 only.
[c]DOE-owned inventories reported by the Office of Nuclear Energy, Science and Technology; U.S. Department of Energy. For year-end 1994 through 1996, includes the held inventories of the United States Enrichment Corporation (USEC), then a wholly-owned U.S. government corporation. After privatization in July 1998, USEC Incorporated reported its owned inventories in the 1998 survey, for year-end 1997 and year-end 1998, and are included with the commercial inventories of U.S. suppliers.
P=Preliminary data. Final 1997 inventory data reported in the 1998 survey.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1998).

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 contract 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, 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 uraniferous 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 nonconventioanl 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 xf into a mass P of product assay xp and waste of mass W and assay xw 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).