

# Uranium Industry Annual 1999

May 2000

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**Energy Information Administration**  
Office of Coal, Nuclear, Electric and Alternate Fuels  
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Washington, DC 20585

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# Preface

The *Uranium Industry Annual 1999* (UIA 1999) provides current statistical data on the U.S. uranium industry's activities relating to uranium raw materials and uranium marketing. The UIA 1999 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 1990 through 2009 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 1999, 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 1990 through 1999, 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 1995 through 2009, 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 1999 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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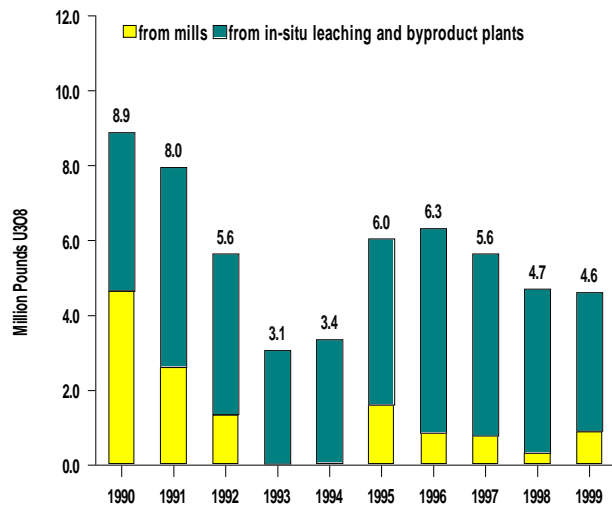
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# Highlights

## Uranium Raw Material Activities

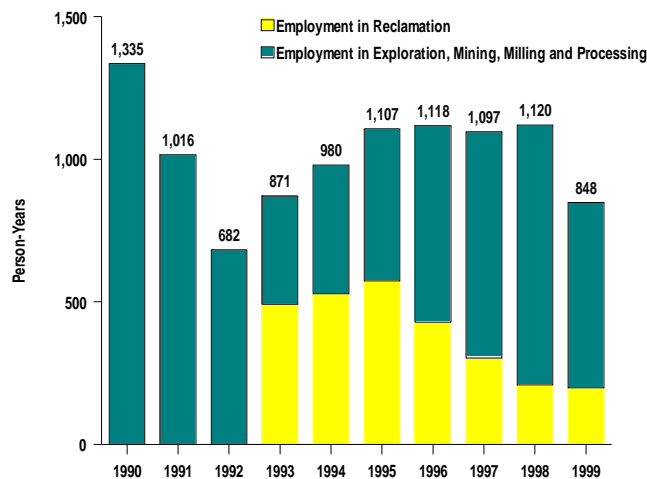
Total U.S. uranium exploration and development expenditures in 1999 were \$9.0 million, a decrease of 59 percent from the 1998 level (Table H1). Mine production of uranium was 4.5 million pounds and uranium concentrate production totaled 4.6 million pounds in 1999. U.S. uranium mills produced 20 percent; and in-situ leaching and as a byproduct of phosphate processing combined for 80 percent of the concentrate production in 1999 (Figure H1).

**Figure H1. U.S. Uranium Concentrate Production, 1990-1999**



Employment in the U.S. uranium raw materials industry totaled 848 person-years in 1999, a decrease of 24 percent from the 1998 level (Figure H2).

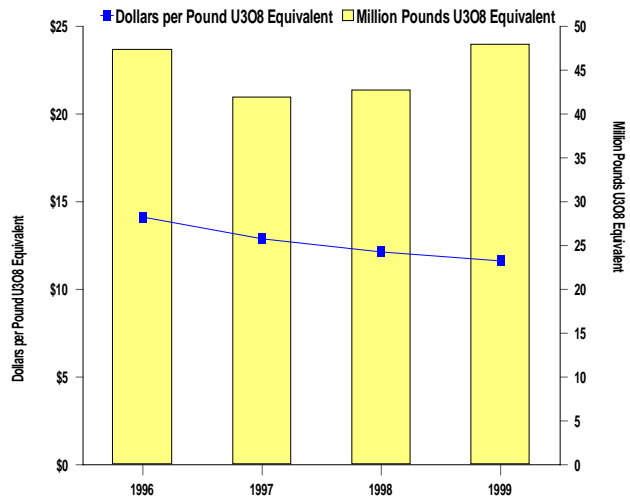
**Figure H2. U.S. Uranium Raw Materials Employment, 1990-1999**



## Uranium Marketing Activities

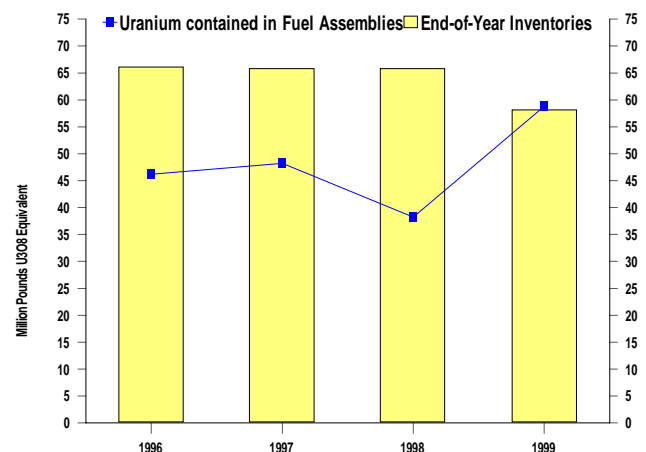
U.S. utilities purchased from U.S. and foreign suppliers a total of 47.9 million pounds  $U_3O_8e$  (equivalent) of deliveries during 1999 (Table H2). The average price paid by the utilities was \$11.63 per pound  $U_3O_8e$ , a decrease of 18 percent compared with the 1996 price (Figure H3).

**Figure H3. Uranium Purchases by U.S. Utilities, 1996-1999**



Fuel assemblies loaded into U.S. commercial nuclear power reactors during 1999 contained 58.8 million pounds  $U_3O_8e$  (Table H3). Uranium inventories owned at the end of the year by U.S. utilities in 1999 was 58.2 million pounds  $U_3O_8e$ , a decrease of 12 percent from the 1998 level (Figure H4).

**Figure H4. Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors and Uranium Inventories of U.S. Utilities, 1996-1999**



**Table H1. Raw Materials Summary Statistics of the U.S. Uranium Industry, 1990-1999**

Items	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
<b>Exploration and Development</b>										
Surface Drilling (million feet) .....	1.7	1.8	1.1	1.1	0.7	1.3	3.0	4.9	4.6	2.5
(million meters) .....	0.5	0.6	0.3	0.3	0.2	0.4	0.9	1.5	1.4	0.8
Expenditures <sup>a</sup> (million dollars) .....	17.1	17.8	14.5	11.3	3.7	6.0	10.1	30.4	21.7	9.0
<b>Reserves at End of Year</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> , \$US30 per pound) .....	265	304	295	292	294	290	285	281	276	274
(thousand metric tons U, \$US80 per kilogram) .....	102	117	114	112	113	112	110	108	106	105
<b>Mine Production of Uranium</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	5.9	5.2	1.0	2.1	2.5	3.5	4.7	4.7	4.8	4.5
(thousand metric tons U) .....	2.3	2.0	0.4	0.8	1.0	1.4	1.8	1.8	1.8	1.8
<b>Uranium Concentrate Production</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	8.9	8.0	5.6	3.1	3.4	6.0	6.3	5.6	4.7	4.6
(thousand metric tons U) .....	3.4	3.1	2.2	1.2	1.3	2.3	2.4	2.2	1.8	1.8
<b>Uranium Concentrate Shipments</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	13.0	8.4	6.9	3.4	6.3	5.5	6.0	5.8	4.9	5.5
(thousand metric tons U) .....	5.0	3.2	2.6	1.3	2.4	2.1	2.3	2.2	1.9	2.1
<b>Employment</b> (person-years expended) ...	1,335	1,016	682	871	980	1,107	1,118	1,097	1,120	848

<sup>a</sup>Expenditures are in nominal U.S. dollars.

Notes: 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 1999, total employment includes reclamation employment.

Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999); **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table H2. Transaction Summary Statistics of the U.S. Uranium Industry, 1996-1999**

Actual Deliveries	1996		1997		1998		1999	
	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price
<b>Purchases by U.S. Brokers and Traders</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	25.3	12.61	19.7	11.00	24.4	11.10	22.0	9.91
(thousand metric tons U; dollars per kilogram U) .....	9.7	32.79	7.6	28.60	9.4	28.87	8.5	25.76
<b>Purchases by U.S. Utilities</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	47.3	14.12	42.0	12.88	42.7	12.14	47.9	11.63
(thousand metric tons U; dollars per kilogram U) .....	18.2	36.71	16.1	33.49	16.4	31.55	18.4	30.24
<b>Foreign Purchases by U.S. Suppliers and Utilities</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	45.4	13.15	43.0	11.81	43.7	11.19	47.6	10.55
(thousand metric tons U; dollars per kilogram U) .....	17.5	34.19	16.5	30.69	16.8	29.08	18.3	27.42
<b>Foreign Sales by U.S. Suppliers and Utilities</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	11.5	14.20	17.0	12.39	15.1	12.05	8.5	11.97
(thousand metric tons U; dollars per kilogram U) .....	4.4	36.92	6.5	32.22	5.8	31.33	3.3	31.11

U<sub>3</sub>O<sub>8</sub>e = U<sub>3</sub>O<sub>8</sub> equivalent.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1999).

**Table H3. Summary Statistics of Uranium Fuel and Commercial Inventories, 1996-1999**

Items	1996	1997	1998	1999 <sup>P</sup>
<b>Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors</b>				
(million pounds U <sub>3</sub> O <sub>8</sub> e) .....	46.2	48.2	38.2	58.8
(thousand metric tons U) .....	17.8	18.5	14.7	22.6
<b>Commercial Inventories at the End of the Year</b>				
<b>U.S. Utility Inventories</b>				
(million pounds U <sub>3</sub> O <sub>8</sub> e) .....	66.1	65.9	65.8	58.2
(thousand metric tons U) .....	25.4	25.3	25.3	22.4
<b>U.S. Utility and Supplier Inventories</b>				
(million pounds U <sub>3</sub> O <sub>8</sub> e) .....	80.0	106.2	136.5	127.0
(thousand metric tons U) .....	30.8	40.9	52.5	48.9

U<sub>3</sub>O<sub>8</sub>e = U<sub>3</sub>O<sub>8</sub> equivalent.

P=Preliminary data. Final 1998 data reported in the 1999 survey.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1999).



# 1. U.S. Uranium Raw Materials Industry

## Introduction

The levels of activity in the U.S. uranium raw materials industry overall were lower during 1999, compared with 1998. Expenditures for exploration, drilling, and related activities reported were lower (Figure 1), mine production of uranium declined (Figure 2), total uranium concentrate production decreased (Figure 3), and total employment for uranium exploration, mining, milling, processing and reclamation decreased in 1999 (Figure 4). Uranium concentrate was produced in 1999 by conventional milling and in-situ leach methods. Also, uranium concentrate was processed as a byproduct of phosphate mining and from mine water and other materials.

## Exploration and Development Activities

### Land Holdings and Acquisitions

U.S. uranium exploration companies held 807 thousand acres for all exploration purposes at the end of 1999 (Table 1). None were acquired for exploration during 1999. The types of land 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 2.5 million feet in 3,176 holes (Table 1). Development drilling expenditures in 1999 were \$7.6 million, while exploration drilling expenditures were \$0.3 million (Figure 5).

### Expenditures for Uranium Exploration and Development

Total U.S. uranium exploration and development expenditures in 1999 were \$9.0 million, consisting of (in millions) \$7.9 for surface drilling and \$1.1 for other exploration activities (Table 2). This total represents a 59 percent decrease from the 1998 level.

## Estimates of U.S. Uranium Reserves

The EIA's yearend 1999 estimate of U.S. uranium reserves for the \$30- and \$50-per-pound  $U_3O_8$  forward cost categories were 274 and 908 million pounds respectively (Table 3). Forward costs are the operating and capital costs yet to be incurred in production of the uranium, and the cost categories are independent of the market price for uranium. The reserves represent the quantities of uranium in known deposits that, based on the measured grade and quantity of ore, its configuration, and depth, could be mined at a specified cost using current mining and milling technology. Compared with the yearend 1998 reserve estimates, the 1999 reserves show modest decreases (0.9 percent at \$30- and 1.7 percent at \$50-per-pound  $U_3O_8$ ) that reflect combined effects of depletion and erosion of the remaining in-place ore at yearend 1999 after accounting for the mine production of uranium as reported for 1999 by domestic mining firms. Other adjustments were made for the 1999 reserves to account for the losses resulting from the effects of ongoing environmental restoration projects at sites where mining activities have been indefinitely suspended or terminated.

## Mine Production of Uranium

During 1999, a total of 4.5 million pounds  $U_3O_8$  of uranium were produced by mining, 5 percent less than the level of production in 1998 (Table 4). Mine production came from three underground mines and six in-situ mines during 1999. Uranium was also recovered from waste mine-water and from reclamation and restoration activities at closed in-situ mine sites. Compared with 1998, in situ leach mine production increased 3 percent in 1999. Overall, there were nine commercially operating uranium mines during part or all of 1999, one less than in 1998 (Table 4).

## Concentrate Production and Shipments

Total U.S. uranium concentrate production in 1999 was 4.6 million pounds  $U_3O_8$ , 2 percent below the 1998 level (Table 5). Concentrate production from conventional mills was 0.9 million pounds.

Concentrate production in the “Other Processing” category includes production from in-situ leaching and as a byproduct of phosphate processing. Compared with 1998, this category decreased 15 percent and totaled 3.7 million pounds  $U_3O_8$  in 1999 (Table 5).

Shipments of uranium concentrate from domestic production facilities (mills, in situ and phosphate byproduct plants) totaled 5.5 million pounds in 1999 (Table 5). Shipments have exceeded production for the last three years (Figure 6).

## **Status of Uranium Processing Facilities**

At the end of 1999, one U.S. uranium mill was active based on a conventional milling capacity of 400 tons of ore per day. Five mills with a conventional milling capacity of 13,200 tons of ore per day were inactive at year-end 1999 (Table 6). However, one of the inactive conventional mills was active (milling uranium ore) and two others produced uranium concentrate from mine water during part of the year 1999.

Four nonconventional uranium producing plants, all in-situ leach plants, were in commercial operation in the United States at the end of 1999. These plants had a

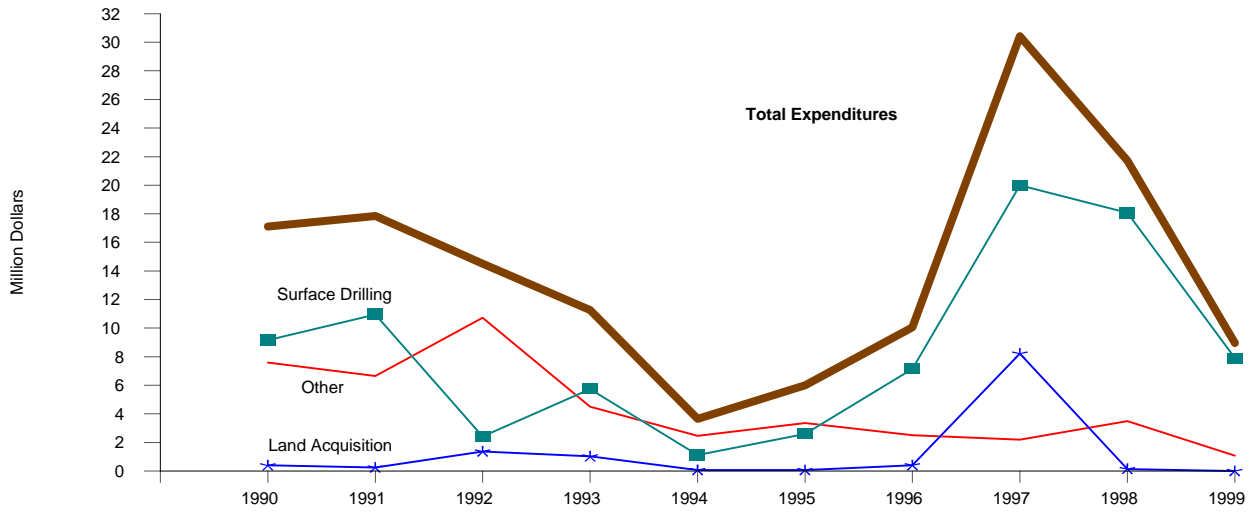
combined rated capacity of 5.7 million pounds  $U_3O_8$  per year (Table 7). Eleven nonconventional plants were inactive at the end of 1999, of which five are closed permanently. Three of the seven inactive in-situ leach plants had produced a small amount of uranium concentrate in 1999 from restoration activities. Two in-situ leach plants in Texas closed during 1999. One phosphate byproduct plant in Louisiana closed in 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.

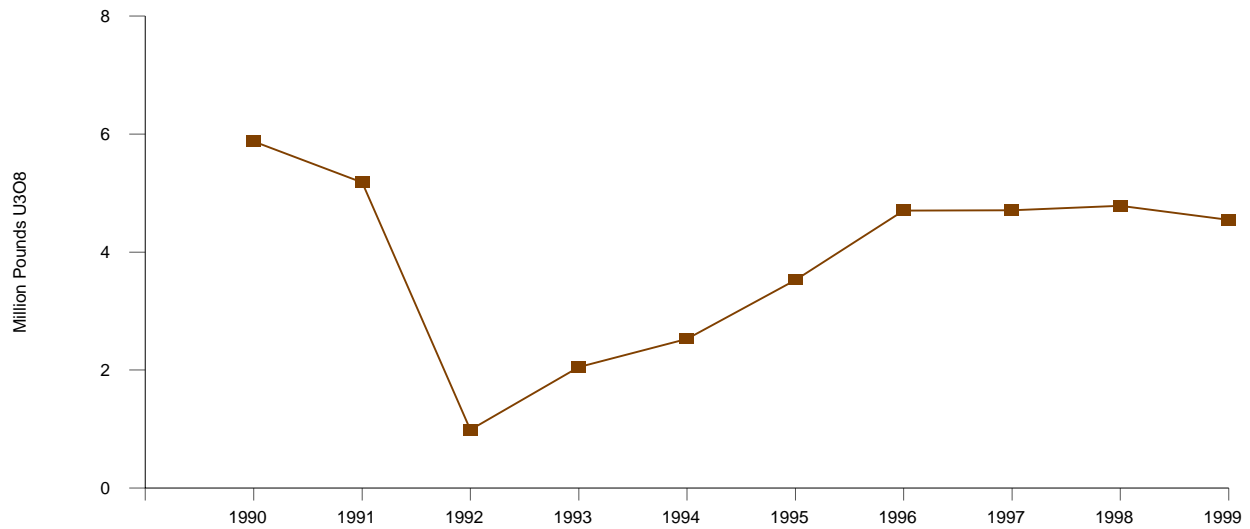
## **Employment**

Employment in the U.S. uranium raw materials industry in 1999 was reported as 848 person-years expended (Table 8). Compared with 1998, 1999 employment overall decreased by 24 percent. However, employment levels in individual categories changed significantly: exploration employment declined by 77 percent, mining employment declined by 40 percent, and processing by 35 percent, while milling employment rose by 26 percent. Three States, Colorado, Texas and Wyoming, accounted for 69 percent of the total employment in 1999 (Table 9).

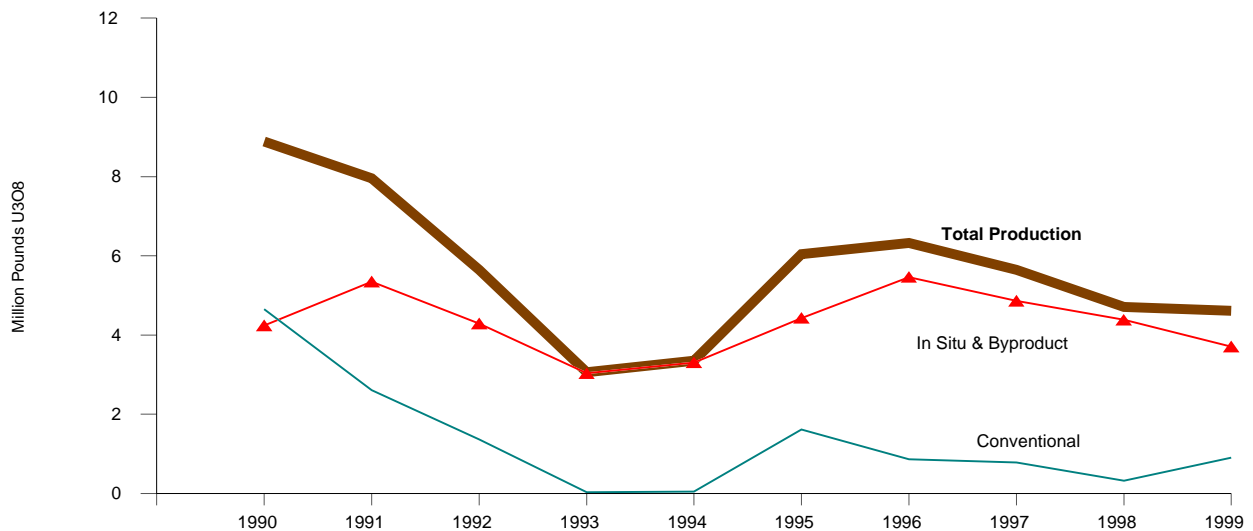
**Figure 1. U. S. Uranium Exploration and Development Expenditures, 1990-1999**



**Figure 2. U.S. Uranium Mine Production, 1990-1999**

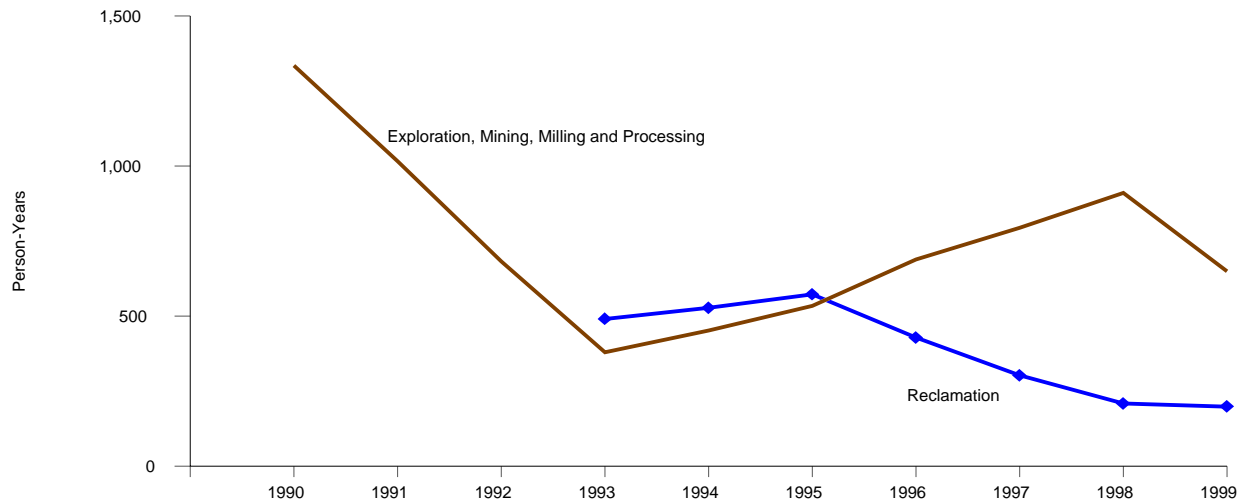


**Figure 3. U.S. Uranium Concentrate Production, 1990-1999**

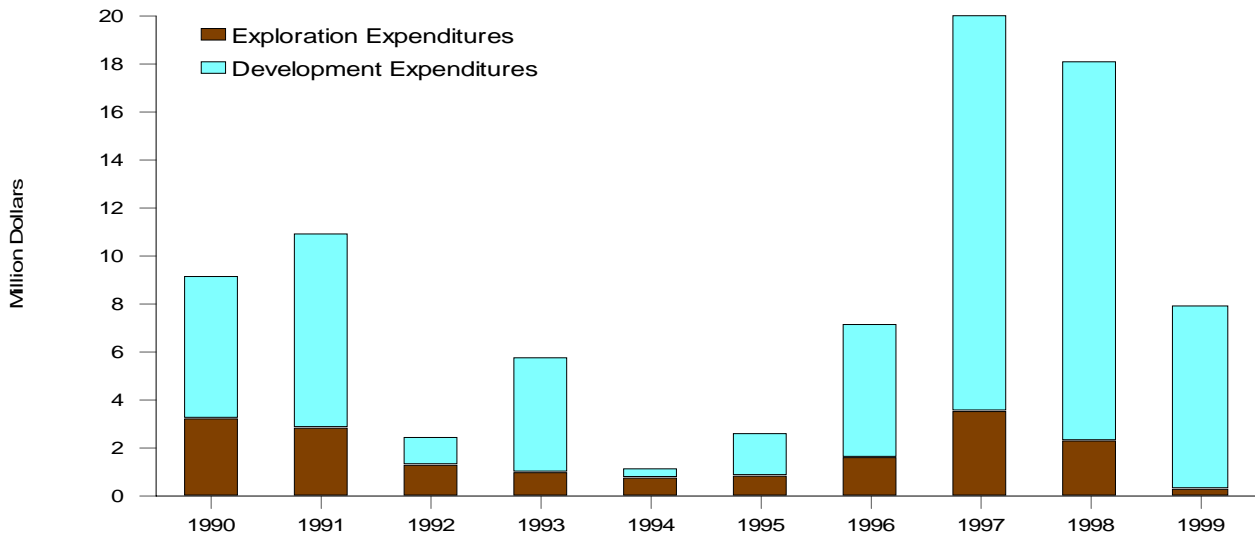


Sources: Energy Information Administration: 1990-1998-Uranium Industry Annual 1998 (April 1999). 1999-Form EIA-858, "Uranium Industry Annual Survey" (1999).

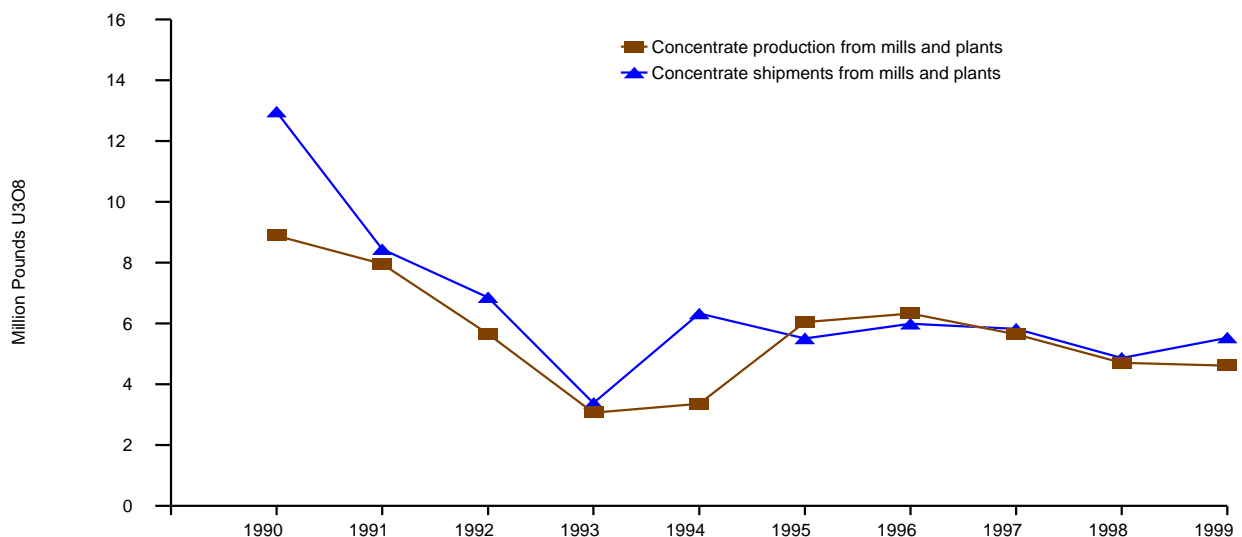
**Figure 4. Employment - U.S. Uranium Raw Materials Sector, 1990-1999**



**Figure 5. U.S. Uranium Exploration and Development Surface Drilling Expenditures, 1990-1999**



**Figure 6. U.S. Uranium Concentrate Production and Shipments, 1990-1999**



Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999). **1999**-Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 1. U.S. Uranium Land and Surface Drilling Activities, 1990-1999**

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)
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
1999 ....	0	807	265	178	276	2,911	2,325	7,616	3,176	2,503	7,892

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

Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999). **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table 2. Expenditures for Exploration and Development of Uranium in the United States, 1990-1999 (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
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
1999 .....	7,892	0	1,076	8,968	W	W

W=Data withheld to avoid disclosure.

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

Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999). **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table 3. Forward-Cost Uranium Reserves by Mining Method, 1999**

Mining Method	Forward-Cost Category					
	\$30 per pound			\$50 per pound		
	Ore (million tons)	Grade <sup>a</sup> (percent U <sub>3</sub> O <sub>8</sub> )	U <sub>3</sub> O <sub>8</sub> (million pounds)	Ore (million tons)	Grade <sup>a</sup> (percent U <sub>3</sub> O <sub>8</sub> )	U <sub>3</sub> O <sub>8</sub> (million pounds)
Underground .....	25	0.271	138	143	0.163	464
Openpit .....	10	0.139	29	163	0.079	257
In Situ Leaching .....	40	0.132	106	121	0.076	183
Other <sup>b</sup> .....	< 1	0.264	< 1	3	0.059	4
<b>Total .....</b>	<b>76</b>	<b>0.179</b>	<b>274</b>	<b>429</b>	<b>0.106</b>	<b>908</b>

<sup>a</sup>Weighted average percent U<sub>3</sub>O<sub>8</sub> per ton of ore.

<sup>b</sup>Includes heap leach, low grade material, and miscellaneous.

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 files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 4. U.S. Uranium Mine Production and Number of Mines and Sources, 1990-1999**

Mining Method	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Underground (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	W	W	W	0	0	0	W	W	W	W
Openpit (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	1,881	2,528	W	0	0	0	0	0	0	0
In Situ Leaching (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	W	W	W	W	2,448	3,372	4,379	4,084	3,721	3,830
Other <sup>a</sup> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	3,995	2,654	986	2,050	78	156	326	626	1,062	718
<b>Total Mine Production</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<b>5,876</b>	<b>5,182</b>	<b>986</b>	<b>2,050</b>	<b>2,526</b>	<b>3,528</b>	<b>4,705</b>	<b>4,710</b>	<b>4,782</b>	<b>4,548</b>
<b>Number of Mines Operated</b>										
Underground .....	27	6	4	0	0	0	1	1	4	3
Openpit .....	2	2	1	0	0	0	0	0	0	0
In Situ Leaching .....	7	6	4	5	5	5	6	7	6	6
Other Sources <sup>b</sup> .....	3	1	8	7	7	7	6	6	5	5
<b>Total Mines and Sources .....</b>	<b>39</b>	<b>15</b>	<b>17</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>14</b>

<sup>a</sup>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 1999, "Other" includes production from underground mines and uranium bearing water from mine workings and restoration.

<sup>b</sup>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: **1990-1998-Uranium Industry Annual 1998** (April 1999); **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table 5. U.S. Uranium Concentrate Processing Operations, 1990-1999**

Processing Operations	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Ore Fed to Process <sup>a</sup> (thousand tons) .....	722	639	256	0	0	167	44	0	0	W
Percent U <sub>3</sub> O <sub>8</sub> <sup>b</sup> .....	0.293	0.198	0.229	—	—	0.520	0.500	—	—	W
Contained U <sub>3</sub> O <sub>8</sub> (thousand pounds)										
In Ore .....	4,227	2,529	1,171	0	0	1,739	444	0	0	W
Other Feed Materials <sup>c</sup> .....	485	179	181	42	78	163	409	911	387	W
Total Mill Feed (thousand pounds U <sub>3</sub> O <sub>8</sub> ) ..	4,712	2,708	1,353	42	78	1,902	853	911	387	1,260
In-Process Inventory Change .....	-244	-122	-25	10	24	157	-137	52	-7	106
(thousand pounds U <sub>3</sub> O <sub>8</sub> )										
<b>Concentrate Produced at Mills</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> )										
Theoretical <sup>d</sup> .....	4,956	2,830	1,377	31	54	1,744	990	859	393	1,154
<b>Actual</b> .....	<b>4,649</b>	<b>2,608</b>	<b>1,359</b>	<b>30</b>	<b>46</b>	<b>1,615</b>	<b>860</b>	<b>784</b>	<b>323</b>	<b>907</b>
Recovery as Percent .....	93.8	92.2	98.7	—	—	92.6	86.8	91.2	82.2	78.6
Tailings and Unaccountable (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	307	222	18	1	8	130	130	76	70	246
<b>Other Processing<sup>e</sup></b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<b>4,237</b>	<b>5,344</b>	<b>4,286</b>	<b>3,033</b>	<b>3,306</b>	<b>4,428</b>	<b>5,461</b>	<b>4,859</b>	<b>4,381</b>	<b>3,703</b>
<b>Total Uranium Concentrate Production</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<b>8,886</b>	<b>7,952</b>	<b>5,645</b>	<b>3,063</b>	<b>3,352</b>	<b>6,043</b>	<b>6,321</b>	<b>5,643</b>	<b>4,705</b>	<b>4,611</b>
<b>Total Concentrate Shipped From Mills and Plants</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<b>12,957</b>	<b>8,437</b>	<b>6,853</b>	<b>3,374</b>	<b>6,319</b>	<b>5,500</b>	<b>5,982</b>	<b>5,817</b>	<b>4,863</b>	<b>5,527</b>

<sup>a</sup>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.

<sup>b</sup>Weighted average percent U<sub>3</sub>O<sub>8</sub> per ton of ore.

<sup>c</sup>Includes for various years uranium from low-grade ore, mill cleanup, mine water, tailings water, heap leaching, and waste stream materials.

<sup>d</sup>At 100-percent recovery.

<sup>e</sup>U<sub>3</sub>O<sub>8</sub> concentrate production from in-situ leaching and as a byproduct of phosphate processing.

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

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

Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999); **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table 6. Operating Status of Conventional Uranium Mills, End of the Year, 1996-1999**

Mill Owner(s)	Mill Name	Milling Capacity <sup>a</sup> (short tons of ore per day)	Operating Status at End of the Year			
			1996	1997	1998	1999
Cotter .....	Canon City	400	I	I	I	O
Dawn Mining .....	Dawn/Ford	450	I	I	I	I
International Uranium .....	White Mesa	2,000	I	I	I	I
Quivira Mining (Rio Algom) .....	Ambrosia Lake	7,000	I	I	I	I
U.S. Energy/Kennecott (Green Mountain Mining Venture) .....	Sweetwater	3,000	I	I	I	I
U.S. Energy/Plateau Resources .....	Shootaring	750	I	I	I	I

**Summary of Mill Status**

Number of Mills						
Operating <sup>b</sup> .....	--	--	0	0	0	1
Inactive .....	--	--	6	6	6	5
Total .....	--	--	6	6	6	6

**Available Milling Capacity**

Operating (tons of ore per day) .....	--	--	0	0	0	400
Inactive (tons of ore per day) .....	--	--	14,400	14,400	14,400	13,200
Total Available Capacity (tons of ore per day) .....	--	--	14,400	14,400	14,400	13,600
Average Daily Mill Feed						
(tons of ore per day) <sup>c</sup> .....	--	--	127	0	0	W
Percent of Total Available Capacity <sup>d</sup> .....	--	--	1	0	0	W

<sup>a</sup>Milling capacity based on data reported on Form EIA-858 for 1999.

<sup>b</sup>Number that milled uranium-bearing ore at the end of year.

<sup>c</sup>Rounded value. Based on 350 workdays per year and total ore fed to process during the year shown in Table 5.

<sup>d</sup>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. W=Data withheld to avoid disclosure.

Sources: Energy Information Administration: **1996-1998-Uranium Industry Annual 1998** (April 1999). **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table 7. Operating Status of Nonconventional Uranium Plants, 1999**

Plant Owner(s)	Plant Name	Plant Type	Rated Capacity <sup>a</sup> (thousand pounds U <sub>3</sub> O <sub>8</sub> per year)	Operating Status at the End of the Year <sup>b</sup>
COGEMA Mining .....	West Cole	In Situ Leach	200	I (R)
Everest Exploration .....	Hobson	In Situ Leach	1,000	I (CI)
IMC-Agrico .....	Sunshine Bridge	Phosphate Byproduct	420	I (CP)
IMC-Agrico .....	Uncle Sam	Phosphate Byproduct	750	I (CP)
IMC-Agrico .....	Plant City	Phosphate Byproduct	608	I (CP)
IMC-Agrico .....	New Wales	Phosphate Byproduct	750	I (CP)
Malapai Resources .....	Christensen Ranch	In Situ Leach	650	O
Malapai Resources .....	Holiday-EI Mesquite	In Situ Leach	600	I (R)
Malapai Resources .....	Irigaray	In Situ Leach	350	I (R)
Malapai Resources .....	O'Hern	In Situ Leach	NA	I (R)
Power Resources/Geomex (Converse County Mining Venture) .....				
	Highland	In Situ Leach	2,000	O
Quivira Mining (Rio Algom) .....	Smith Ranch	In Situ Leach	2,000	O
Uranium Resources .....	Kingsville Dome	In Situ Leach	1,300	I (CI)
Uranium Resources .....	Rosita	In Situ Leach	1,000	I (CP)
UUS/Geomex/KEPRA (Crow Butte Resources) .....	Crow Butte	In Situ Leach	1,000	O

<sup>a</sup>Milling capacity based on data reported on Form EIA-858 for 1999.

<sup>b</sup>I=Inactive at the end of the year. R=Reclamation (restoration in process or completed). CI=Closed indefinitely (following year restart not planned).

CP=Closed permanently (will not be restarted). NA = Not available. O=Operating at the end of the year.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).



**Table 8. Employment in the U.S. Uranium Industry by Category, 1990-1999**  
(Person-Years)

Year	Employment Categories					Total
	Exploration	Mining	Milling	Processing	Reclamation <sup>a</sup>	
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
1999 .....	7	310	201	132	199	848

<sup>a</sup>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: **1990-1998-Uranium Industry Annual 1998** (April 1999); **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table 9. Employment in the U.S. Uranium Industry by State, 1999**  
(Person-Years)

State(s)	Total	Percent of Total
Wyoming .....	335	39
Colorado .....	198	23
Texas .....	59	7
Arizona, New Mexico, Utah .....	169	20
Other <sup>a</sup> .....	87	10
<b>Total .....</b>	<b>848</b>	<b>100</b>

<sup>a</sup>Includes Louisiana, Nebraska, and Washington.

Notes: Totals may not equal sum of components because of independent rounding. Total employment includes 199 person years for reclamation.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

## 2. Uranium Marketing Activities in the United States

### Introduction

Movement of both natural and enriched uranium materials illustrates, for 1999, 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 are nuclear-fuel generating companies that 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 1999 status of uranium inventories.

### Uranium Market Activity of U.S. Utilities

#### Uranium Purchases

In 1999, U.S. utilities received a total of 47.9 million pounds  $U_3O_8e$  (Figure 9), and the average price was \$11.63 per pound (Table 10 and Figure 10). Compared with 1998, the quantity is an increase of 12 percent, but a decrease in price of 4 percent. Foreign-origin uranium accounted for 36.5 million pounds (76 percent) of the deliveries (Figure 11) at an average price of \$11.47 per pound (Table 11). Approximately 26 percent of all uranium purchased by U.S. utilities was Canadian origin (Table 12), while 24 percent was U.S.-origin. In rank order, the next five foreign country origins were Australia (15 percent), Russia (13 percent), South Africa (6 percent), Uzbekistan (5 percent), and Ukraine (4 percent) (Figure 12).

The 26 sellers of uranium to U.S. utilities with 1999 deliveries are shown in the following list. Twelve of the 26 firms (designated with an asterisk) had purchase contracts signed in 1999.

#### Uranium Sellers to U.S. Utilities

British Nuclear Fuels Ltd (BNFL)\*  
Cameco Corporation\*  
China Nuclear Energy Industry Corp (CNEIC)  
COGEMA, Inc.  
ConverDyn  
Energy Resources of Australia  
Geomex Minerals, Inc.  
Global Nuclear Services & Supply Ltd.\*  
International Uranium Corp.  
New York Nuclear Corp (NYNCO)\*  
Nuclear Fuels Corp. of South Africa\*  
NUKEM, Inc.\*  
Palabora Mining\*  
Power Resources, Inc.  
Rio Algom Mining Corporation  
RTZ Minerals Services Limited  
Sheep Mountain Partners  
Siemens Power Corporation\*  
The Uranium Exchange Company  
U.S. Enrichment Corporation (USEC)\*  
UG U.S.A., Inc.\*  
Uranerz Exploration & Mining Ltd.  
Uranium Resources, Inc.  
Urenco, Ltd.\*  
UUS, Inc.  
Vermont Yankee Nuclear Power Corp.\*

The utilities purchased uranium of several material types (Table 13). Uranium concentrate ( $U_3O_8$ ) accounted for 64 percent of the purchases, uranium hexafluoride ( $UF_6$ ) was 27 percent, and enriched uranium was 10 percent (Figure 13).

Domestic purchases of uranium (both U.S. and foreign-origin) in 1999 totaled 19.2 million pounds  $U_3O_8e$ , 1.0 million pounds less than the deliveries for 1998 (Table 14). The average price of these domestic purchases in 1999 was \$11.88 per pound.

Foreign purchases of uranium (only foreign-origin) from foreign suppliers in 1999 totaled 26.3 million pounds  $U_3O_8e$ , 6.5 million pounds more than the deliveries for 1998. The average price of these foreign purchases in 1999 was \$11.45 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 1997 through 1999 (Table 14).

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 1999, 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 \$9.52 per pound, but for medium-term contracts it was \$12.58 per pound. Most deliveries were made under medium-term contracts in 1999, and long-term contracts were second in deliveries (Figure 14).

## New Purchases

The quantity of uranium delivered in 1999, under 40 purchase contracts signed in 1999, was 10.8 million pounds  $U_3O_8e$ , and the average price was \$9.30 per pound (Table 17). Twenty-nine new spot contracts accounted for 64 percent of the 1999 deliveries for these new purchase contracts.

Future deliveries reported for 2000 through 2009, for contracts signed in 1999, total 44.1 million pounds. Of this quantity, firm deliveries amount to 27.5 million pounds (Table 18).

## Anticipated Uranium Market Requirements

Future deliveries for 2000-2009, based on U.S. utility contracts reported in effect at the end of 1999, for all reported purchase contracts consisted of 122.3 million pounds for firm deliveries and 56.6 million pounds for

optional deliveries (Table 19). Foreign suppliers would provide 57 percent of the existing firm deliveries to U.S. utilities through 2009 (Figure 15 and Table 19).

At the end of 1999, cumulative unfilled uranium requirements for commercial nuclear reactors for 2000 through 2009 were reported to be 325.5 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 178.9 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 1999, was 504.4 million pounds.

The unfilled requirements category, as reported at the end of 1999, constitutes a small portion of anticipated market requirements in 2000 (Figure 16). However, it increases to 57 percent of total anticipated requirements by 2003 and to 93 percent by 2009. For the years 2000 and 2002, U.S. utilities anticipated market requirements do not meet their projected enrichment feed deliveries. However, for the years 2003 through 2007, 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 1999, U.S. utilities delivered 43.9 million pounds  $U_3O_8e$  of natural uranium feed to domestic and foreign enrichment suppliers (Table 22). U.S.-origin uranium accounted for 6.7 million pounds (15 percent) of the feed deliveries (Table 23). Deliveries to U.S. enrichment plants accounted for 31.4 million pounds, or 71 percent of the total, and deliveries to foreign enrichment plants was 12.5 million pounds, 29 percent of total feed deliveries in 1999.

As of the end of 1999, the U.S. utilities projected that the amount of natural uranium feed to be shipped for enrichment for the years 2000 through 2009 will vary between 43 million and 53 million pounds annually (Table 24).

## Purchases of Enrichment Services

In 1999, 10.0 million separative work units (SWU) were purchased by U.S. utilities under enrichment services contracts (Table 25). U.S. uranium enrichment plants provided 46 percent of the utilities' SWU and foreign enrichment plants the remaining 54 percent. In comparison, for 1998 U.S. enrichment plants provided 56 percent of the utilities' enrichment needs.

Enrichment services by Russia accounts for 63 percent of foreign purchases and 34 percent of the total U.S. utilities' needs in 1999. In comparison, for 1995 Russia supplied only 12 percent of the total.

The 11 firms that were reported as the sellers of enrichment services for these SWU deliveries in 1999 are shown in the following list.

#### **Enrichment Service Sellers to U.S. Utilities**

Ameren/UE  
China Nuclear Energy Industry Corp (CNEIC)  
COGEMA, Inc.  
Global Nuclear Service & Supply, Ltd.  
Nuexco Trading Corp. (NTC) Liquidating Trust  
NUKEM, Inc.  
Siemens Power Corp.  
UG U.S.A., Inc.  
United States Enrichment Corporation (USEC)  
Urenco, Ltd.  
Vermont Yankee Nuclear Power Corp.

The long-term enrichment service contracts were dominant in 1999, and represented 82 percent of SWU deliveries that were provided at both U.S. and foreign enrichment plants (Table 26). In contrast, the spot enrichment service contracts represents only 6 percent of SWU deliveries.

#### **Fuel Assemblies**

The total amount of uranium contained in fuel assemblies loaded into U.S. commercial nuclear reactors during 1999 was 58.8 million pounds  $U_3O_8$  (Table 27). This was 20.6 million pounds more than in 1998 (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 purchased from foreign suppliers 47.6 million pounds  $U_3O_8$  that was received in 1999 (Table 28). The average price for these foreign purchases was \$10.55 per pound  $U_3O_8$ . This is 6 percent lower than the 1998 average price of \$11.19 per pound.

U.S. brokers and traders, a primary supplier of uranium, purchased 22.0 million pounds  $U_3O_8$  of deliveries during 1999 at an average price of \$9.91 per pound (Table 29). Most of the uranium (19.2 million pounds or 88 percent) was from foreign suppliers. In 1998, by comparison, U.S. brokers and traders purchased 24.4 million pounds  $U_3O_8$  at an average price of \$11.10 per pound (Figure 19).

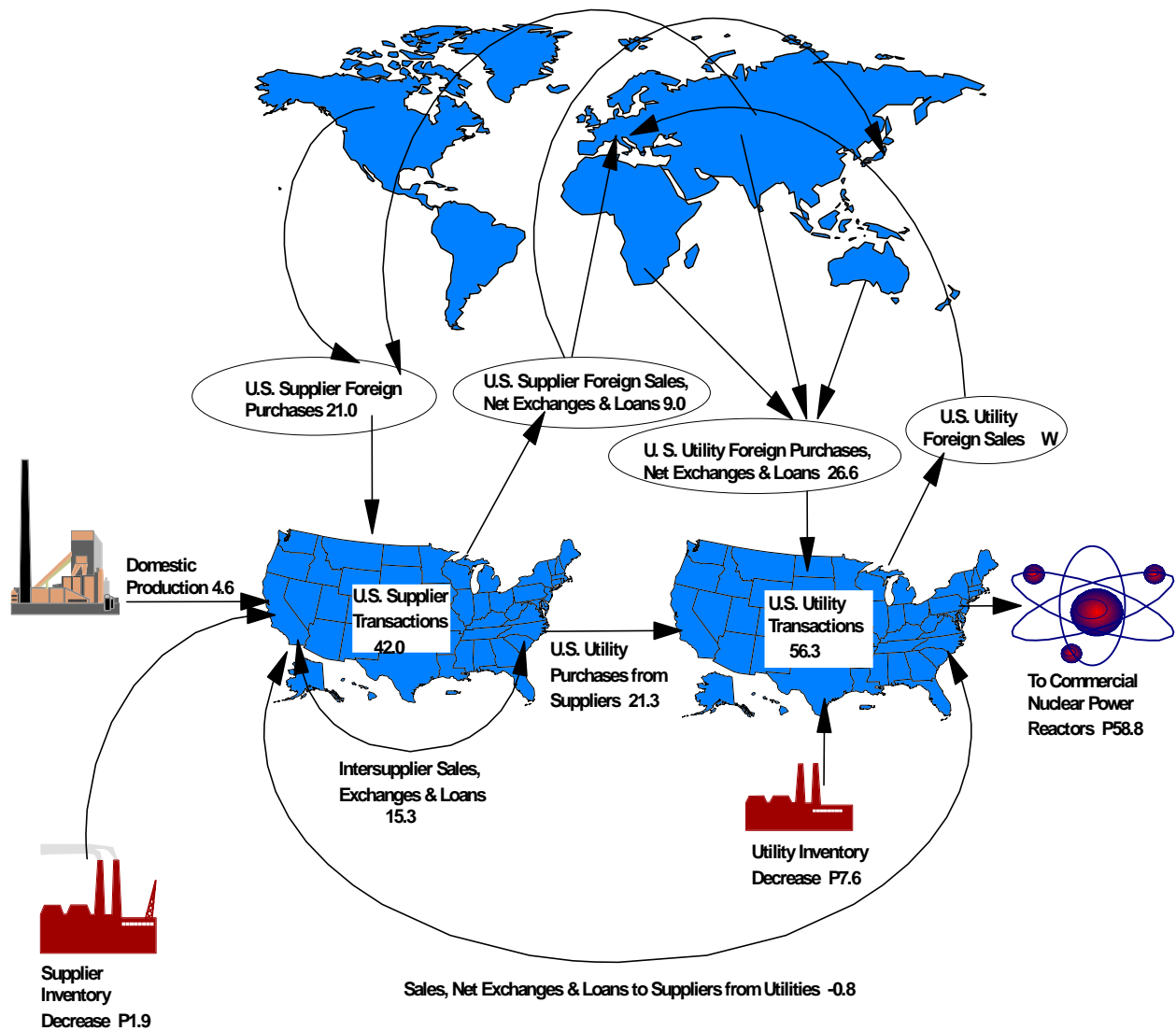
## **Foreign Sales of Uranium**

In 1999, uranium sold to foreign suppliers and foreign utilities totaled 8.5 million pounds  $U_3O_8$ , 44 percent less than in 1998. The average price was \$11.97 per pound, 1 percent less than in 1998 (Table 30 and Figure 20). Of the foreign sales, 55 percent was foreign-origin and 45 percent was U.S.-origin uranium. U.S. brokers and traders sold 4.7 million pounds at an average price of \$10.32 per pound in 1999.

## **Uranium Inventories**

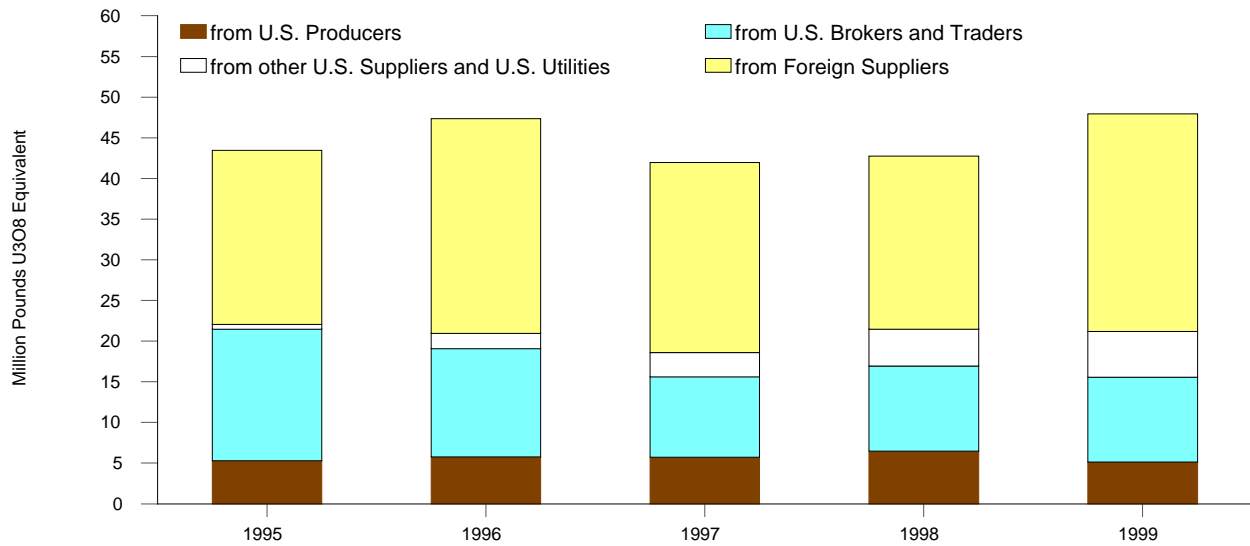
Total commercial inventories, as of December 31, 1999, were 127.0 million pounds  $U_3O_8$ , an decrease of 9.5 million pounds from end of 1998 (Table 31). The U.S. utility inventory level declined 7.6 million pounds, ending with 58.2 million pounds at the end of 1999 (Figure 21). Only the enriched uranium inventory declined from year-end 1998 to 1999 (Figure 22). Commercial natural and enriched  $UF_6$  inventories at the end of 1999 totaled 88.6 million pounds  $U_3O_8$  (Table 32). U.S. suppliers owned more (53.1 million pounds) than U.S. utilities (35.5 million pounds) (Table 33).

Figure 8. Uranium Marketing Activity During 1999

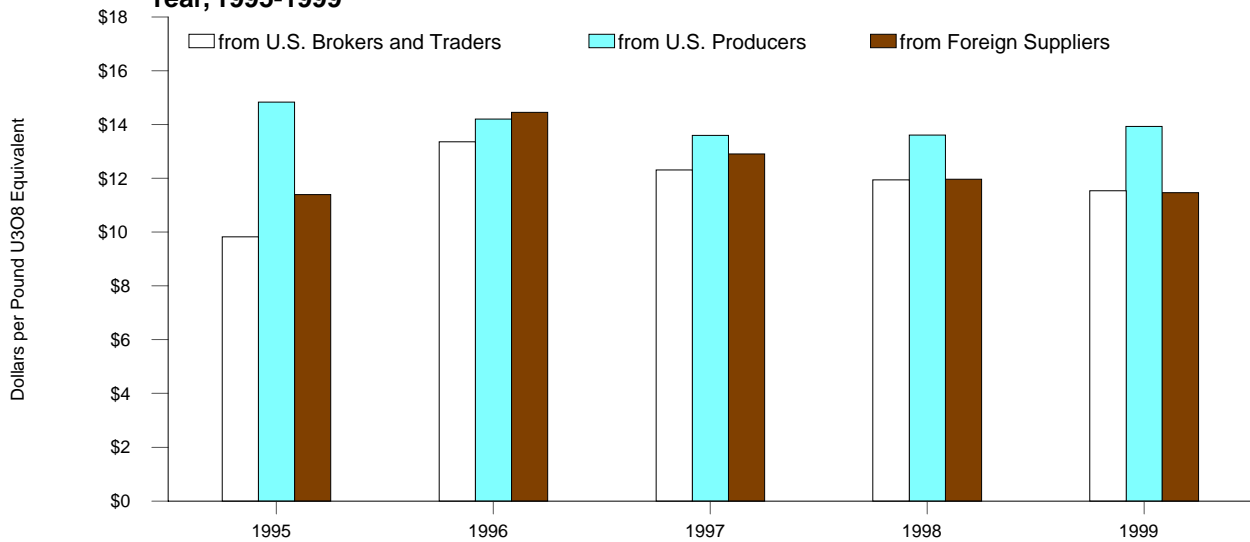


W=Data withheld to avoid disclosure. P=Preliminary data.  
 Note: Quantities are in million pounds U<sub>3</sub>O<sub>8</sub> equivalent.  
 Source: Prepared by the Energy Information Administration, Office of Coal Nuclear, Electric and Alternate Fuels, based on data reported on Form EIA-858 for 1999.

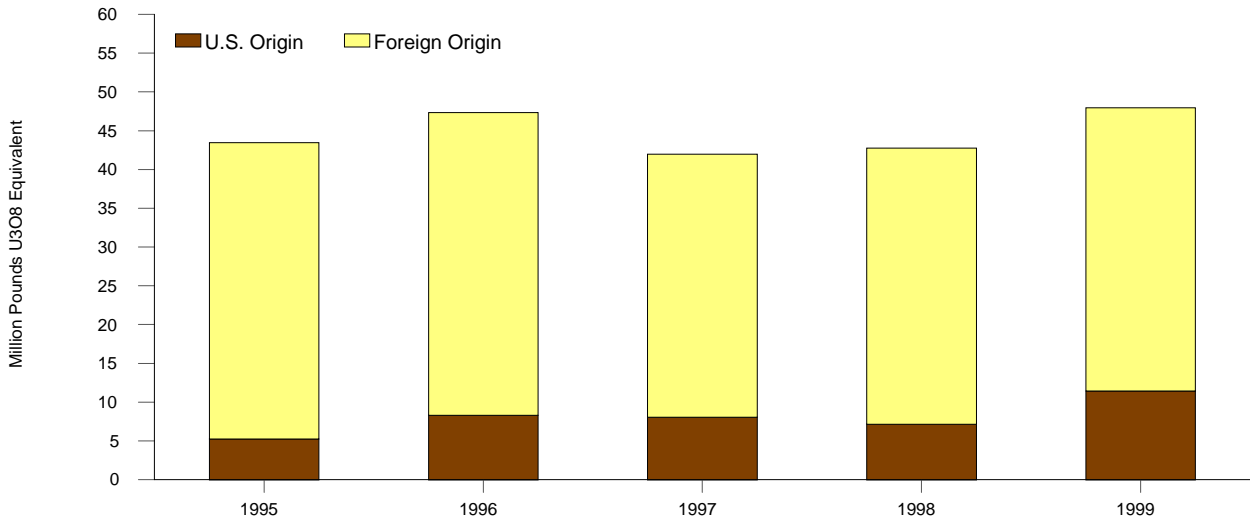
**Figure 9. Quantity of U.S. Utility Purchases of Uranium by Supplier and Delivery Year, 1995-1999**



**Figure 10. Weighted-Average Price of U.S. Utility Purchases of Uranium by Supplier and Delivery Year, 1995-1999**

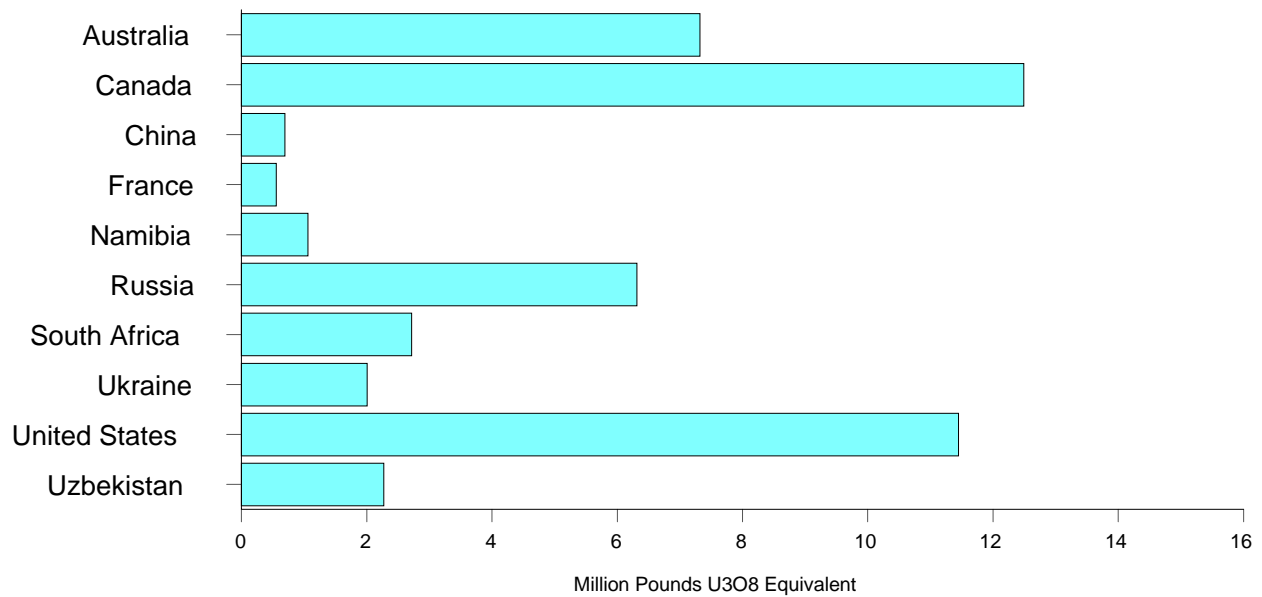


**Figure 11. Quantity of U.S. Utility Purchases of Uranium by Origin and Delivery Year, 1995-1999**

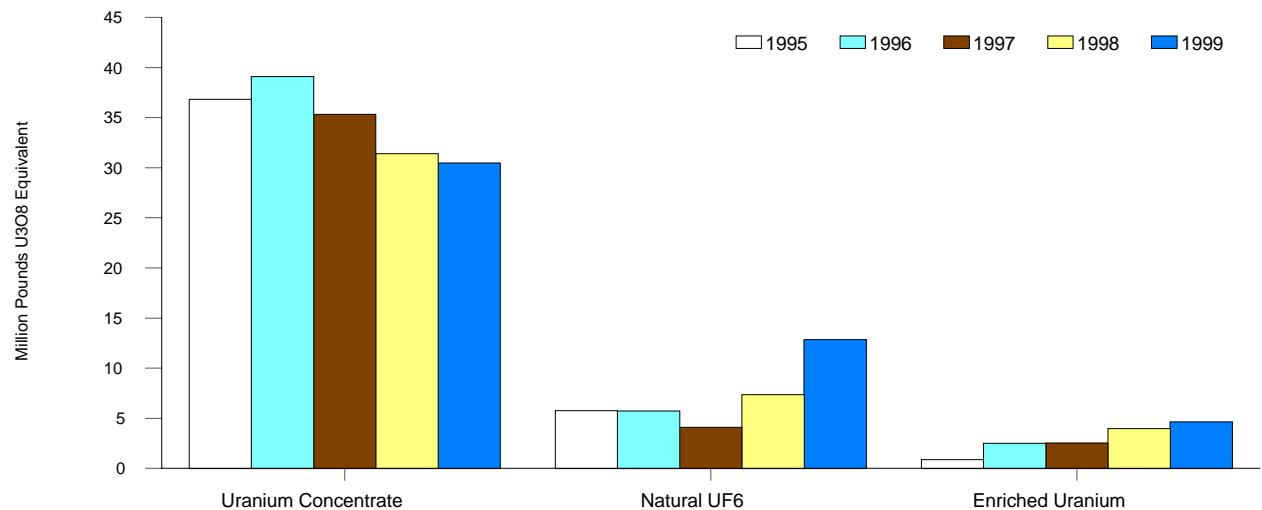


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

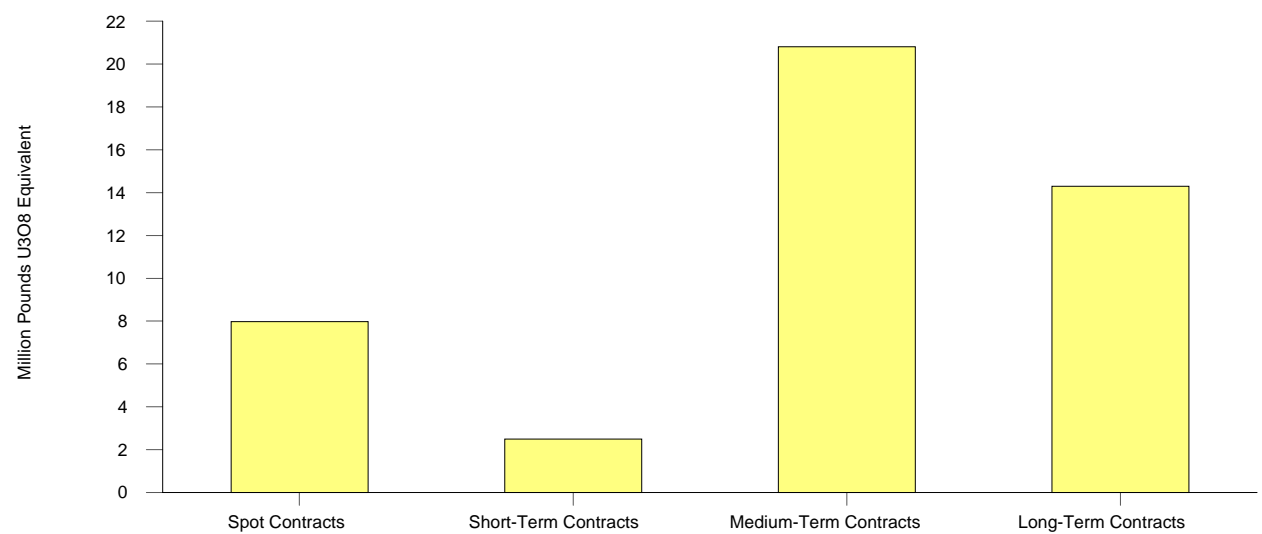
**Figure 12. U.S. Utility Purchases of Uranium by Selected Country Origin, 1999 Deliveries**



**Figure 13. U.S. Utility Purchases of Uranium by Material Type and Delivery Year, 1995-1999**

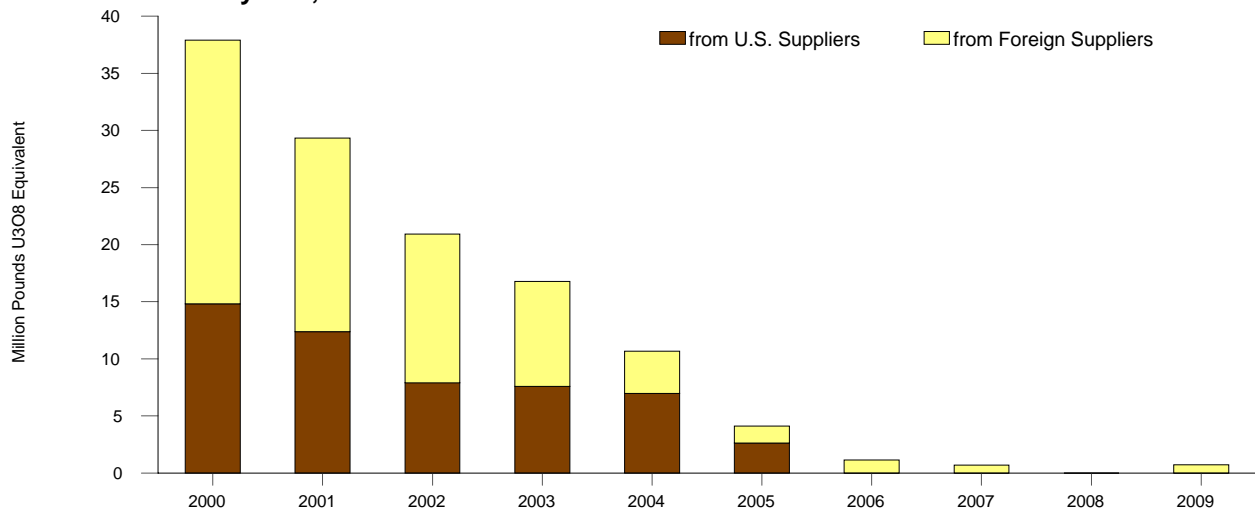


**Figure 14. U.S. Utility Purchases of Uranium by Contract Type, 1999 Deliveries**

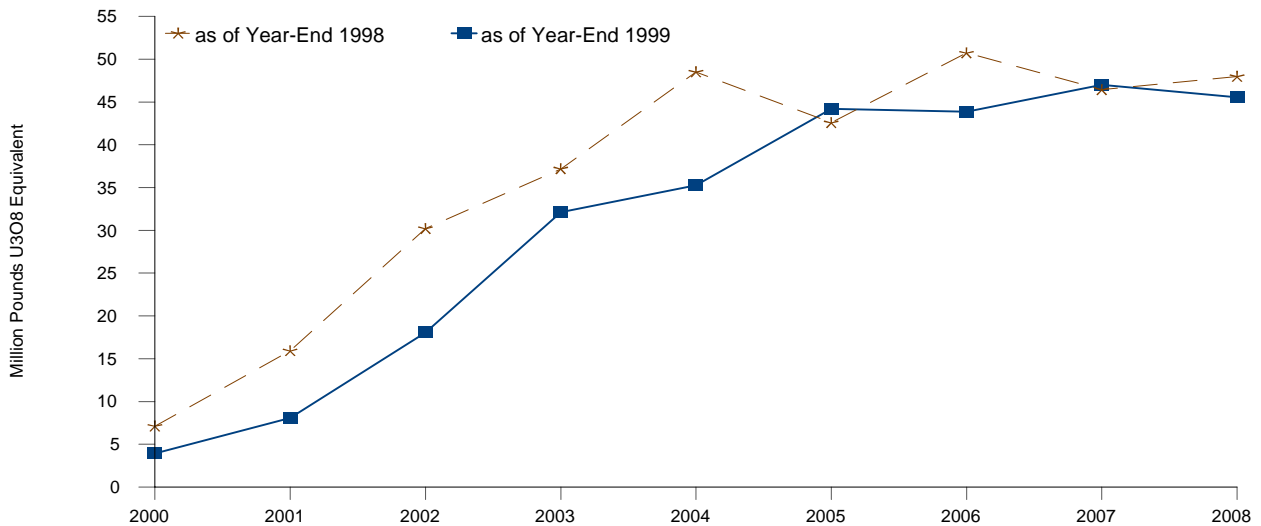


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

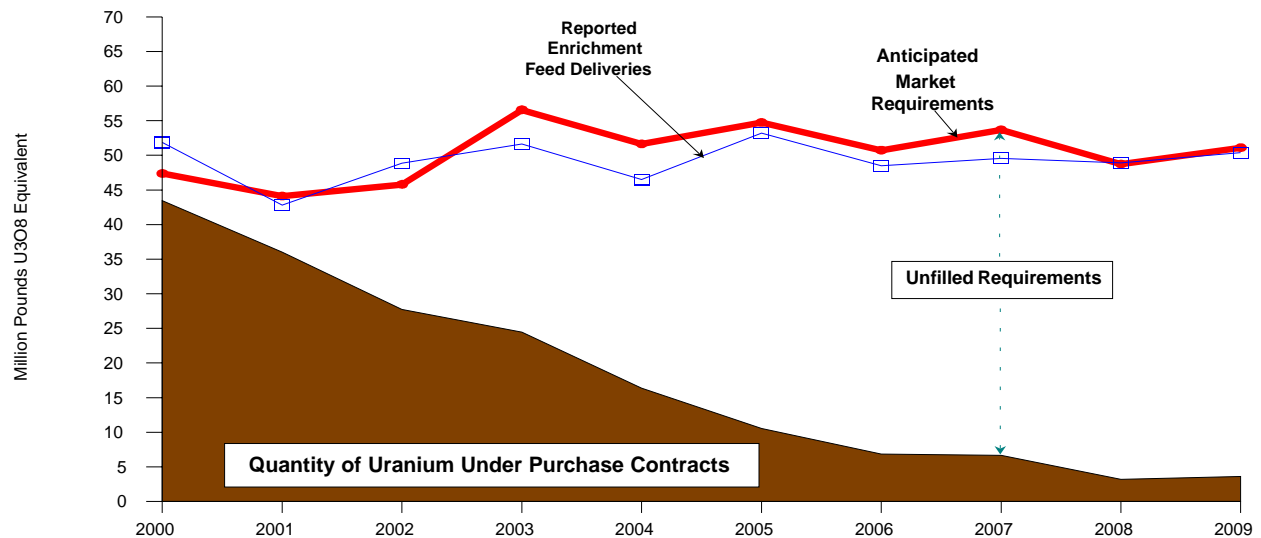
**Figure 15. U.S. Utility Contracted Purchases of Uranium by Supplier, Firm Deliveries, and Delivery Year, 2000-2009**



**Figure 16. U.S. Utility Annual Unfilled Uranium Requirements, 2000-2008**



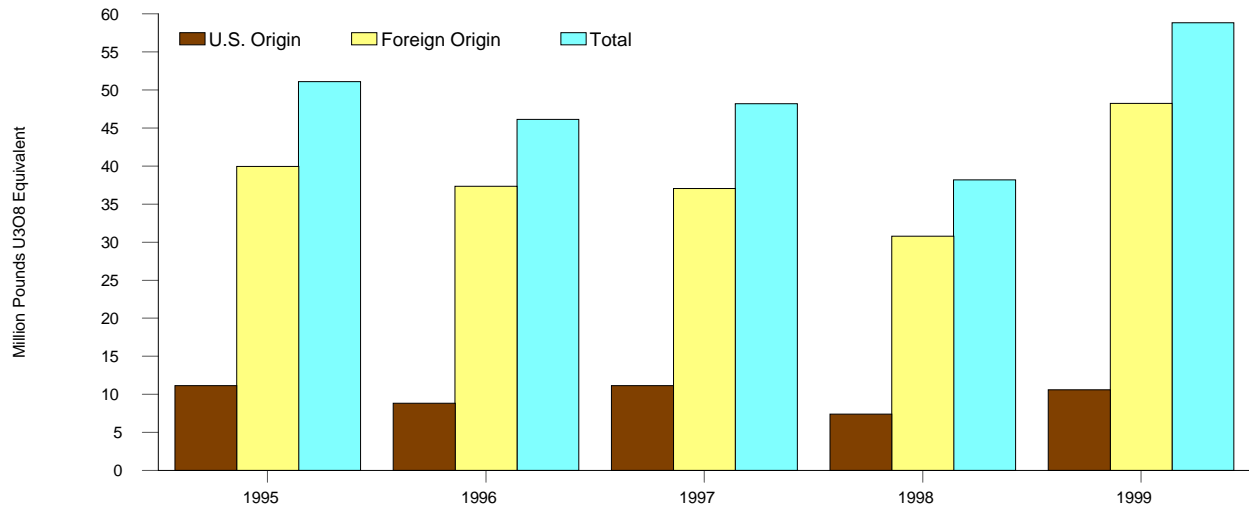
**Figure 17. Anticipated Uranium Market Requirements of U.S. Utilities, 2000-2009**



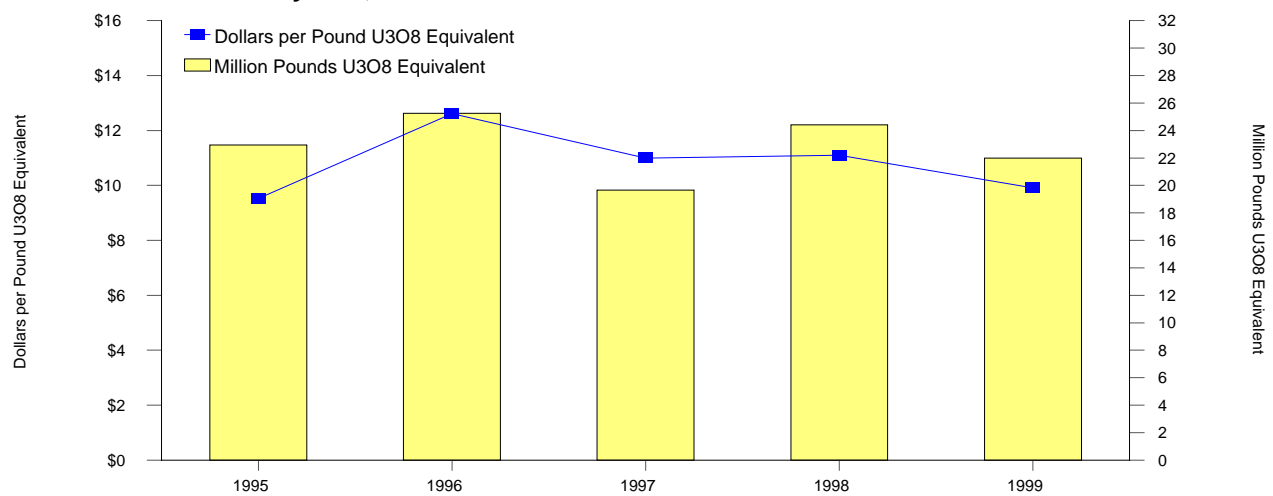
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).



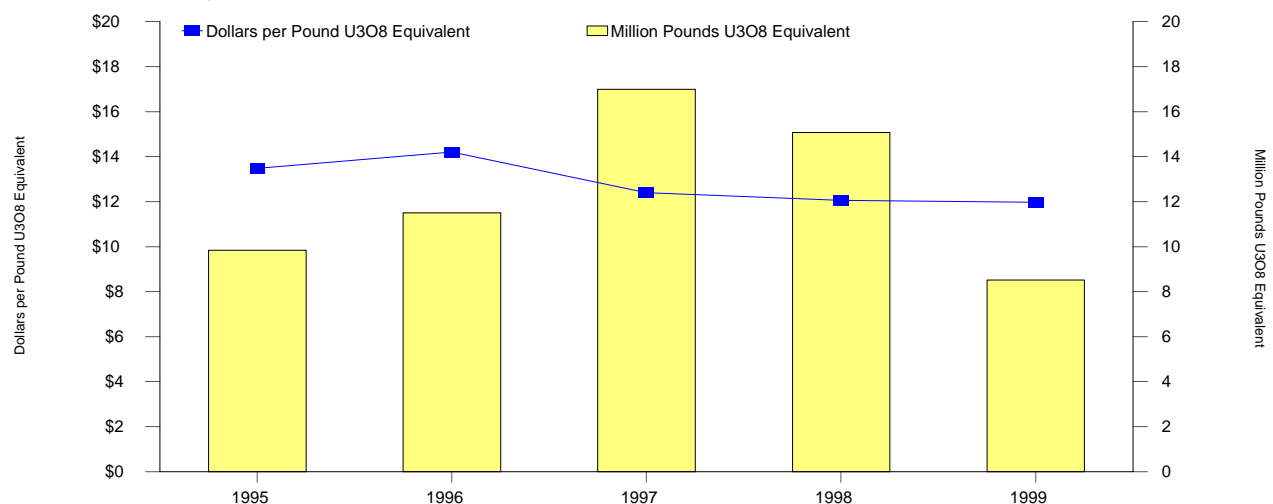
**Figure 18. Uranium in Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors by Year, 1995-1999**



**Figure 19. U. S. Broker and Trader Purchases of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1995-1999**

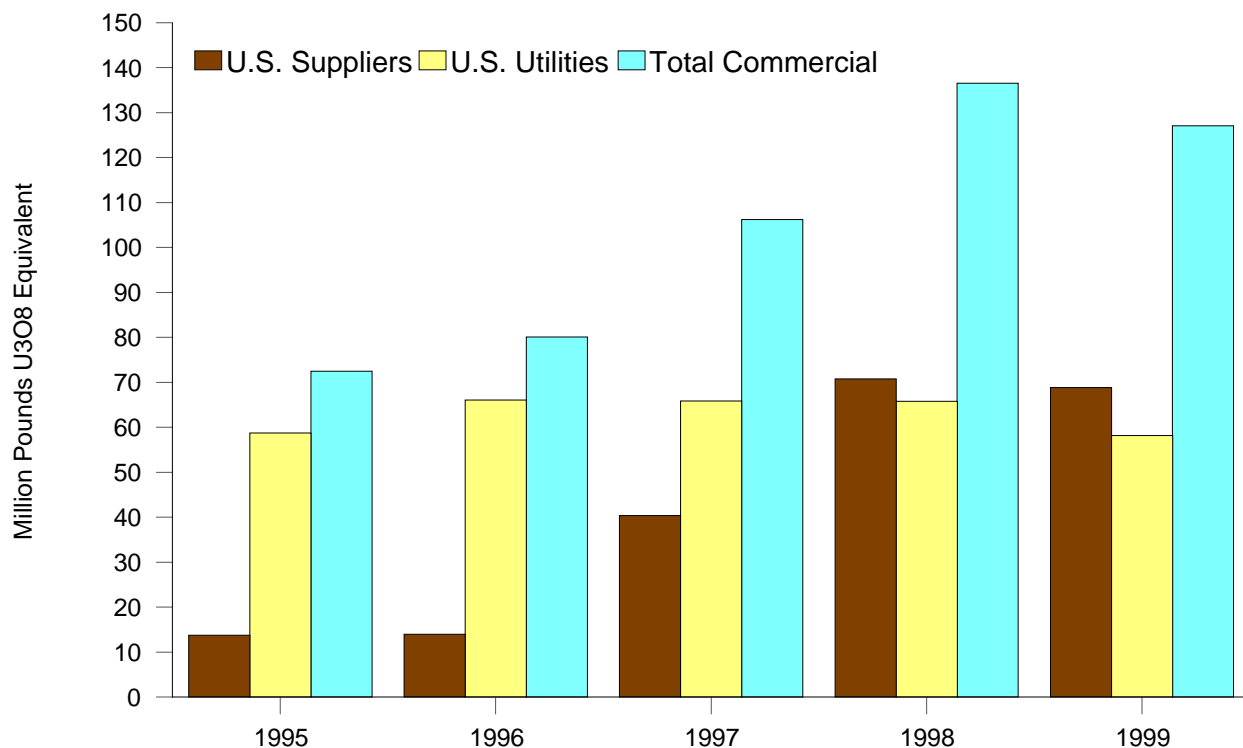


**Figure 20. Foreign Sales of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1995-1999**

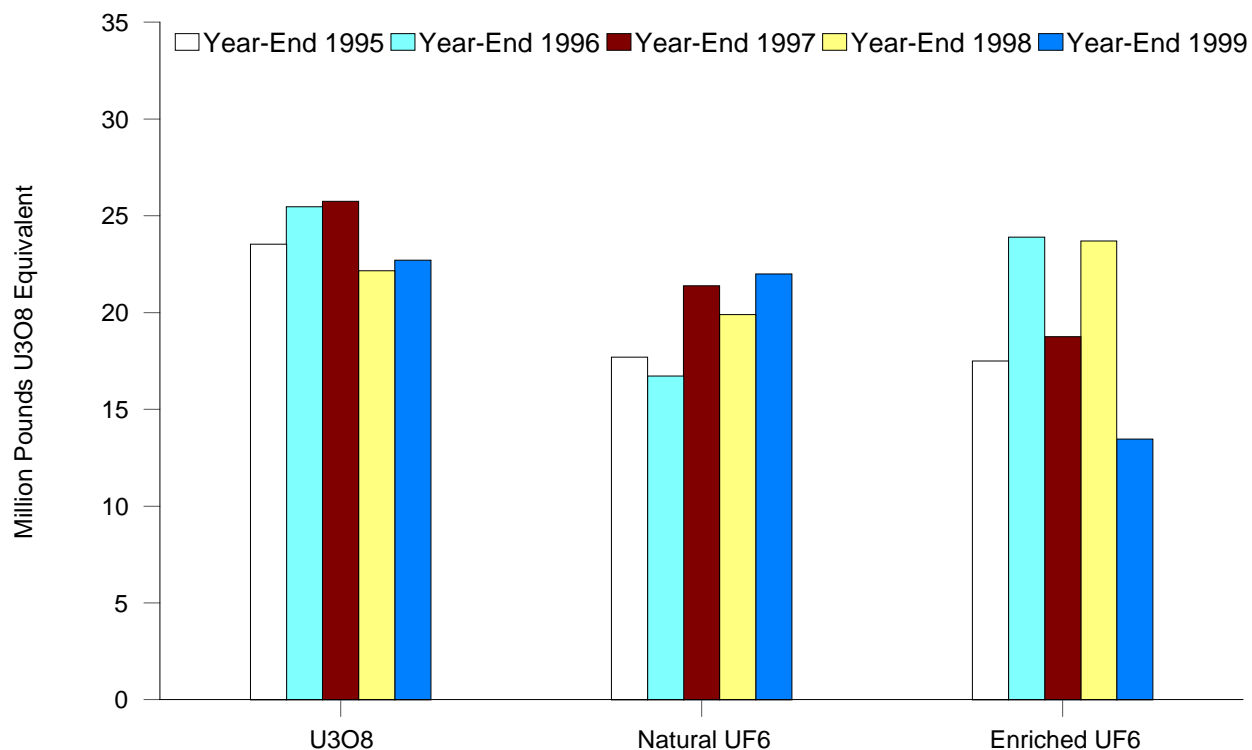


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Figure 21. Commercial Uranium Inventories at End of the Year, 1995-1999**



**Figure 22. U.S. Utility Uranium Inventories at End of the Year, 1995-1999**



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1999).

**Table 10. U.S. Utility Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1995-1999**

(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
Received by U.S. Utilities from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	5,289	5,766	5,732	6,488	5,161
Weighted-Average Price .....	14.84	14.20	13.60	13.61	13.93
Received by U.S. Utilities from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	16,202	13,322	9,890	10,467	10,395
Weighted-Average Price .....	9.83	13.36	12.31	11.95	11.54
Received by U.S. Utilities from other U.S. Utilities:					
Purchases .....	0	0	W	W	W
Weighted-Average Price .....	—	—	W	W	W
Received by U.S. Utilities from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	561	1,885	W	W	W
Weighted-Average Price .....	12.52	14.98	W	W	W
Received by U.S. Utilities from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	21,389	26,360	23,361	21,252	26,767
Weighted-Average Price .....	11.40	14.45	12.91	11.97	11.47
<b>Total Received by U.S. Utilities:</b>					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	<b>43,441</b>	<b>47,333</b>	<b>41,961</b>	<b>42,743</b>	<b>47,948</b>
Weighted-Average Price .....	<b>11.25</b>	<b>14.12</b>	<b>12.88</b>	<b>12.14</b>	<b>11.63</b>

— = 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" (1995-1999).

**Table 11. U.S. Utility Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1995-1999**

(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
Received by U.S. Utilities of U.S.-Origin Uranium:					
Purchases .....	5,246	8,299	8,072	7,181	11,448
Weighted-Average Price .....	14.20	14.62	13.36	13.37	12.24
Received by U.S. Utilities of Foreign-Origin Uranium:					
Purchases .....	38,195	39,034	33,889	35,562	36,500
Weighted-Average Price .....	10.84	14.02	12.78	11.90	11.47
<b>Total:</b>					
Purchases .....	<b>43,441</b>	<b>47,333</b>	<b>41,961</b>	<b>42,743</b>	<b>47,948</b>
Weighted-Average Price .....	<b>11.25</b>	<b>14.12</b>	<b>12.88</b>	<b>12.14</b>	<b>11.63</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table 12. U.S. Utility Purchases of Uranium by Origin Country and Delivery Year, 1997-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin Country	Actual Deliveries in 1997		Actual Deliveries in 1998		Actual Deliveries in 1999	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
<b>All Purchases:</b>						
Australia .....	4,351	13.11	5,768	11.43	7,319	10.93
Brazil .....	0	—	W	W	0	—
Canada .....	16,713	12.78	14,366	11.51	12,489	11.26
China .....	231	17.62	W	W	695	12.14
Czech Republic .....	0	—	0	—	W	W
France .....	0	—	0	—	554	9.97
Gabon .....	W	W	W	W	0	—
Germany .....	W	W	W	W	W	W
Kazakhstan .....	1,934	12.73	1,189	10.82	W	W
Kyrgyzstan .....	W	W	0	—	0	—
Mongolia .....	W	W	W	W	0	—
Namibia .....	774	14.63	780	14.36	1,061	12.99
Niger .....	0	—	856	15.53	W	W
Russia .....	3,594	12.63	5,959	13.27	6,313	12.87
South Africa .....	2,573	11.52	2,544	12.34	2,719	10.72
Tajikistan .....	0	—	W	W	0	—
Ukraine .....	W	W	W	W	2,008	8.98
United Kingdom .....	0	—	W	W	0	—
Uzbekistan .....	2,756	13.19	2,499	11.45	2,273	12.64
Yugoslavia .....	0	—	W	W	0	—
<b>Total Foreign .....</b>	<b>33,889</b>	<b>12.78</b>	<b>35,562</b>	<b>11.90</b>	<b>36,500</b>	<b>11.47</b>
United States .....	8,072	13.36	7,181	13.37	11,448	12.24
<b>Total Purchases .....</b>	<b>41,961</b>	<b>12.88</b>	<b>42,743</b>	<b>12.14</b>	<b>47,948</b>	<b>11.63</b>
<b>Domestic Purchases:</b>						
Australia .....	702	12.62	1,287	12.08	932	11.31
Brazil .....	0	—	W	W	0	—
Canada .....	4,025	12.36	3,017	11.61	1,350	11.07
China .....	W	W	W	W	W	W
France .....	0	—	0	—	W	W
Gabon .....	0	—	W	W	0	—
Germany .....	W	W	W	W	W	W
Kazakhstan .....	519	12.51	W	W	W	W
Namibia .....	W	W	W	W	W	W
Niger .....	0	—	W	W	W	W
Russia .....	2,438	12.74	2,572	12.71	1,726	14.08
South Africa .....	866	10.82	1,956	11.96	1,262	11.52
Tajikistan .....	0	—	W	W	0	—
Ukraine .....	0	—	W	W	W	W
United Kingdom .....	0	—	W	W	0	—
Uzbekistan .....	2,296	13.18	2,499	11.45	W	W
Yugoslavia .....	0	—	W	W	0	—
United States .....	8,072	13.36	7,181	13.37	11,448	12.24
<b>Total Domestic Purchases .....</b>	<b>19,416</b>	<b>12.87</b>	<b>21,641</b>	<b>12.31</b>	<b>21,371</b>	<b>11.88</b>
<b>Foreign Purchases:</b>						
Australia .....	3,649	13.21	4,481	11.30	6,387	10.88
Canada .....	12,688	12.91	11,349	11.49	11,139	11.28
China .....	W	W	0	—	W	W
Czech Republic .....	0	—	0	—	W	W
France .....	0	—	0	—	W	W
Gabon .....	W	W	0	—	0	—
Germany .....	0	—	0	—	W	W
Kazakhstan .....	1,415	12.81	W	W	0	—
Kyrgyzstan .....	W	W	0	—	0	—
Mongolia .....	W	W	W	W	0	—
Namibia .....	745	14.79	W	W	W	W
Niger .....	0	—	W	W	W	W
Russia .....	1,156	12.40	3,387	13.83	4,587	12.41
South Africa .....	1,707	11.88	588	13.59	1,457	10.02
Ukraine .....	W	W	0	—	W	W
Uzbekistan .....	460	13.25	0	—	W	W
<b>Total Foreign Purchases .....</b>	<b>22,545</b>	<b>12.89</b>	<b>21,102</b>	<b>11.96</b>	<b>26,577</b>	<b>11.45</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1999).

**Table 13. U.S. Utility Purchases of Uranium by Origin and Material Type, 1999 Deliveries**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Actual Deliveries	U <sub>3</sub> O <sub>8</sub>	Natural UF <sub>6</sub>	Enriched Uranium	Total
Received by U.S. Utilities of U.S.-Origin Uranium:				
Purchases .....	4,934	2,850	3,664	11,448
Weighted-Average Price .....	14.51	9.48	10.09	12.24
Received by U.S. Utilities of Foreign-Origin Uranium:				
Purchases .....	25,545	9,991	964	36,500
Weighted-Average Price .....	11.41	11.85	9.42	11.47
<b>Total:</b>				
Purchases .....	<b>30,479</b>	<b>12,841</b>	<b>4,628</b>	<b>47,948</b>
Weighted-Average Price .....	<b>11.91</b>	<b>11.33</b>	<b>9.83</b>	<b>11.63</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 14. Average Price and Quantity for Purchases of Uranium by U.S. Utilities by Pricing Mechanisms and Delivery Year, 1997-1999**  
(Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent; Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Pricing Mechanisms	Domestic Purchases <sup>a</sup>			Foreign Purchases <sup>b</sup>			Total Purchases		
	1997	1998	1999	1997	1998	1999	1997	1998	1999
<b>Contract-Specified Pricing</b>									
Weighted-Average Price .....	13.33	12.53	12.72	14.21	14.08	13.53	13.65	12.99	13.04
Quantity with Reported Price .....	13,091	17,951	13,677	7,349	7,581	9,163	20,440	25,532	22,840
<b>Market-Related Pricing</b>									
No Floor Type									
Weighted-Average Price .....	11.20	9.33	9.52	12.44	10.09	9.76	12.03	9.92	9.71
Quantity with Reported Price .....	1,878	1,048	961	3,814	3,452	3,197	5,692	4,500	4,158
Floor Type									
Weighted-Average Price .....	14.52	13.50	14.75	11.96	10.93	11.46	12.21	11.07	11.73
Quantity with Reported Price .....	707	325	440	6,582	5,529	4,840	7,289	5,854	5,280
Market Related Total									
Weighted-Average Price .....	12.11	10.31	11.16	12.14	10.61	10.78	12.13	10.57	10.84
Quantity with Reported Price .....	2,585	1,373	1,401	10,396	8,981	8,037	12,981	10,354	9,438
<b>Contract Specified and Market Related Total</b>									
Weighted-Average Price .....	13.13	12.37	12.57	13.00	12.20	12.25	13.06	12.29	12.40
Quantity with Reported Price .....	15,676	19,324	15,078	17,745	16,562	17,200	33,421	35,886	32,278
<b>Spot-Market Pricing</b>									
Weighted-Average Price .....	11.03	10.66	9.38	12.39	10.43	9.66	11.80	10.49	9.58
Quantity with Reported Price .....	2,497	813	2,853	3,249	2,404	7,644	5,746	3,217	10,497
<b>Other Pricing<sup>c</sup></b>									
Weighted-Average Price .....	14.09	12.21	9.40	12.75	11.78	11.42	13.07	11.85	10.47
Quantity with Reported Price .....	481	151	1,313	1,551	854	1,489	2,032	1,005	2,802
<b>All Pricing Mechanisms</b>									
Weighted-Average Price .....	<b>12.87</b>	<b>12.31</b>	<b>11.88</b>	<b>12.89</b>	<b>11.96</b>	<b>11.45</b>	<b>12.88</b>	<b>12.14</b>	<b>11.63</b>
Quantity with Reported Price .....	<b>18,654</b>	<b>20,288</b>	<b>19,244</b>	<b>22,545</b>	<b>19,820</b>	<b>26,333</b>	<b>41,199</b>	<b>40,108</b>	<b>45,577</b>

<sup>a</sup>Uranium of both U.S. and foreign origin.

<sup>b</sup>Uranium of foreign origin only.

<sup>c</sup>Category used to report pricing mechanisms that are different from the other categories.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1999).

**Table 15. Price Distributions of Uranium Purchases by U.S. Utilities by Delivery Year, 1997-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Distributions	Actual Deliveries in 1997		Actual Deliveries in 1998		Actual Deliveries in 1999	
	Quantity with Reported Price	Weighted-Average Price	Quantity with Reported Price	Weighted-Average Price	Quantity with Reported Price	Weighted-Average Price
<b>Octile<sup>a</sup>:</b>						
First .....	5,150	9.85	5,014	8.99	5,697	8.60
Second .....	5,150	10.53	5,014	10.09	5,697	9.23
Third .....	5,150	11.37	5,014	10.52	5,697	9.82
Fourth .....	5,150	12.29	5,014	10.78	5,697	10.18
Fifth .....	5,150	12.89	5,014	11.81	5,697	11.12
Sixth .....	5,150	13.81	5,014	12.94	5,697	12.70
Seventh .....	5,150	15.04	5,014	14.46	5,697	14.08
Eighth .....	5,150	17.29	5,014	17.51	5,697	17.32
<b>Total .....</b>	<b>41,199</b>	<b>12.88</b>	<b>40,108</b>	<b>12.14</b>	<b>45,577</b>	<b>11.63</b>
<b>Quartile<sup>b</sup>:</b>						
First .....	7,442	11.18	7,609	10.16	8,575	9.76
Second .....	16,808	12.27	7,791	11.58	19,535	11.05
Third .....	10,035	13.29	15,540	12.53	10,611	12.26
Fourth .....	6,914	15.63	9,168	13.58	6,856	14.68
<b>Total .....</b>	<b>41,199</b>	<b>12.88</b>	<b>40,108</b>	<b>12.14</b>	<b>45,577</b>	<b>11.63</b>

<sup>a</sup>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.

<sup>b</sup>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" (1997-1999).

**Table 16. U.S. Utility Uranium Purchases by Contract Type and Material Type, 1999 Deliveries**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> 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 <sub>3</sub> O <sub>8</sub> .....	3,502	9.60	W	W	14,859	12.50	W	W	30,235	11.91
Natural UF <sub>6</sub> .....	3,627	9.46	W	W	4,779	13.39	W	W	12,819	11.33
Enriched Uranium .....	851	9.51	W	W	1,169	10.16	W	W	2,523	9.83
<b>Total .....</b>	<b>7,980</b>	<b>9.52</b>	<b>2,496</b>	<b>9.17</b>	<b>20,807</b>	<b>12.58</b>	<b>14,294</b>	<b>11.87</b>	<b>45,577</b>	<b>11.63</b>

W=Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 17. Contracts Signed by U.S. Utilities in 1999 by Contract Type with 1999 Deliveries**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Purchase Contract Type	Quantity of Actual Deliveries Received in 1999	Weighted-Average Price	Number of Purchase Contracts
Spot .....	6,911	9.51	29
Short-term .....	W	W	3
Medium-term .....	1,102	9.47	6
Long-term .....	W	W	2
<b>Total .....</b>	<b>10,796</b>	<b>9.30</b>	<b>40</b>

W=Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 18. U.S. Utility Contracted Purchases of Uranium, Signed in 1999, by Delivery Year, 2000-2009**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Delivery	Firm Deliveries	Optional Deliveries	Total Deliveries
2000 .....	4,162	545	4,707
2001 .....	4,881	626	5,507
2002 .....	3,645	642	4,287
2003 .....	4,422	582	5,004
2004 .....	5,856	430	6,286
2005 .....	2,391	1,253	3,644
2006 .....	710	3,373	4,083
2007 .....	703	4,448	5,151
2008 .....	0	2,476	2,476
2009 .....	710	2,200	2,910
<b>Total .....</b>	<b>27,480</b>	<b>16,575</b>	<b>44,055</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 19. U.S. Utility Contracted Purchases of Uranium from Suppliers, in Effect at the End of 1999, by Delivery Year, 2000-2009**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> 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
2000 .....	14,810	1,195	23,089	4,342	37,899	5,537
2001 .....	12,374	2,344	16,967	4,319	29,341	6,663
2002 .....	7,910	1,742	13,029	5,053	20,939	6,795
2003 .....	7,584	3,236	9,203	4,418	16,787	7,654
2004 .....	6,962	2,062	3,715	3,620	10,677	5,682
2005 .....	2,625	1,933	1,485	4,491	4,110	6,424
2006 .....	0	3,825	1,131	1,914	1,131	5,739
2007 .....	0	3,300	703	2,663	703	5,963
2008 .....	0	1,628	0	1,563	0	3,191
2009 .....	0	2,200	710	715	710	2,915
<b>Total .....</b>	<b>52,265</b>	<b>23,465</b>	<b>70,032</b>	<b>33,098</b>	<b>122,297</b>	<b>56,563</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 20. Unfilled Uranium Requirements of U.S. Utilities, 2000-2009**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year	As of December 31, 1998		As of December 31, 1999	
	Annual	Cumulative	Annual	Cumulative
2000 .....	7,111	7,111	3,927	3,927
2001 .....	15,922	23,033	8,081	12,008
2002 .....	30,212	53,245	18,054	30,062
2003 .....	37,194	90,439	32,116	62,178
2004 .....	48,508	138,947	35,267	97,445
2005 .....	42,577	181,524	44,196	141,641
2006 .....	50,734	232,258	43,852	185,493
2007 .....	46,441	278,699	46,998	232,491
2008 .....	47,986	326,685	45,539	278,030
2009 .....	NR	—	47,464	325,494

NR=Not Reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998-1999).



**Table 21. Anticipated Uranium Market Requirements of U.S. Utilities, 2000-2009, as of December 31, 1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year	Quantity of Uranium Under Purchase Contracts	Unfilled Requirements	Anticipated Market Requirements	Enrichment Feed Deliveries
2000 .....	43,436	3,927	47,363	51,848
2001 .....	36,004	8,081	44,085	42,786
2002 .....	27,734	18,054	45,788	48,842
2003 .....	24,441	32,116	56,557	51,656
2004 .....	16,359	35,267	51,626	46,483
2005 .....	10,534	44,196	54,730	53,196
2006 .....	6,870	43,852	50,722	48,495
2007 .....	6,666	46,998	53,664	49,568
2008 .....	3,191	45,539	48,730	48,904
2009 .....	3,625	47,464	51,089	50,370
<b>Total .....</b>	<b>178,860</b>	<b>325,494</b>	<b>504,354</b>	<b>492,148</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table 22. U.S. Utility Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1997-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Enrichment Plant Location	Actual Deliveries in 1997			Actual Deliveries in 1998			Actual Deliveries in 1999		
	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	W	W
France .....	W	W	2,998	W	W	3,091	278	4,994	5,272
Germany .....	0	W	W	W	W	2,497	0	1,385	1,385
Netherlands .....	0	0	0	W	W	1,457	0	W	W
Russia .....	W	W	2,886	0	1,442	1,442	0	1,136	1,136
United Kingdom .....	W	W	W	W	W	2,300	179	3,362	3,541
<b>Foreign Total .....</b>	<b>515</b>	<b>7,496</b>	<b>8,011</b>	<b>1,167</b>	<b>9,620</b>	<b>10,787</b>	<b>457</b>	<b>12,083</b>	<b>12,540</b>
United States .....	6,195	26,096	32,291	4,668	25,175	29,843	6,264	25,105	31,369
<b>Total .....</b>	<b>6,710</b>	<b>33,592</b>	<b>40,302</b>	<b>5,835</b>	<b>34,795</b>	<b>40,630</b>	<b>6,721</b>	<b>37,188</b>	<b>43,909</b>

W=Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1999).

**Table 23. U.S. Utility Deliveries of Uranium Feed for Enrichment by Origin Country and Delivery Year, 1997-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin Country of Feed	Actual Deliveries in 1997			Actual Deliveries in 1998			Actual Deliveries in 1999		
	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 .....	3,732	654	4,386	4,135	608	4,743	3,017	1,888	4,905
Brazil .....	0	0	0	0	0	0	W	W	W
Bulgaria .....	0	0	0	0	0	0	0	W	W
Canada .....	12,366	1,988	14,354	12,233	3,520	15,753	10,643	2,816	13,459
China .....	203	0	203	W	W	146	W	W	521
Czech Republic .....	0	0	0	0	0	0	0	W	W
France .....	0	0	0	0	0	0	W	W	555
Gabon .....	0	W	W	0	0	0	0	0	0
Germany .....	W	0	W	W	0	W	W	W	492
Kazakhstan .....	W	W	993	1,587	0	1,587	W	W	567
Kyrgyzstan .....	W	0	W	0	0	0	0	0	0
Mongolia .....	286	0	286	484	0	484	0	0	0
Namibia .....	415	0	415	W	W	911	W	W	552
Niger .....	0	W	W	W	W	665	W	W	673
Russia .....	4,305	952	5,257	3,412	1,056	4,468	6,128	782	6,910
South Africa .....	1,837	479	2,316	1,465	104	1,569	2,450	370	2,820
Tajikistan .....	W	W	W	W	0	W	W	0	W
Ukraine .....	0	0	0	W	W	2,665	0	3,169	3,169
Uzbekistan .....	1,785	2,256	4,041	376	1,303	1,679	1,388	919	2,307
Yugoslavia .....	0	0	0	0	0	0	W	0	W
<b>Foreign Total .....</b>	<b>26,096</b>	<b>7,496</b>	<b>33,592</b>	<b>25,175</b>	<b>9,620</b>	<b>34,795</b>	<b>25,105</b>	<b>12,083</b>	<b>37,188</b>
United States .....	6,195	515	6,710	4,668	1,167	5,835	6,264	457	6,721
<b>Total .....</b>	<b>32,291</b>	<b>8,011</b>	<b>40,302</b>	<b>29,843</b>	<b>10,787</b>	<b>40,630</b>	<b>31,369</b>	<b>12,540</b>	<b>43,909</b>

W=Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-1999).

**Table 24. Shipments of Uranium by U.S. Utilities to Domestic and Foreign Enrichment Suppliers, 2000-2009**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Shipment	Amount to be Shipped		Change from 1998 to 1999	
	As of December 31, 1998	As of December 31, 1999	Annual	Cumulative
2000 .....	52,976	51,848	-1,128	-1,128
2001 .....	40,764	42,786	2,022	894
2002 .....	54,467	48,842	-5,625	-4,731
2003 .....	45,843	51,656	5,813	1,082
2004 .....	49,276	46,483	-2,793	-1,711
2005 .....	41,760	53,196	11,436	9,725
2006 .....	48,562	48,495	-67	9,658
2007 .....	42,840	49,568	6,728	16,386
2008 .....	45,662	48,904	3,242	19,628
2009 .....	NR	50,370	—	—

NR=Not reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998-1999).

**Table 25. U.S. Utility Purchases of Enrichment Services by Origin Country and Delivery Year, 1995-1999**  
(Thousand Separative Work Units (SWU))

Actual Deliveries	1995	1996	1997	1998	1999
<b>Country where Enrichment Service was performed:</b>					
China .....	0	W	W	W	145
France .....	867	1,507	734	696	822
Germany .....	W	W	W	W	302
Netherlands .....	W	167	0	323	245
Russia .....	1,108	1,073	1,765	2,364	3,424
United Kingdom .....	460	278	119	376	487
<b>Foreign Total .....</b>	<b>2,800</b>	<b>3,154</b>	<b>2,865</b>	<b>4,401</b>	<b>5,425</b>
United States .....	6,741	8,004	6,013	5,677	4,602
<b>Total .....</b>	<b>9,540</b>	<b>11,159</b>	<b>8,878</b>	<b>10,079</b>	<b>10,028</b>

W=Data withheld to avoid disclosure.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table 26. U.S. Utility Purchases of Enrichment Services by Contract Type in Delivery Year, 1999**  
(Thousand Separative Work Units (SWU))

Enrichment Service Contract Type	U.S. Enrichment	Foreign Enrichment	Total
Spot .....	210	379	588
Short-term .....	W	W	W
Medium-term .....	W	W	W
Long-term .....	3,983	4,240	8,223
<b>Total .....</b>	<b>4,602</b>	<b>5,425</b>	<b>10,028</b>

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" (1999).

**Table 27. Uranium in Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors by Year, 1995-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin of Uranium	1995	1996	1997	1998	1999 <sup>P</sup>
Domestic-Origin Uranium .....	11,146	8,820	11,135	7,388	10,583
Foreign-Origin Uranium .....	39,972	37,330	37,069	30,811	48,244
<b>Total .....</b>	<b>51,118</b>	<b>46,151</b>	<b>48,204</b>	<b>38,199</b>	<b>58,827</b>

P = Preliminary data. Final 1998 fuel assembly data reported in the 1999 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" (1996-1999).

**Table 28. Foreign Purchases of Uranium by U.S. Suppliers and U.S. Utilities by Delivery Year, 1995-1999**

(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
<b>U.S. Suppliers:</b>					
Foreign Purchases .....	20,162	21,746	20,425	22,605	20,998
Weighted-Average Price .....	8.96	11.78	10.61	10.50	9.42
<b>U.S. Utilities:</b>					
Foreign Purchases .....	21,139	23,676	22,545	21,102	26,577
Weighted-Average Price .....	11.39	14.41	12.89	11.96	11.45
<b>U.S. Suppliers and U.S. Utilities:</b>					
Foreign Purchases .....	41,301	45,422	42,970	43,707	47,575
Weighted-Average Price .....	10.20	13.15	11.81	11.19	10.55

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table 29. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1995-1999**

(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
<b>Received U.S.-Origin Uranium:</b>					
Purchases .....	3,356	4,725	3,162	2,732	3,301
Weighted-Average Price .....	11.51	13.90	12.78	13.50	12.85
<b>Received Foreign-Origin Uranium:</b>					
Purchases .....	19,593	20,529	16,501	21,686	18,679
Weighted-Average Price .....	9.20	12.32	10.66	10.80	9.39
<b>Total Received by U.S. Brokers and Traders:</b>					
Purchases .....	<b>22,949</b>	<b>25,254</b>	<b>19,663</b>	<b>24,418</b>	<b>21,980</b>
Weighted-Average Price .....	<b>9.53</b>	<b>12.61</b>	<b>11.00</b>	<b>11.10</b>	<b>9.91</b>
<b>Received from Foreign Suppliers:</b>					
Purchases .....	18,311	17,816	15,703	21,651	19,239
Weighted-Average Price .....	9.02	11.78	10.71	10.77	9.60

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table 30. Foreign Sales of Uranium from U.S. Suppliers and U.S. Utilities by Origin and Delivery Year, 1995-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Actual Deliveries to Foreign Suppliers and Foreign Utilities	1995	1996	1997	1998	1999
<b>U.S.-Origin Uranium:</b>					
Foreign Sales .....	4,713	4,962	6,472	3,904	3,795
Weighted-Average Price .....	17.34	17.22	14.81	15.75	13.60
<b>Foreign-Origin Uranium:</b>					
Foreign Sales .....	5,123	6,542	10,517	11,170	4,715
Weighted-Average Price .....	9.94	11.91	10.90	10.76	10.92
<b>Total Sent:</b>					
Foreign Sales .....	<b>9,836</b>	<b>11,504</b>	<b>16,989</b>	<b>15,074</b>	<b>8,510</b>
Weighted-Average Price .....	<b>13.48</b>	<b>14.20</b>	<b>12.39</b>	<b>12.05</b>	<b>11.97</b>
<b>From U.S. Producers, U.S. Utilities, and other U.S. Suppliers:</b>					
Foreign Sales .....	4,342	5,539	8,584	4,565	3,761
Weighted-Average Price .....	18.11	15.69	13.05	14.39	14.58
<b>From U.S. Brokers and Traders:</b>					
Foreign Sales .....	5,494	5,965	8,405	10,509	4,749
Weighted-Average Price .....	9.83	12.82	11.72	11.04	10.32

Note: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators.  
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table 31. Inventories of Natural and Enriched Uranium as of End of Year, 1995-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1995	1996	1997	1998	1999 <sup>P</sup>
<b>U.S. Utility Inventories</b> .....	<b>58,730</b>	<b>66,089</b>	<b>65,877</b>	<b>65,758</b>	<b>58,167</b>
Natural Uranium .....	41,227	42,194	47,123	42,051	44,708
Enriched Uranium <sup>a</sup> .....	17,504	23,895	18,753	23,708	13,459
<b>U.S. Supplier Inventories<sup>b</sup></b> .....	<b>13,740</b>	<b>13,949</b>	<b>40,360</b>	<b>70,732</b>	<b>68,848</b>
Natural Uranium .....	13,218	12,969	10,276	35,030	29,468
Enriched Uranium <sup>a</sup> .....	521	980	30,085	35,702	39,380
<b>Total Commercial Inventories</b> .....	<b>72,470</b>	<b>80,038</b>	<b>106,237</b>	<b>136,491</b>	<b>127,015</b>
<b>DOE-Owned and USEC-Held Inventories<sup>c</sup></b> ...	<b>110,797</b>	<b>108,491</b>	<b>53,238</b>	<b>24,454</b>	<b>53,054</b>
Natural Uranium .....	81,987	83,211	53,238	24,454	53,054
Enriched Uranium .....	28,810	25,280	0	0	0

<sup>a</sup>Includes amounts reported as inventories of enriched UF<sub>6</sub> at enrichment suppliers.

<sup>b</sup>Includes inventories owned by the 1998 privatized USEC, Inc. (United States Enrichment Corporation) for year-end 1997, 1998 and 1999 only.

<sup>c</sup>DOE-owned inventories reported by the Office of Nuclear Energy, Science and Technology; U.S. Department of Energy. For year-end 1995 and 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 in the 1999 survey for year-end 1998 and 1999, and are included with the commercial inventories of U.S. suppliers.

P=Preliminary data. Final 1998 inventory data reported in the 1999 survey.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1999).

**Table 32. Commercial Uranium Inventories by Type and Location at End of Year, 1997-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Material Type and Location	U.S. Utilities			U.S. Suppliers			U.S. Utilities and U.S. Suppliers		
	1997	1998	1999 <sup>P</sup>	1997	1998	1999 <sup>P</sup>	1997	1998	1999 <sup>P</sup>
<b>U<sub>3</sub>O<sub>8</sub> on hand, in off-site storage, or at conversion plants</b> .....	<b>25,746</b>	<b>22,151</b>	<b>22,710</b>	<b>9,402</b>	<b>7,466</b>	<b>15,728</b>	<b>35,148</b>	<b>29,617</b>	<b>38,439</b>
<b>Natural UF<sub>6</sub></b> .....	<b>21,377</b>	<b>19,900</b>	<b>21,998</b>	<b>874</b>	<b>27,564</b>	<b>13,740</b>	<b>22,251</b>	<b>47,463</b>	<b>35,738</b>
on hand, in private off-site storage, or at conversion plants .....	W	4,901	W	W	1,226	W	3,031	6,127	7,483
delivered to enrichment plants under usage agreements .....	W	W	W	W	W	W	10,217	6,137	6,420
at enrichment suppliers .....	8,554	W	9,237	449	W	12,598	9,003	35,199	21,835
<b>Enriched UF<sub>6</sub></b> .....	<b>18,753</b>	<b>23,708</b>	<b>13,459</b>	<b>30,085</b>	<b>35,702</b>	<b>39,380</b>	<b>48,838</b>	<b>59,410</b>	<b>52,839</b>
at enrichment suppliers .....	W	0	W	W	W	W	W	W	W
on hand, and/or in private storage .....	W	7,722	W	W	W	W	W	W	W
as fabricated fuel not inserted into a reactor, on hand, and/or in private storage .....	7,741	15,985	6,650	0	0	0	7,741	15,985	6,650
<b>Total Commercial Inventories</b> .....	<b>65,877</b>	<b>65,758</b>	<b>58,167</b>	<b>40,360</b>	<b>70,732</b>	<b>68,848</b>	<b>106,237</b>	<b>136,491</b>	<b>127,015</b>

P = Preliminary data. Final 1998 inventory data reported in the 1999 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" (1998-1999).

**Table 33. Commercial Uranium Inventories by Type and Owner at End of Year, 1997-1999**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

U.S. Firms	U <sub>3</sub> O <sub>8</sub>			Natural and Enriched UF <sub>6</sub>			Total		
	1997	1998	1999 <sup>P</sup>	1997	1998	1999 <sup>P</sup>	1997	1998	1999 <sup>P</sup>
Brokers and Traders .....	3,085	1,136	5,640	678	1,110	1,485	3,762	2,246	7,125
Converter, Fabricators, Enricher .....	0	0	W	30,281	62,156	W	30,281	62,156	55,219
Producers .....	6,317	6,330	W	0	0	W	6,317	6,330	6,503
Utilities .....	25,746	22,151	22,710	40,130	43,607	35,457	65,877	65,758	58,167
<b>Total Commercial Inventories</b> .....	<b>35,148</b>	<b>29,617</b>	<b>38,439</b>	<b>71,089</b>	<b>106,873</b>	<b>88,575</b>	<b>106,237</b>	<b>136,491</b>	<b>127,015</b>

P = Preliminary data. Final 1998 inventory data reported in the 1999 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" (1998-1999).

## **Appendix A**

# **Survey Methodology**

## Survey Methodology

### Survey Design

The 16th comprehensive survey of the U.S. uranium industry was conducted in 2000 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 1999. The data reported in this publication were developed from the 1999 survey and predecessor databases.

EIA asked respondents to the “Uranium Industry Annual Survey” to provide data current to the end of 1999 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.<sup>1</sup> 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 1999, 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 1999 or plan such expenditures in 2000; (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 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 owners or operators 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 firms 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.

<sup>1</sup>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.

Approximately 70 percent of the forms were received by the specified deadline (March 1st). Those that had not responded by the due date were contacted by telephone or email to encourage submission of the forms, and those calls resulted in the receipt of most of the remaining forms. Subsequent contacts were made to obtain forms not yet received. In a few instances, company data were collected through telephone conversations. The last form was received in the middle of April.

## 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 Coal, Nuclear and Renewables 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 or email 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 1999 Form EIA-858 survey, Schedule A, "Uranium Raw Materials Activities," was mailed to 41 firms and Schedule B, "Uranium Marketing Activities," was mailed to 80 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 1999 Uranium Industry Annual Survey**

Response Status	Schedule	
	A	B
Survey Schedules Mailed Out	41	80
Data Provided	37	76
Reported as Not Applicable	4	4

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

## 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, 1999 potential resources are the same as those reported for the previous year. Estimates of uranium resources in the EAR and SR classes for 1990 through 1999 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

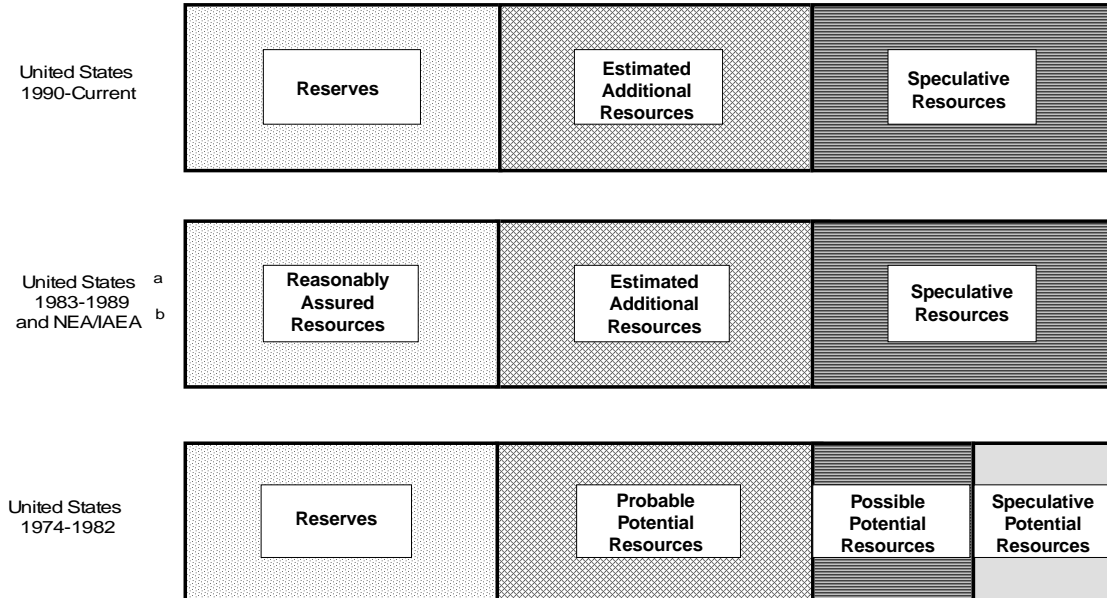
The U.S. uranium reserves reported annually by the EIA for specific forward cost categories represent the sums of quantities estimated to occur in known deposits on

properties where statistical sampling of grade, ore configuration, and depth indicate that the quantities could be recovered under current regulations at or less than the stated cost using current mining and milling technology. The reserves for 1999 are based on the historical data for 576 uranium reserve properties evaluated under prior U. S. governmental uranium resource programs and on data for 135 uranium reserves properties reported by domestic uranium mining companies on the 1999 Form EIA-858. Current mining cost information is not available for all of the uranium reserve properties included in the 1999 National estimate, and the reserve quantities reported for the stated forward-cost categories should be viewed as the upper limits of quantities that could be recoverable under the most favorable conditions.

The uranium property reserve estimates incorporate direct bore hole radiometric data validated by chemical analysis of samples from cores and drill cuttings. The thickness of mineralized rock, mineral grades and their spatial distribution, host-rock depth, proposed mining method, ore haulage distance, and reclamation method are considered in the reserve evaluation. Reserve quantities reported by the EIA have been adjusted to reflect the effects of mining dilution and milling/processing recovery factors. The costs used to categorize uranium reserves are based on the concept of forward cost (see Glossary) and reflect the year-of-estimate costs anticipated to be incurred in producing the uranium. Forward costs include the costs for power and fuel, labor, materials, royalties, insurance, severance and ad valorem taxes, and applicable administrative costs. Previous expenditures (sunk costs) for such items as exploration and land acquisition are excluded as are the costs for income taxes, profit, and the cost of money. The forward-cost concept is categorically independent of the price at which uranium produced from the estimated reserves might be sold in the commercial market.

Current and historical estimates of the annual U.S. uranium reserves since 1990 are shown in Table B3. The 1999 reserve estimates for the \$30- and the \$50-per-pound  $U_3O_8$  categories are summarized for the major uranium-industry States in Table B4.

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



<sup>a</sup>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.

<sup>b</sup>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, 1990-1999**  
(Million Pounds U<sub>3</sub>O<sub>8</sub>)

Year	Forward-Cost Category					
	\$30 per pound		\$50 per pound		\$100 per pound	
	EAR <sup>a</sup>	SR <sup>b</sup>	EAR <sup>a</sup>	SR <sup>b</sup>	EAR <sup>a</sup>	SR <sup>b</sup>
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 <sup>c</sup> .....	2,180	1,310	3,310	2,230	4,850	3,480
1996 <sup>c</sup> .....	2,180	1,310	3,310	2,230	4,850	3,480
1997 <sup>c</sup> .....	2,180	1,310	3,310	2,230	4,850	3,480
1998 <sup>c</sup> .....	2,180	1,310	3,310	2,230	4,850	3,480
1999 <sup>c</sup> .....	2,180	1,310	3,310	2,230	4,850	3,480

<sup>a</sup>EAR = Estimated Additional Resources.

<sup>b</sup>SR = Speculative Resources.

<sup>c</sup>Annual updating of the estimates by the Energy Information Administration was suspended after 1994.

Notes: Values shown are the mean values for the distribution of estimates for each forward-cost category: 1990-1992- rounded to the nearest 100 million pounds U<sub>3</sub>O<sub>8</sub>; 1993-1999- rounded to the nearest 10 million pounds U<sub>3</sub>O<sub>8</sub>. 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: 1990-1994- 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, 1999**  
(Million Pounds U<sub>3</sub>O<sub>8</sub>)

Resource Region	Forward-Cost Category					
	\$30 per pound		\$50 per pound		\$100 per pound	
	EAR <sup>a</sup>	SR <sup>b</sup>	EAR <sup>a</sup>	SR <sup>b</sup>	EAR <sup>a</sup>	SR <sup>b</sup>
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 <sup>c</sup> .....	110	330	180	610	270	990
<b>Total .....</b>	<b>2,180</b>	<b>1,310</b>	<b>3,310</b>	<b>2,230</b>	<b>4,850</b>	<b>3,480</b>

<sup>a</sup>EAR = Estimated Additional Resources.

<sup>b</sup>SR = Speculative Resources.

<sup>c</sup>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<sub>3</sub>O<sub>8</sub>. 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, 1990-1999**  
(Million Pounds U<sub>3</sub>O<sub>8</sub>)

Year	\$30 per pound	\$50 per pound	\$100 per pound
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
1999 .....	274	908	1,432

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 files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1990-1999).

**Table B4. Forward-Cost Uranium Reserves by State, 1999**

State(s)	\$30 per pound			\$50 per pound		
	Ore (million tons)	Grade <sup>a</sup> (percent U <sub>3</sub> O <sub>8</sub> )	U <sub>3</sub> O <sub>8</sub> (million pounds)	Ore (million tons)	Grade <sup>a</sup> (percent U <sub>3</sub> O <sub>8</sub> )	U <sub>3</sub> O <sub>8</sub> (million pounds)
New Mexico .....	15	0.277	84	102	0.166	341
Wyoming .....	44	0.130	113	243	0.077	377
Arizona, Colorado, Utah .....	7	0.289	41	42	0.138	115
Texas .....	4	0.079	7	19	0.065	24
Other <sup>b</sup> .....	6	0.232	28	23	0.108	51
<b>Total .....</b>	<b>76</b>	<b>0.179</b>	<b>274</b>	<b>429</b>	<b>0.106</b>	<b>908</b>

<sup>a</sup>Weighted average percent U<sub>3</sub>O<sub>8</sub> per ton of ore.

<sup>b</sup>Includes California, Idaho, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Washington, and undisclosed.

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 files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**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) 1999 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 during the survey year. The footnote at the end of Table C1 provides an explanation for the activity codes.

**Table C1. Respondents to the 1999 Uranium Industry Annual Survey**

Company Name	Industry Activity Code <sup>a</sup>	Company Name	Industry Activity Code <sup>a</sup>
Alabama Power Co. (Southern Nuclear)	UTL	FirstEnergy Nuclear Operating Company	UTL
AmerenUE (Union Electric Company)	UTL	Florida Power Corporation	UTL
Anaconda Uranium Corporation	UPH	Florida Power & Light	UTL
Arizona Public Service Company	UTL	Framatome Cogema Fuels	FAB
Aspen Exploration Corporation	UPH	General Electric Company	FAB
B. B. Brooks Company	UPH	Geomex Minerals, Inc.	UPH
Baltimore Gas & Electric	UTL	Georgia Power Co. (Southern Nuclear)	UTL
Boston Edison Co./Entergy Nuclear Gen. Co.	UTL	GPU Nuclear, Inc.	UTL
Cameco Resources (U.S.) Inc.	UPH	Green Mountain Mining Venture	UPH
Carolina Power & Light	UTL	Hanson Exploration, Inc.	UPH
Cobb Resources Corporation	UPH	HBS, 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/ABB C-E Nuclear Power	FAB	Illinois Power Co./AmerGen Energy Co.	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	Malapai Resources Company	MLG
Cotter Corporation	MLG	Marquez Development Corporation	UPH
Crow Butte Resources, Inc.	MLG	Mining Unlimited, Inc.	UPH
Dawn Mining Company	UPH	Nebraska Public Power District	UTL
Detroit Edison	UTL	New York Nuclear Corp. / NYNCO Trading	BRO
Duke Power Company	UTL	New York Power Authority	UTL
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
Everest Exploration, Inc.	UPH	Northern States Power Company	UTL

**Table C1. Respondents to the 1999 Uranium Industry Annual Survey (Continued)**

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

<sup>a</sup>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-fueled generating 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" (1999).

**Appendix D**

**Form EIA-858:  
Uranium Industry  
Annual Survey**



**Energy Information Administration  
U.S. Department of Energy  
Uranium Industry Annual Survey  
Survey Year 1999  
Schedule A**

Data on this mandatory survey are collected under authority of Section 13(b) Federal Energy Administration Act of 1974 (Public Law 93-275), and section 1015 of the Energy Policy Act of 1992 (Public Law 102-486). Provisions regarding sanctions are described in Part IV, page i of the instructions. Provisions regarding the confidentiality of information submitted in response to this survey are set forth on page xiii of the instructions for Schedules A and B.

*The public reporting burden for this form is estimated to average 25.0 hours per response, including the time of reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Please send your comments about this burden estimate, suggestions for reducing this burden, or any other aspect of this collection of information to: the Energy Information Administration, Statistics and Methods Group EI-70, 1000 Independence Avenue SW, Washington, DC 20585; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.*

**RESPONDENT IDENTIFICATION**

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Respondent ID (For EIA Use Only)									

Parent Company: \_\_\_\_\_

**APPLICABILITY OF SCHEDULE A**

Check one box on each line under column (b) or (c). If Part II and Part III are applicable, give in column (d) the total number of properties and mills or plants reported.

EIA-858 Schedule and Part (a)	Applies to This Company (b)	Does Not Apply to This Company (c)	Number Submitted (d)
A, Part I: Exploration and Development	<input type="checkbox"/>	<input type="checkbox"/>	
A, Part II: Reserves and Mine Production by Property	<input type="checkbox"/>	<input type="checkbox"/>	
A, Part III: Uranium Milling and Processing	<input type="checkbox"/>	<input type="checkbox"/>	
A, Part IV: Employment	<input type="checkbox"/>	<input type="checkbox"/>	

**CONTACT PERSON**

Schedule A:

Name (Please print): \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Phone: (\_\_\_\_\_) \_\_\_\_\_ Fax: (\_\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

E-Mail Address: \_\_\_\_\_@\_\_\_\_\_

Title 18 U.S.C. 1001 makes it a crime for any person knowingly and willingly to make to any Agency or Department of the United States any false, fictitious or fraudulent statement or misrepresentation as to any matter within its jurisdiction.



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**SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES  
Part I: Exploration and Development**

**ITEM 1: JOINT VENTURE ARRANGEMENTS**

Was your company the controlling partner in one or more joint ventures in the Survey Year?     Yes     No  
If "Yes", list names of joint ventures. If "No", go to Item 2.

- |          |          |
|----------|----------|
| 1. _____ | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | 6. _____ |

**ITEM 2: EXPLORATION LAND STATUS AND COST FOR THE SURVEY YEAR**

<b>Exploration land acquired:</b>	Acres
<b>Cost of all exploration land acquired:</b>	\$
<b>Total exploration land released:</b>	Acres
<b>Total exploration land held, December 31st of Survey Year:</b>	Acres

**ITEM 3: EXPLORATION AND DEVELOPMENT DRILLING BY STATE AND TOTAL COST**  
Survey Year Drilling: Include drilling done for assessment under exploration drilling.

States	Exploration Drilling			Development Drilling		
	Holes	Feet	Cost	Holes	Feet	Cost
Arizona						
Colorado						
Nebraska						
New Mexico						
Texas						
Utah						
Washington						
Wyoming						
Other (Specify):						
<b>Totals:</b>			\$			\$

<b>Following Year:</b>	Projected Total Cost
<b>Projected Estimates</b>	\$

**ITEM 4: OTHER EXPLORATION AND DEVELOPMENT EXPENDITURES**  
(Include assessment activities)

All other expenditures: \$ \_\_\_\_\_

**ITEM 5: FOREIGN CONTRIBUTIONS TO EXPLORATION EXPENDITURES**

Contribution by foreign-owned companies:

Survey Year: \_\_\_\_\_ %  
Following Year (planned): \_\_\_\_\_ %

**ITEM 6: EXPENDITURES FOR EXPLORATION IN FOREIGN COUNTRIES**

Country	Total Expenditures	
	Survey Year	Following Year
	\$	\$
	\$	\$
	\$	\$
	\$	\$



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**SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES  
Part II: Reserves and Mine Production by Property**

**ITEM 7: PROPERTY INFORMATION**

**Identification:**

Property Name: \_\_\_\_\_ State: \_\_\_\_\_  
Other Name(s) Used: \_\_\_\_\_ County: \_\_\_\_\_

Section(s)	Township N. or S.	Range E. or W.	Latitude N.	Longitude W.
			0 'N	0 'W
			0 'N	0 'W
			0 'N	0 'W

**Ownership:**

Name of Firm	Percent Ownership

**Status:** (Check only one):

- Only assessment work being done
- Exploration continuing
- Exploration completed
- Development drilling complete
- Under development for production
- Mine in production
- Mined out
- Mine closed temporarily } \_\_\_\_/\_\_\_\_
- Mine closed permanently } MM/YR

**Controllership:**

If your firm no longer controls this property, identify the party to which it was transferred:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: (\_\_\_\_\_) \_\_\_\_\_--\_\_\_\_\_

**Studies Completed:** (Check all that apply):

- Preliminary reserves estimate
- Final reserves estimate
- Preliminary feasibility study
- Final feasibility study
- Mining plan

**ITEM 8: PROPERTY URANIUM RESERVES ESTIMATES**

Mining Method	Reserves Component	Reserves Quantities by Cost Category (\$ per pound U <sub>3</sub> O <sub>8</sub> )					
		\$15	\$30	\$50	\$100	\$	\$
Openpit	Ore (1000 tons)						
	U <sub>3</sub> O <sub>8</sub> (1000 lbs)						
	V <sub>2</sub> O <sub>5</sub> (1000 lbs)						
Underground	Ore (1000 tons)						
	U <sub>3</sub> O <sub>8</sub> (1000 lbs)						
	V <sub>2</sub> O <sub>5</sub> (1000 lbs)						
In Situ Leach	Ore (Grade % or 1000 tons)						
	U <sub>3</sub> O <sub>8</sub> (1000 lbs)						
Other (Specify)	Ore (Grade % or 1000 tons)						
	U <sub>3</sub> O <sub>8</sub> (1000 lbs)						

Reserves estimation date: \_\_\_\_/\_\_\_\_(MM/YY)

**ITEM 9: OPERATING COST USED IN ESTIMATING RESERVES**

Mining Method	Operating Cost (\$ per Ton of Ore)					
	Direct Mining	Haulage	Royalty	Direct Milling	Indirect Costs	Other <sup>1</sup>
Openpit	\$	\$	\$	\$	\$	\$
Underground	\$	\$	\$	\$	\$	\$
	\$/Lb U <sub>3</sub> O <sub>8</sub> Recovered					
In Situ Leach	\$	<sup>1</sup> Define Other Costs: _____				
Other (Specify):	\$					



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**SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES  
Part II: Reserves and Mine Production by Property (Continued)**

Property Name: \_\_\_\_\_

**ITEM 10: CAPITAL COSTS BY MINING METHOD****Capital Costs for Development, Construction and Equipment**

Mining Method	Capital Costs	
	Mine or ISL Field	Mill or Plant
Openpit	\$	\$
Underground	\$	\$
<i>In Situ</i> Leach	\$	\$
Other <sup>1</sup>	\$	\$

<sup>1</sup>Other: (Specify method chosen) \_\_\_\_\_**ITEM 11: DRILLING AND RESERVES ESTIMATION PARAMETERS**

Number of holes drilled, including barren holes, in the reserves outline:

During the Survey Year: \_\_\_\_\_ Holes.

Prior to the Survey Year: \_\_\_\_\_ Holes.

Reserves Estimate Parameters	Openpit	Underground	<i>In Situ</i> Leach
Break-even cutoff grade (Percent U <sub>3</sub> O <sub>8</sub> )			
Grade x thickness (Feet Percent)			
Cutoff ore thickness			
Minimum mining height (Feet)			
Average area of influence per ore hole (Sq Ft)			
Tonnage factor (Cubic Feet per Ton)			
Mine Recovery factor (Percent)			
Mill or plant recovery (Percent)			
Average depth to ore (Feet)			
Average ore thickness (Feet)			
Average ore grade (Percent U <sub>3</sub> O <sub>8</sub> )			

**ITEM 12: MINE PRODUCTION AND SHIPMENTS OF ORE OR PREGNANT SOLUTIONS****Uranium and Vanadium Mined**

Mining Method	Ore (Tons)	Contained U <sub>3</sub> O <sub>8</sub> (Pounds)	Contained V <sub>2</sub> O <sub>5</sub> (Pounds)
Openpit			
Underground			
<i>In Situ</i> Leach	(Grade):		
Other <sup>1</sup>	(Tons or Grade):		

<sup>1</sup>Other, please specify: \_\_\_\_\_**Shipment of Ore or Pregnant Solutions**

Shipment Destination		Ore (Tons)	Contained U <sub>3</sub> O <sub>8</sub> (Pounds)	Contained V <sub>2</sub> O <sub>5</sub> (Pounds)
Facility	Facility Name			
To Stockpile				
To Mill or Plant				
To Others				



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**SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES  
Part III: Uranium Milling and Processing**

**ITEM 13: MILL OR PLANT INFORMATION**

**Name and Location:**

Facility Name : \_\_\_\_\_ State: \_\_\_\_\_  
Other Name(s) Used: \_\_\_\_\_ County: \_\_\_\_\_

**Type of Facility:**

- Conventional mill  
 Nonconventional plant  
 Other (Specify): \_\_\_\_\_

Section(s)	Township N. or S.	Range E. or W.	Latitude N.	Longitude W.
			0 'N	0 'W
			0 'N	0 'W
			0 'N	0 'W

**Ownership:**

Name of Firm	Percent Ownership

**Controllership:**

If your firm no longer controls this facility, identify the party to which it was transferred:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: (\_\_\_\_) \_\_\_\_\_ -- \_\_\_\_\_

**ITEM 14: RATED CAPACITY**

Conventional mill (Tons ore per day) <sup>1</sup>	
Nonconventional plant (Lbs U <sub>3</sub> O <sub>8</sub> per yr) <sup>1</sup>	

<sup>1</sup>See provisions regarding confidentiality of information in the instructions.

Indicate the nature of the arrangement between your firm and the firm named above (mark one):

- Title transfer     Contract     Lease  
 Other arrangement (Specify): \_\_\_\_\_

**ITEM 15: OPERATING STATUS DURING SURVEY YEAR**

Number of days operated in Survey Year. Nominal: \_\_\_\_\_ Days    Actual: \_\_\_\_\_ Days  
Was facility operated throughout Survey Year?     Yes     No    If No, give closing date: \_\_\_\_/\_\_\_\_ MM/YY  
Was facility operating at end of Survey Year?<sup>1</sup>     Yes     No

**If facility did not operate during Survey Year:**

<input type="checkbox"/> Closed temporarily (Restart planned for Following Year)	Holding (standby) cost per year	\$
<input type="checkbox"/> Closed indefinitely (Following Year restart not planned)	One-time cost to reopen	\$
<input type="checkbox"/> Closed permanently (Will not be restarted)	Months required to return plant to full production, if decided on December 31st of the Survey Year	_____ months
<input type="checkbox"/> Reclaimed (Restoration in progress or completed)		
<input type="checkbox"/> Other status (Please specify): _____		

<sup>1</sup>See provisions on confidentiality of information in the instructions.

**ITEM 16: URANIUM CONCENTRATE PRODUCTION**

Category	Conventional	Nonconventional
Ore Fed-to-Process	Tons Ore	
	Lbs U <sub>3</sub> O <sub>8</sub>	
Other Mill Feed <sup>1</sup> (Lbs U <sub>3</sub> O <sub>8</sub> )		
In-Process Inventories (Lbs U <sub>3</sub> O <sub>8</sub> ) as of December 31st	Prior Year	
	Survey Year	
Possible Production: 100% Recovery (Lbs U <sub>3</sub> O <sub>8</sub> )		
Total Plant Feed <sup>2</sup> (Lbs U <sub>3</sub> O <sub>8</sub> )		
Concentration Production (Lbs U <sub>3</sub> O <sub>8</sub> )		
Tailings and Unaccountable (Lbs U <sub>3</sub> O <sub>8</sub> )		
Recovery Percent		
Concentrate Inventories (Lbs U <sub>3</sub> O <sub>8</sub> ) as of December 31st	Prior Year	
	Survey Year	
Concentrate Shipped (Lbs U <sub>3</sub> O <sub>8</sub> )		

- <sup>1</sup>Other Mill Feed: (Check all sources)  
 Mine water  
 Heap leach  
 Tailings water  
 Other (Specify): \_\_\_\_\_
- <sup>2</sup>Total Plant Feed: (Check all sources)  
 *In situ* Leach  
 Reclamation  
 Byproduct recovery  
 Other (Specify): \_\_\_\_\_





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**SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES  
Part IV: Employment**

**ITEM 17: EMPLOYMENT BY STATE**

States	Employment (Person-Years): Include staff and contract personnel.				
	Exploration	Mining	Milling	Processing	Reclamation
Arizona					
Colorado					
Florida					
Nebraska					
New Mexico					
Texas					
Utah					
Washington					
Wyoming					
Other (Specify):					
<b>Totals:</b>					

COMMENTS FOR SCHEDULE A



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**Schedule B: Uranium Marketing Activities**

Data on this mandatory survey are collected under authority of Section 13(b) Federal Energy Administration Act of 1974 (Public Law 93-275), and section 1015 of the Energy Policy Act of 1992 (Public Law 102-486). Provisions regarding sanctions are described in Part IV, page i of the instructions. Provisions regarding the confidentiality of information submitted in response to this survey are set forth on page xiii of the instructions for Schedules A and B.

*The public reporting burden for this form is estimated to average 25.0 hours per response, including the time of reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Please send your comments about this burden estimate, suggestions for reducing this burden, or any other aspect of this collection of information to: the Energy Information Administration, Statistics and Methods Group EI-70, 1000 Independence Avenue SW, Washington, DC 20585; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.*

**RESPONDENT IDENTIFICATION**

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Respondent ID (For EIA Use Only)									

Parent Company: \_\_\_\_\_

**APPLICABILITY OF SCHEDULE B**

Check one box on each line under column (b) or (c). If Item 1 is applicable, give in column (d) the total number of contracts reported on the Schedule B for the Survey Year.

EIA-858 Schedule B Items (a)	Applies to This Company (b)	Does Not Apply to This Company (c)	Number Submitted (d)
<b>B: Item 1: Contract(s)</b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>B: Item 2: Enrichment Services Purchased by Utilities</b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>B: Item 3: Uranium Inventories</b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>B: Item 4: Utility Uranium Inventory Policy</b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>B: Item 5: Uranium Used in Fuel Assemblies</b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>B: Item 6: Actual Enrichment Feed Deliveries</b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>B: Item 7: Projected Enrichment Feed Deliveries &amp; Unfilled Req'd</b>	<input type="checkbox"/>	<input type="checkbox"/>	

**CONTACT PERSON**

Schedule B:

Name (Please print): \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Phone: (\_\_\_\_\_) \_\_\_\_\_ Fax: (\_\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

E-Mail Address: \_\_\_\_\_@\_\_\_\_\_

Title 18 U.S.C. 1001 makes it a crime for any person knowingly and willingly to make to any Agency or Department of the United States any false, fictitious or fraudulent statement or misrepresentation as to any matter within its jurisdiction.



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**Schedule B: Uranium Marketing Activities**

ITEM 1: CONTRACT: Complete one copy of this page for each contract (market commitment and/or custody transaction) your firm had in place on December 31 of the Survey Year.

**Contract Completed.**

**A. Other Party Name:** \_\_\_\_\_  
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**B. Date Contract Signed:** \_\_\_/\_\_\_/\_\_\_  
Date Contract Renegotiated: \_\_\_/\_\_\_/\_\_\_

**C. Contract Type:** Spot  Short-Term  Medium-Term  Long-Term

Check if the renegotiation was price related.

**D.1. Transfer of Title:** Mark in order.

- |   |  |
|---|--|
| <input type="checkbox"/> Sale(Sent)                               | <input type="checkbox"/> Purchase(Received)              |
| <input type="checkbox"/> Exchange(Sent)                           | <input type="checkbox"/> Exchange(Received)              |
| <input type="checkbox"/> Loan Lender(Sent)                        | <input type="checkbox"/> Loan Borrower(Received)         |
| <input type="checkbox"/> Loan Repayment Borrower(Sent)            | <input type="checkbox"/> Loan Repayment Lender(Received) |
| <input type="checkbox"/> Other Transfer of Title (Specify): _____ |  |

**2. Custody Transactions:** (Involving foreign-owned uranium)

- Storage/Holding Agreement
- Other Custody Transaction (Specify): \_\_\_\_\_

**3. Match Sales Transactions:**

Check if involved matched sales.

Does this transaction involve intracompany transfer of material?  Yes  No

**E. Country Codes:** for all Items. AR = Argentina AS = Australia BE = Belgium BR = Brazil BU = Bulgaria CA = Canada CH = China FI = Finland FR = France GR = Germany GB = Gabon HU = Hungary IN = India JA = Japan KA = Kazakhstan KN = Korea, North KS = Korea, South KY = Kyrgyzstan MO = Mongolia LH = Lithuania LO = Slovakia NI = Niger NL = Netherlands PK = Pakistan PO = Portugal RO = Romania RP = Phillippines SF = South Africa SP = Spain SW = Sweden SZ = Switzerland TI = Tajikistan TW = Taiwan WA = Namibia UK = United Kingdom UP = Ukraine UR = Russia US = United States UR = U.S./ Russia UZ = Uzbekistan UN = Unknown  
Other Specify: \_\_\_\_\_

**F. Uranium Deliveries: (Quantities in Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)**

Not Applicable

Actual 1999 Deliveries month/day	1. U <sub>3</sub> O <sub>8</sub>		2. Natural UF <sub>6</sub> <input type="checkbox"/>		3. Enriched Uranium <input type="checkbox"/>		4. Imported FROM	5. Exported TO	6. Country of Origin	7. Received	8. Sent	Pricing Mechanism								
	Quantity	Price \$/lb	Quantity	Price \$/lb	9. Base Escalated	10. Fixed						11. No Floor	12. Floor	13. Spot	14. Other					
1 Date ___/___																				
2 Date ___/___																				
3 Date ___/___																				
4 Date ___/___																				
5 Date ___/___																				
6 Date ___/___																				
7 Date ___/___																				
8 Date ___/___																				
9 Date ___/___																				
10 Date ___/___																				
11 Date ___/___																				
12 Date ___/___																				
13 Date ___/___																				
<b>TOTAL</b>																				
Future Deliveries	Quantity		Price		Quantity		Price		Imported FROM	Exported TO	Country of Origin	Received	Sent	Base Escalated	Fixed	No Floor	Floor	Spot	Other	
	Firm	Optional	\$/lb	\$/lb	Firm	Optional	\$/lb	\$/lb												
2000																				
2001																				
2002																				
2003																				
2004																				
2005																				
2006																				
2007																				
2008																				
2009																				
2010																				
2011																				
2012																				



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**Schedule B: Uranium Marketing Activities**

**ITEM 2: ENRICHMENT SERVICES PURCHASED BY UTILITIES**

Not Applicable

1. Delivery Date MM/DD	2. Quantity (SWU)	3. Seller's Name	4. Country of Enrichment Service	Spot	Short-Term	Medium-Term	Long-Term
1. Date ___/___/___							
2. Date ___/___/___							
3. Date ___/___/___							
4. Date ___/___/___							
5. Date ___/___/___							
6. Date ___/___/___							
7. Date ___/___/___							
8. Date ___/___/___							
9. Date ___/___/___							
10. Date ___/___/___							
11. Date ___/___/___							
12. Date ___/___/___							
13. Date ___/___/___							
14. Date ___/___/___							
15. Date ___/___/___							
16. Date ___/___/___							
17. Date ___/___/___							
18. Date ___/___/___							
19. Date ___/___/___							
20. Date ___/___/___							

**ITEM 3: URANIUM INVENTORIES:** Includes material reported in Item 1.D.2 above belongs to a foreign company and was stored at your site(s) at year end.

Type of Inventory	Quantity ( 1000 lbs of U <sub>3</sub> O <sub>8</sub> Equivalent)			
	Domestic-Origin		Foreign-Origin	
	Year-end 1998	Year-end 1999	Year-end 1998	Year-end 1999
A. U <sub>3</sub> O <sub>8</sub> on hand, in off-site storage, or at conversion plant				
B. Natural UF <sub>6</sub> on hand, in private off-site storage, or at conversion plants				
C1. Natural UF <sub>6</sub> at enrichment suppliers (Exclude amounts held under usage agreements)				
C2. Enriched UF <sub>6</sub> at enrichment suppliers				
D. Enriched UF <sub>6</sub> on hand, and/or in private storage				
E. Fabricated fuel not inserted into a reactor, on hand, and/or private storage				
F. Natural UF <sub>6</sub> your company has delivered to DOE/USEC under usage agreements				
G. Totals of 3.A through 3.F				



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**Schedule B: Uranium Marketing Activities**

ITEM 4: UTILITY URANIUM INVENTORY POLICY: Does your company have an inventory policy on any form of uranium?  Yes  No (If Yes, provide the following data)

Type of Inventory	Desired Inventory Levels	
	Months of Forward coverage	Thousand pounds U <sub>3</sub> O <sub>8</sub> equivalent
U <sub>3</sub> O <sub>8</sub>		
Natural UF <sub>6</sub>		
Enriched UF <sub>6</sub>		
Fabricated Fuel		

ITEM 5: URANIUM USED IN FUEL ASSEMBLIES IN THE SURVEY YEAR

Utilities Only: Report only the total of unirradiated new fuel assemblies loaded into the reactor during the Survey Year and during the prior year by origin. Do not include uranium removed from reactors that subsequently will be reloaded.	Quantity (1000 lbs of U <sub>3</sub> O <sub>8</sub> Equivalent)			
	Domestic-Origin		Foreign-Origin	
	Year-end 1998	Year-end 1999	Year-end 1998	Year-end 1999
Unirradiated Uranium in Fuel Assemblies				

ITEM 6: ACTUAL ENRICHMENT FEED DELIVERIES IN THE SURVEY YEAR

Classification of Material Shipped	Quantity (1000 lbs U <sub>3</sub> O <sub>8</sub> Equivalent)	Enrichment Source Country
A. Shipment of U.S.-origin material to DOE/USEC enrichment plants		
B. Shipment of foreign-origin material to DOE/USEC enrichment plants:		
Origin: Australia		
Origin: Canada		
Origin: South Africa		
Origin: Other (Please Specify):		
Origin: Other (Please Specify):		
Origin: Other (Please Specify):		
Origin: Other (Please Specify):		
Origin: Other (Please Specify):		
C. Shipment of U.S.-origin material to non-U.S. enrichment suppliers		
D. Shipment of foreign-origin material to non-U.S. enrichment suppliers		
Origin: (Please Specify):		
Origin: (Please Specify):		
Origin: (Please Specify):		
Origin: (Please Specify):		
Origin: (Please Specify):		
Origin: (Please Specify):		
Origin: (Please Specify):		
Origin: (Please Specify):		
E. U <sub>3</sub> O <sub>8</sub> Equivalent of secondary SWU received in exchange (for DOE/USEC enrichment only)		
F. Total (A + B + C + D + E)		



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**Schedule B: Uranium Marketing Activities**

**ITEM 7: PROJECTED ENRICHMENT FEED DELIVERIES AND UNFILLED MARKET REQUIREMENTS**

Year	(1000 lbs U <sub>3</sub> O <sub>8</sub> equivalent)	
	Projected shipments to enrichment suppliers	Unfilled market requirements
2000		
2001		
2002		
2003		
2004		
2005		
2006		
2007		
2008		
2009		

COMMENTS FOR SCHEDULE B



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**Schedule B: Uranium Marketing Activities**

**ITEM 2: ENRICHMENT SERVICES PURCHASED BY UTILITIES  
(USE ONLY AS A CONTINUATION SHEET)**

1. Delivery Date MM/DD	2. Quantity (SWU)	3. Seller's Name	4. Country of Enrichment Service	Spot	Short-Term	Medium-Term	Long-Term
21. Date ___/___							
22. Date ___/___							
23. Date ___/___							
24. Date ___/___							
25. Date ___/___							
26. Date ___/___							
27. Date ___/___							
28. Date ___/___							
29. Date ___/___							
30. Date ___/___							
31. Date ___/___							
32. Date ___/___							
33. Date ___/___							
34. Date ___/___							
35. Date ___/___							
36. Date ___/___							
37. Date ___/___							
38. Date ___/___							
39. Date ___/___							
40. Date ___/___							
41. Date ___/___							
42. Date ___/___							
43. Date ___/___							
44. Date ___/___							
45. Date ___/___							
46. Date ___/___							
47. Date ___/___							
48. Date ___/___							
49. Date ___/___							
50. Date ___/___							

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

<sup>a</sup>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.

<sup>b</sup>The factor of 1 pound U<sub>3</sub>O<sub>8</sub> = 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<sub>3</sub>O<sub>8</sub>” 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 1999 (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, 1990-1999**

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 <sup>a</sup> (thousand dollars)	Number of Holes	Meters (thousand)	Cost <sup>a</sup> (thousand dollars)	Number of Holes	Meters (thousand)	Cost <sup>a</sup> (thousand dollars)
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
1999 ....	0	3,267	265	54	276	2,911	709	7,616	3,176	763	7,892

<sup>a</sup>Costs for 1990 were rounded to the nearest \$10 thousand.

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

Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999). **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table E3. Forward-Cost Uranium Reserves by Mining Method, 1999**

Mining Method	Forward-Cost Category					
	\$80 per kilogram			\$130 per kilogram		
	Ore (million metric tons)	Grade <sup>a</sup> (percent U)	Uranium (thousand metric tons)	Ore (million metric tons)	Grade <sup>a</sup> (percent U)	Uranium (thousand metric tons)
Underground .....	23	0.230	53	130	0.138	179
Openpit .....	9	0.118	11	148	0.067	99
In Situ Leaching .....	37	0.112	41	110	0.064	70
Other <sup>b</sup> .....	< 1	0.224	< 1	3	0.050	1
<b>Total .....</b>	<b>69</b>	<b>0.152</b>	<b>105</b>	<b>390</b>	<b>0.090</b>	<b>349</b>

<sup>a</sup>Weighted average percent U per metric ton of ore.

<sup>b</sup>Includes heap leach, low grade material, and miscellaneous.

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 files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table E4. U.S. Uranium Mine Production and Number of Mines and Sources, 1990-1999**

Mining Method	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Underground (metric tons U) .....	W	W	W	0	0	0	W	W	W	W
Openpit (metric tons U) .....	724	972	W	0	0	0	0	0	0	0
In Situ Leaching (metric tons U) .....	W	W	W	W	942	1,297	1,684	1,571	1,431	1,473
Other <sup>a</sup> (metric tons U) .....	1,537	1,021	379	789	30	60	125	241	408	276
<b>Total Mine Production</b> (metric tons U) .....	<b>2,260</b>	<b>1,993</b>	<b>379</b>	<b>789</b>	<b>972</b>	<b>1,357</b>	<b>1,810</b>	<b>1,812</b>	<b>1,840</b>	<b>1,750</b>
<b>Number of Mines Operated</b>										
Underground .....	27	6	4	0	0	0	1	1	4	3
Openpit .....	2	2	1	0	0	0	0	0	0	0
In Situ Leaching .....	7	6	4	5	5	5	6	7	6	6
Other Sources <sup>b</sup> .....	3	1	8	7	7	7	6	6	5	5
<b>Total Mines and Sources</b> .....	<b>39</b>	<b>15</b>	<b>17</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>14</b>

<sup>a</sup>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 1999, "Other" includes production from underground mines and uranium bearing water from mine workings and restoration.

<sup>b</sup>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: **1990-1998-Uranium Industry Annual 1998** (April 1999); **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table E5. U.S. Uranium Concentrate Processing Operations, 1990-1999**

Processing Operations	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Ore Fed to Process <sup>a</sup> (thousand metric tons) .....	655	580	232	0	0	151	40	0	0	W
Percent U <sup>b</sup> .....	0.248	0.168	0.194	—	—	0.441	0.424	—	—	W
Contained U (metric tons)										
In Ore .....	1,626	973	451	0	0	669	171	0	0	W
Other Feed Materials <sup>c</sup> .....	187	69	70	16	30	63	157	350	149	W
Total Mill Feed (metric tons U) .....	1,812	1,042	520	16	30	732	328	350	149	485
In-Process Inventory Change (metric tons U) .....	- 94	- 47	- 10	4	9	60	- 53	20	- 3	41
<b>Concentrate Produced at Mills</b> (metric tons U)										
Theoretical <sup>d</sup> .....	1,906	1,089	530	12	21	671	381	330	151	444
<b>Actual</b> .....	<b>1,788</b>	<b>1,003</b>	<b>523</b>	<b>12</b>	<b>18</b>	<b>621</b>	<b>331</b>	<b>302</b>	<b>124</b>	<b>349</b>
Recovery as Percent .....	93.8	92.2	98.7	—	—	92.6	86.8	91.2	82.2	78.6
Tailings and Unaccountable (metric tons U) .....	118	85	7	0	3	50	50	29	27	95
<b>Other Processing<sup>e</sup></b> (metric tons U) .....	<b>1,630</b>	<b>2,056</b>	<b>1,649</b>	<b>1,167</b>	<b>1,272</b>	<b>1,703</b>	<b>2,101</b>	<b>1,869</b>	<b>1,685</b>	<b>1,425</b>
<b>Total Uranium Concentrate Production</b> (metric tons U) .....	<b>3,418</b>	<b>3,059</b>	<b>2,171</b>	<b>1,178</b>	<b>1,289</b>	<b>2,324</b>	<b>2,431</b>	<b>2,171</b>	<b>1,810</b>	<b>1,773</b>
<b>Total Concentrate Shipped From Mills and Plants</b> (metric tons U) .....	<b>4,984</b>	<b>3,245</b>	<b>2,636</b>	<b>1,298</b>	<b>2,431</b>	<b>2,116</b>	<b>2,301</b>	<b>2,237</b>	<b>1,871</b>	<b>2,126</b>

<sup>a</sup>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.

<sup>b</sup>Weighted average percent U per metric ton of ore.

<sup>c</sup>Includes for various years uranium from low-grade ore, mill cleanup, mine water, tailings water, heap leaching, and waste stream materials.

<sup>d</sup>At 100-percent recovery.

<sup>e</sup>U<sub>3</sub>O<sub>8</sub> concentrate production from in-situ leaching and as a byproduct of phosphate processing.

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

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

Sources: Energy Information Administration: **1990-1998-Uranium Industry Annual 1998** (April 1999); **1999-Form EIA-858, "Uranium Industry Annual Survey"** (1999).

**Table E6. U.S. Utility Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1995-1999**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
Received by U.S. Utilities from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	2,034	2,218	2,205	2,496	1,985
Weighted-Average Price .....	38.59	36.91	35.35	35.38	36.21
Received by U.S. Utilities from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	6,232	5,124	3,804	4,026	3,998
Weighted-Average Price .....	25.56	34.73	32.01	31.07	30.00
Received by U.S. Utilities from other U.S. Utilities:					
Purchases .....	0	0	W	W	W
Weighted-Average Price .....	—	—	W	W	W
Received by U.S. Utilities from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	216	725	W	W	W
Weighted-Average Price .....	32.56	38.95	W	W	W
Received by U.S. Utilities from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	8,227	10,139	8,986	8,175	10,296
Weighted-Average Price .....	29.63	37.57	33.56	31.11	29.83
<b>Total Received by U.S. Utilities:</b>					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	<b>16,709</b>	<b>18,206</b>	<b>16,140</b>	<b>16,441</b>	<b>18,443</b>
Weighted-Average Price .....	<b>29.24</b>	<b>36.71</b>	<b>33.49</b>	<b>31.55</b>	<b>30.24</b>

— = 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" (1995-1999).

**Table E7. U.S. Utility Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1995-1999**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
Received by U.S. Utilities of U.S.-Origin Uranium:					
Purchases .....	2,018	3,192	3,105	2,762	4,403
Weighted-Average Price .....	36.93	38.01	34.73	34.76	31.83
Received by U.S. Utilities of Foreign-Origin Uranium:					
Purchases .....	14,692	15,014	13,035	13,679	14,040
Weighted-Average Price .....	28.18	36.45	33.23	30.94	29.83
<b>Total:</b>					
Purchases .....	<b>16,709</b>	<b>18,206</b>	<b>16,140</b>	<b>16,441</b>	<b>18,443</b>
Weighted-Average Price .....	<b>29.24</b>	<b>36.71</b>	<b>33.49</b>	<b>31.55</b>	<b>30.24</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table E8. U.S. Utility Purchases of Uranium by Origin Country and Delivery Year, 1997-1999**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Origin Country	Actual Deliveries in 1997		Actual Deliveries in 1998		Actual Deliveries in 1999	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
<b>All Purchases:</b>						
Australia .....	1,674	34.09	2,219	29.72	2,815	28.43
Brazil .....	0	—	W	W	0	—
Canada .....	6,429	33.21	5,526	29.93	4,804	29.26
China .....	89	45.82	W	W	267	31.56
Czech Republic .....	0	—	0	—	W	W
France .....	0	—	0	—	213	25.93
Gabon .....	W	W	W	W	0	—
Germany .....	W	W	W	W	W	W
Kazakhstan .....	744	33.10	457	28.14	W	W
Kyrgyzstan .....	W	W	0	—	0	—
Mongolia .....	W	W	W	W	0	—
Namibia .....	298	38.04	300	37.34	408	33.77
Niger .....	0	—	329	40.38	W	W
Russia .....	1,382	32.84	2,292	34.50	2,428	33.46
South Africa .....	990	29.96	979	32.07	1,046	27.86
Tajikistan .....	0	—	W	W	0	—
Ukraine .....	W	W	W	W	772	23.35
United Kingdom .....	0	—	W	W	0	—
Uzbekistan .....	1,060	34.30	961	29.77	874	32.86
Yugoslavia .....	0	—	W	W	0	—
<b>Total Foreign .....</b>	<b>13,035</b>	<b>33.23</b>	<b>13,679</b>	<b>30.94</b>	<b>14,040</b>	<b>29.83</b>
United States .....	3,105	34.73	2,762	34.76	4,403	31.83
<b>Total Purchases .....</b>	<b>16,140</b>	<b>33.49</b>	<b>16,441</b>	<b>31.55</b>	<b>18,443</b>	<b>30.24</b>
<b>Domestic Purchases:</b>						
Australia .....	270	32.80	495	31.41	358	29.40
Brazil .....	0	—	W	W	0	—
Canada .....	1,548	32.13	1,160	30.18	519	28.79
China .....	W	W	W	W	W	W
France .....	0	—	0	—	W	W
Gabon .....	0	—	W	W	0	—
Germany .....	W	W	W	W	W	W
Kazakhstan .....	200	32.52	W	W	W	W
Namibia .....	W	W	W	W	W	W
Niger .....	0	—	W	W	W	W
Russia .....	938	33.13	989	33.05	664	36.61
South Africa .....	333	28.12	752	31.09	485	29.95
Tajikistan .....	0	—	W	W	0	—
Ukraine .....	0	—	W	W	W	W
United Kingdom .....	0	—	W	W	0	—
Uzbekistan .....	883	34.28	961	29.77	W	W
Yugoslavia .....	0	—	W	W	0	—
United States .....	3,105	34.73	2,762	34.76	4,403	31.83
<b>Total Domestic Purchases .....</b>	<b>7,468</b>	<b>33.46</b>	<b>8,324</b>	<b>31.99</b>	<b>8,220</b>	<b>30.90</b>
<b>Foreign Purchases:</b>						
Australia .....	1,404	34.34	1,724	29.37	2,457	28.28
Canada .....	4,880	33.56	4,365	29.87	4,285	29.32
China .....	W	W	0	—	W	W
Czech Republic .....	0	—	0	—	W	W
France .....	0	—	0	—	W	W
Gabon .....	W	W	0	—	0	—
Germany .....	0	—	0	—	W	W
Kazakhstan .....	544	33.31	W	W	0	—
Kyrgyzstan .....	W	W	0	—	0	—
Mongolia .....	W	W	W	W	0	—
Namibia .....	287	38.46	W	W	W	W
Niger .....	0	—	W	W	W	W
Russia .....	445	32.24	1,303	35.95	1,764	32.28
South Africa .....	657	30.90	226	35.33	560	26.04
Ukraine .....	W	W	0	—	W	W
Uzbekistan .....	177	34.45	0	—	W	W
<b>Total Foreign Purchases .....</b>	<b>8,672</b>	<b>33.52</b>	<b>8,117</b>	<b>31.10</b>	<b>10,223</b>	<b>29.76</b>

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" (1997-1999).

**Table E9. Average Price and Quantity for Purchases of Uranium by U.S. Utilities by Pricing Mechanisms and Delivery Year, 1997-1999**  
(Dollars per Kilogram U Equivalent; Metric Tons U Equivalent)

Pricing Mechanisms	Domestic Purchases			Foreign Purchases			Total Purchases		
	1997	1998	1999	1997	1998	1999	1997	1998	1999
<b>Contract-Specified Pricing</b>									
Weighted-Average Price .....	34.65	32.58	33.07	36.95	36.60	35.17	35.48	33.77	33.91
Quantity with Reported Price .....	5,035	6,905	5,261	2,827	2,916	3,525	7,862	9,821	8,785
<b>Market-Related Pricing</b>									
No Floor Type									
Weighted-Average Price .....	29.12	24.24	24.74	32.35	26.24	25.38	31.29	25.78	25.24
Quantity with Reported Price .....	722	403	370	1,467	1,328	1,230	2,189	1,731	1,599
Floor Type									
Weighted-Average Price .....	37.76	35.09	38.35	31.09	28.42	29.79	31.73	28.79	30.50
Quantity with Reported Price .....	272	125	169	2,532	2,127	1,862	2,804	2,252	2,031
Market Related Total									
Weighted-Average Price .....	31.48	26.81	29.02	31.55	27.58	28.04	31.54	27.48	28.18
Quantity with Reported Price .....	994	528	539	3,999	3,455	3,091	4,993	3,983	3,630
<b>Contract Specified and Market Related Total</b>									
Weighted-Average Price .....	34.13	32.17	32.69	33.79	31.71	31.84	33.95	31.96	32.24
Quantity with Reported Price .....	6,030	7,433	5,800	6,826	6,371	6,616	12,855	13,803	12,416
<b>Spot-Market Pricing</b>									
Weighted-Average Price .....	28.69	27.73	24.39	32.21	27.11	25.11	30.68	27.26	24.91
Quantity with Reported Price .....	960	313	1,097	1,250	925	2,940	2,210	1,237	4,038
<b>Other Pricing<sup>a</sup></b>									
Weighted-Average Price .....	36.63	31.75	24.43	33.15	30.63	29.69	33.98	30.80	27.23
Quantity with Reported Price .....	185	58	505	597	328	573	782	387	1,078
<b>All Pricing Mechanisms</b>									
Weighted-Average Price .....	<b>33.46</b>	<b>31.99</b>	<b>30.90</b>	<b>33.52</b>	<b>31.10</b>	<b>29.76</b>	<b>33.49</b>	<b>31.55</b>	<b>30.24</b>
Quantity with Reported Price .....	<b>7,175</b>	<b>7,804</b>	<b>7,402</b>	<b>8,672</b>	<b>7,624</b>	<b>10,129</b>	<b>15,847</b>	<b>15,427</b>	<b>17,531</b>

<sup>a</sup>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" (1997-1999).

**Table E10. U.S. Utility Contracted Purchases of Uranium from Suppliers, in Effect at the End of 1999, by Delivery Year, 2000-2009**  
(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
2000 .....	5,697	460	8,881	1,670	14,578	2,130
2001 .....	4,760	902	6,526	1,661	11,286	2,563
2002 .....	3,043	670	5,012	1,944	8,054	2,614
2003 .....	2,917	1,245	3,540	1,699	6,457	2,944
2004 .....	2,678	793	1,429	1,392	4,107	2,186
2005 .....	1,010	744	571	1,727	1,581	2,471
2006 .....	0	1,471	435	736	435	2,207
2007 .....	0	1,269	270	1,024	270	2,294
2008 .....	0	626	0	601	0	1,227
2009 .....	0	846	273	275	273	1,121
<b>Total .....</b>	<b>20,104</b>	<b>9,026</b>	<b>26,938</b>	<b>12,731</b>	<b>47,041</b>	<b>21,757</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).



**Table E11. Anticipated Uranium Market Requirements of U.S. Utilities, 2000-2009, as of December 31, 1999**  
(Metric Tons U Equivalent)

Year	Quantity of Uranium Under Purchase Contracts	Unfilled Requirements	Anticipated Market Requirements	Enrichment Feed Deliveries
2000 .....	16,708	1,511	18,218	19,943
2001 .....	13,849	3,108	16,957	16,458
2002 .....	10,668	6,944	17,612	18,787
2003 .....	9,401	12,353	21,754	19,869
2004 .....	6,292	13,565	19,858	17,880
2005 .....	4,052	17,000	21,052	20,462
2006 .....	2,643	16,868	19,510	18,653
2007 .....	2,564	18,078	20,642	19,066
2008 .....	1,227	17,516	18,744	18,811
2009 .....	1,394	18,257	19,651	19,375
<b>Total .....</b>	<b>68,798</b>	<b>125,200</b>	<b>193,998</b>	<b>189,303</b>

Note: Totals may not equal sum of components because of independent rounding.  
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999).

**Table E12. U.S. Utility Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1997-1999**  
(Metric Tons U Equivalent)

Enrichment Plant Location	Actual Deliveries in 1997			Actual Deliveries in 1998			Actual Deliveries in 1999		
	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	W	W
France .....	W	W	1,153	W	W	1,189	107	1,921	2,028
Germany .....	0	W	W	W	W	960	0	533	533
Netherlands .....	0	0	0	W	W	560	0	W	W
Russia .....	W	W	1,110	0	555	555	0	437	437
United Kingdom .....	W	W	W	W	W	885	69	1,293	1,362
<b>Foreign Total .....</b>	<b>198</b>	<b>2,883</b>	<b>3,081</b>	<b>449</b>	<b>3,700</b>	<b>4,149</b>	<b>176</b>	<b>4,648</b>	<b>4,823</b>
United States .....	2,383	10,038	12,421	1,796	9,683	11,479	2,409	9,657	12,066
<b>Total .....</b>	<b>2,581</b>	<b>12,921</b>	<b>15,502</b>	<b>2,244</b>	<b>13,384</b>	<b>15,628</b>	<b>2,585</b>	<b>14,304</b>	<b>16,889</b>

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" (1997-1999).

**Table E13. Uranium in Fuel Assemblies Loaded into U.S. Commercial Nuclear Power Reactors by Year, 1995-1999**  
(Metric Tons U Equivalent)

Origin of Uranium	1995	1996	1997	1998	1999 <sup>P</sup>
Domestic-Origin Uranium .....	4,287	3,393	4,283	2,842	4,071
Foreign-Origin Uranium .....	15,375	14,359	14,258	11,851	18,557
<b>Total .....</b>	<b>19,662</b>	<b>17,752</b>	<b>18,542</b>	<b>14,693</b>	<b>22,627</b>

P = Preliminary data. Final 1998 fuel assembly data reported in the 1999 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" (1996-1999).

**Table E14. Foreign Purchases of Uranium by U.S. Suppliers and U.S. Utilities by Delivery Year, 1995-1999**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
<b>U.S. Suppliers:</b>					
Foreign Purchases .....	7,755	8,365	7,856	8,695	8,077
Weighted-Average Price .....	23.29	30.62	27.58	27.29	24.49
<b>U.S. Utilities:</b>					
Foreign Purchases .....	8,131	9,107	8,672	8,117	10,223
Weighted-Average Price .....	29.61	37.47	33.52	31.10	29.76
<b>U.S. Suppliers and U.S. Utilities:</b>					
Foreign Purchases .....	15,886	17,471	16,528	16,812	18,300
Weighted-Average Price .....	26.52	34.19	30.69	29.08	27.42

Note: Totals may not equal sum of components because of independent rounding.  
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table E15. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1995-1999**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries	1995	1996	1997	1998	1999
<b>Received U.S.-Origin Uranium:</b>					
Purchases .....	1,291	1,817	1,216	1,051	1,270
Weighted-Average Price .....	29.91	36.15	33.23	35.09	33.40
<b>Received Foreign-Origin Uranium:</b>					
Purchases .....	7,536	7,896	6,347	8,341	7,185
Weighted-Average Price .....	23.91	32.02	27.71	28.08	24.41
<b>Total Received by U.S. Brokers and Traders:</b>					
Purchases .....	<b>8,827</b>	<b>9,714</b>	<b>7,563</b>	<b>9,392</b>	<b>8,455</b>
Weighted-Average Price .....	<b>24.79</b>	<b>32.79</b>	<b>28.60</b>	<b>28.87</b>	<b>25.76</b>
<b>Received from Foreign Suppliers:</b>					
Purchases .....	7,043	6,853	6,040	8,328	7,400
Weighted-Average Price .....	23.46	30.62	27.84	28.01	24.96

Note: Totals may not equal sum of components because of independent rounding.  
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1995-1999).

**Table E16. Foreign Sales of Uranium from U.S. Suppliers and U.S. Utilities by Origin and Delivery Year, 1995-1999**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Actual Deliveries to Foreign Suppliers and Foreign Utilities	1995	1996	1997	1998	1999
<b>U.S.-Origin Uranium:</b>					
Foreign Sales .....	1,813	1,909	2,489	1,502	1,460
Weighted-Average Price .....	45.07	44.76	38.51	40.94	35.36
<b>Foreign-Origin Uranium:</b>					
Foreign Sales .....	1,971	2,516	4,045	4,297	1,814
Weighted-Average Price .....	25.84	30.98	28.35	27.98	28.39
<b>Total Sent:</b>					
Foreign Sales .....	<b>3,783</b>	<b>4,425</b>	<b>6,535</b>	<b>5,798</b>	<b>3,273</b>
Weighted-Average Price .....	<b>35.06</b>	<b>36.92</b>	<b>32.22</b>	<b>31.33</b>	<b>31.11</b>
<b>From U.S. Producers, U.S. Utilities, and other U.S. Suppliers:</b>					
Foreign Sales .....	1,670	2,131	3,302	1,756	1,447
Weighted-Average Price .....	47.09	40.80	33.94	37.41	37.91
<b>From U.S. Brokers and Traders:</b>					
Foreign Sales .....	2,113	2,294	3,233	4,042	1,827
Weighted-Average Price .....	25.55	33.32	30.46	28.70	26.84

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" (1995-1999).

**Table E17. Inventories of Natural and Enriched Uranium as of End of Year, 1995-1999**  
(Metric Tons U Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1995	1996	1997	1998	1999 <sup>P</sup>
<b>U.S. Utility Inventories</b> .....	<b>22,590</b>	<b>25,421</b>	<b>25,339</b>	<b>25,294</b>	<b>22,374</b>
Natural Uranium .....	15,858	16,230	18,126	16,175	17,197
Enriched Uranium <sup>a</sup> .....	6,733	9,191	7,213	9,119	5,177
<b>U.S. Supplier Inventories<sup>b</sup></b> .....	<b>5,285</b>	<b>5,365</b>	<b>15,524</b>	<b>27,207</b>	<b>26,482</b>
Natural Uranium .....	5,084	4,989	3,952	13,474	11,335
Enriched Uranium <sup>a</sup> .....	201	377	11,572	13,733	15,147
<b>Total Commercial Inventories</b> .....	<b>27,875</b>	<b>30,786</b>	<b>40,864</b>	<b>52,501</b>	<b>48,856</b>
<b>DOE-Owned and USEC-Held Inventories<sup>c</sup></b> ...	<b>42,618</b>	<b>41,731</b>	<b>20,478</b>	<b>9,406</b>	<b>20,407</b>
Natural Uranium .....	31,536	32,007	20,478	9,406	20,407
Enriched Uranium .....	11,081	9,724	0	0	0

<sup>a</sup>Includes amounts reported as inventories of enriched UF<sub>6</sub> at enrichment suppliers.

<sup>b</sup>Includes inventories owned by the 1998 privatized USEC, Inc. (United States Enrichment Corporation) for year-end 1997, 1998 and 1999 only.

<sup>c</sup>DOE-owned inventories reported by the Office of Nuclear Energy, Science and Technology; U.S. Department of Energy. For year-end 1995 and 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 in the 1999 survey for year-end 1998 and 1999, and are included with the commercial inventories of U.S. suppliers.

P=Preliminary data. Final 1998 inventory data reported in the 1999 survey.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1996-1999).

## **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 uraniumiferous solutions that are produced during in situ leach mining, from heap leaching, or in the manufacture of other commodities, and the recovery, by chemical treatment in the plant’s circuits, of uranium from the processed solutions.

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

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

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

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

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

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

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

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

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

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

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

**Uranium:** A heavy, naturally radioactive, metallic element (atomic number 92). Its two principally occurring isotopes

are  $^{235}U$  and  $^{238}U$ . The isotope  $^{235}U$  is indispensable to the nuclear industry because it is the only isotope existing in nature to any appreciable extent that is fissionable by thermal neutrons. The isotope  $^{238}U$  is also important because it absorbs neutrons to produce a radioactive isotope that subsequently decays to the isotope  $^{239}Pu$ , which also is fissionable by thermal neutrons.

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

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

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

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

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

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

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

**Uranium reserves:** Estimated quantities of uranium in known mineral deposits of such size, grade, and configuration that the uranium could be recovered at or below a specified production cost with currently proven mining and processing technology and under current law and regulations. Reserves are based on direct radiometric and chemical measurements of drill holes and other types of sampling of the deposits. Mineral grades and thickness,

spatial relationships, depths below the surface, mining and reclamation methods, distances to milling facilities, and amenability of ores to processing are considered in the evaluation. The amount of uranium in ore that could be exploited within the chosen forward-cost levels are estimated in accordance with conventional engineering practices.

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

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

**Estimated additional resources (EAR):** The uranium in addition to RAR that is expected to occur, mostly on the basis of direct geological evidence, in extensions of well-explored deposits, little explored

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

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

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

**Yellowcake:** (See uranium oxide).