

# Uranium Industry Annual 2001

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# Preface

The *Uranium Industry Annual 2001* (UIA 2001) provides current statistical data on the U.S. uranium industry's activities relating to uranium raw materials and uranium marketing. The UIA 2001 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 1992 through 2011 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 2001, 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 1992 through 2001, 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 1997 through 2011, including purchases of uranium and enrichment services, enrichment feed deliveries, uranium fuel assemblies, contracted and unfilled market requirements, and uranium inventories, are shown in Chapter 2.

The methodology used in the 2001 survey, including data edit and analysis, is described in Appendix A. The methodologies for estimation of resources and reserves are described in Appendix B. A list of respondents to the "Uranium Industry Annual Survey" is provided in Appendix C. For the readers convenience, metric versions of selected tables from Chapters 1 and 2 are presented in Appendix D along with the standard conversion factors used. A glossary of technical terms is at the end of the report.

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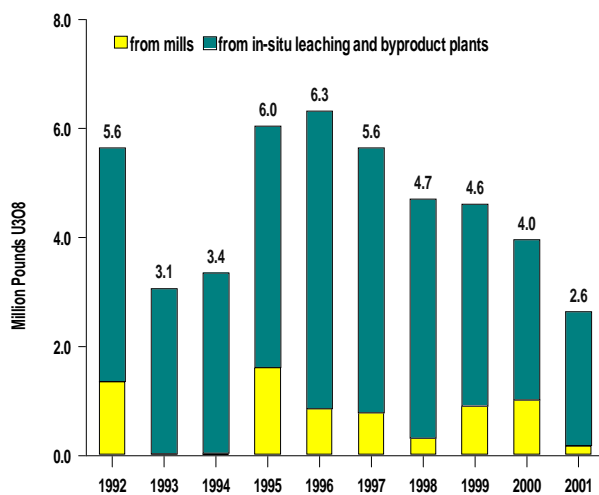
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# Highlights

## Uranium Raw Material Activities

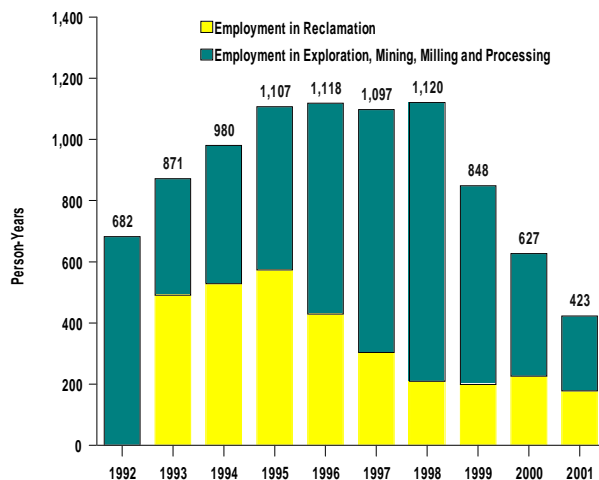
Total U.S. uranium exploration and development expenditures in 2001 were \$4.8 million, a decrease of 84 percent from the 1997 level (Table H1). U.S. uranium concentrate production totaled 2.6 million pounds in 2001, a 58 percent decline from 1996. U.S. uranium mills produced 7 percent and in-situ leaching 93 percent of the concentrate production in 2001 (Figure H1).

**Figure H1. U.S. Uranium Concentrate Production, 1992-2001**



Employment in the U.S. uranium raw materials industry totaled 423 person-years in 2001, a decrease of 62 percent from the 1998 level (Figure H2).

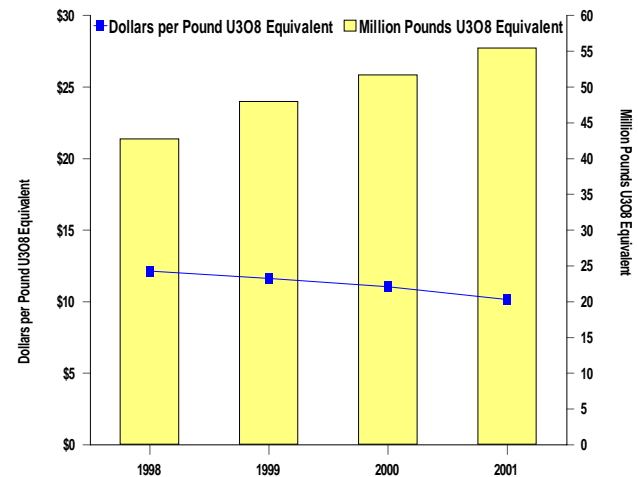
**Figure H2. U.S. Uranium Raw Materials Employment, 1992-2001**



## Uranium Marketing Activities

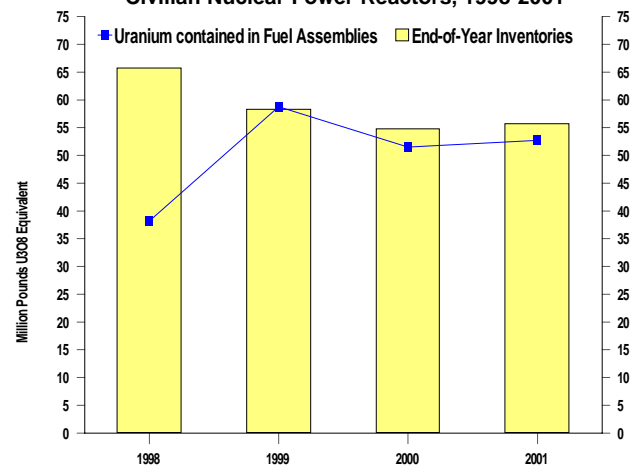
Owners and operators of U.S. civilian nuclear power reactors purchased from U.S. and foreign suppliers a total of 55.4 million pounds U<sub>3</sub>O<sub>8</sub>e (equivalent) of deliveries during 2001 (Table H2). The average price paid was \$10.15 per pound U<sub>3</sub>O<sub>8</sub>e, a decrease of 16 percent compared with the 1998 price (Figure H3).

**Figure H3. Uranium Purchases by Owners and Operators of U.S. Civilian Nuclear Power Reactors, 1998-2001**



Fuel assemblies loaded into U.S. civilian nuclear power reactors during 2001 contained 52.7 million pounds U<sub>3</sub>O<sub>8</sub>e (Table H3). Uranium inventories owned at the end of the year by owners and operators of U.S. civilian nuclear power reactors in 2001 was 55.7 million pounds U<sub>3</sub>O<sub>8</sub>e, a decrease of 15 percent from the 1998 level (Figure H4).

**Figure H4. Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors and Uranium Inventories of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 1998-2001**





**Table H1. Raw Materials Summary Statistics of the U.S. Uranium Industry, 1992-2001**

Items	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Exploration and Development</b>										
Surface Drilling (million feet) .....	1.1	1.1	0.7	1.3	3.0	4.9	4.6	2.5	1.0	0.7
(million meters) .....	0.3	0.3	0.2	0.4	0.9	1.5	1.4	0.8	0.3	0.2
Expenditures <sup>a</sup> (million dollars) .....	14.5	11.3	3.7	6.0	10.1	30.4	21.7	9.0	6.7	4.8
<b>Reserves at End of Year</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....										
\$US30 per pound) .....	295	292	294	290	285	281	276	274	271	268
(thousand metric tons U, \$US80 per kilogram) .....	114	112	113	112	110	108	106	105	104	103
<b>Mine Production of Uranium</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	1.0	2.1	2.5	3.5	4.7	4.7	4.8	4.5	3.1	2.6
(thousand metric tons U) .....	0.4	0.8	1.0	1.4	1.8	1.8	1.8	1.8	1.2	1.0
<b>Uranium Concentrate Production</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	5.6	3.1	3.4	6.0	6.3	5.6	4.7	4.6	4.0	2.6
(thousand metric tons U) .....	2.2	1.2	1.3	2.3	2.4	2.2	1.8	1.8	1.5	1.0
<b>Uranium Concentrate Shipments</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	6.9	3.4	6.3	5.5	6.0	5.8	4.9	5.5	3.2	2.2
(thousand metric tons U) .....	2.6	1.3	2.4	2.1	2.3	2.2	1.9	2.1	1.2	0.8
<b>Employment</b> (person-years) .....	682	871	980	1,107	1,118	1,097	1,120	848	627	423

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

Note: For 1993 through 2001, total employment includes reclamation employment.

Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001); **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table H2. Transaction Summary Statistics of the U.S. Uranium Industry, 1998-2001**

Deliveries	1998		1999		2000		2001	
	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price	Quantity	Weighted-Average Price
<b>Purchases by Owners and Operators of U.S. Civilian Nuclear Power Reactors</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	42.7	12.14	47.9	11.63	51.8	11.04	55.4	10.15
(thousand metric tons U; dollars per kilogram U) .....	16.4	31.55	18.4	30.24	19.9	28.70	21.3	26.39
<b>Foreign Purchases by U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	43.7	11.19	47.6	10.55	44.9	9.84	46.7	9.51
(thousand metric tons U; dollars per kilogram U) .....	16.8	29.08	18.3	27.42	17.3	25.58	18.0	24.74
<b>Foreign Sales by U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors</b>								
(million pounds U <sub>3</sub> O <sub>8</sub> e; dollars per pound U <sub>3</sub> O <sub>8</sub> e) .....	15.1	12.05	8.5	11.97	13.6	8.48	11.7	8.79
(thousand metric tons U; dollars per kilogram U) .....	5.8	31.33	3.3	31.11	5.2	22.04	4.5	22.86

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" (1998-2001).

**Table H3. Summary Statistics of Uranium Fuel and Commercial Inventories, 1998-2001**

Items	1998	1999	2000	2001 <sup>P</sup>
<b>Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors</b>				
(million pounds U <sub>3</sub> O <sub>8</sub> e) .....	38.2	58.8	51.5	52.7
(thousand metric tons U) .....	14.7	22.6	19.8	20.3
<b>Commercial Inventories at the End of the Year</b>				
Owners and Operators of U.S. Civilian Nuclear Power Reactors Inventories				
(million pounds U <sub>3</sub> O <sub>8</sub> e) .....	65.8	58.3	54.8	55.7
(thousand metric tons U) .....	25.3	22.4	21.1	21.4
U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors Inventories				
(million pounds U <sub>3</sub> O <sub>8</sub> e) .....	136.5	127.1	111.3	101.1
(thousand metric tons U) .....	52.5	48.9	42.8	38.9

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

P=Preliminary data. Final 2000 data reported in the 2001 survey.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999-2001).

# 1. U.S. Uranium Raw Materials Industry

## Introduction

The overall activity in the U.S. uranium raw materials industry continued its decline during 2001, substantially less than the last half of the 1990's. Expenditures for exploration, drilling, and related activities are 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 is less (Figure 4).

## Exploration and Development Activities

### Land Holdings and Acquisitions

U.S. uranium exploration companies held 683 thousand acres for all exploration purposes at the end of 2001 (Table 1). 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 in the United States was 0.7 million feet in 1,023 holes, only development drilling was reported during 2001, none for exploration (Table 1). Development drilling expenditures in 2001 were \$2.7 million, 84 percent less than in 1997 (Figure 5).

### Expenditures for Uranium Exploration and Development

Total U.S. uranium exploration and development expenditures in 2001 were \$4.8 million, including land acquisitions, other exploration and development expenditures, and \$2.7 million for development

drilling (Table 2). This total represents a 28 percent decrease from the 2000 level and an 84 percent decrease from 1997.

## Estimates of U.S. Uranium Reserves

The EIA's yearend 2001 estimate of U.S. uranium reserves for the \$30- and \$50-per-pound  $U_3O_8$  forward cost categories were 268 and 899 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 2000 reserve estimates, the 2001 reserves show modest decreases (1.1 percent at \$30- and 0.6 percent at \$50-per-pound  $U_3O_8$ ) that reflect combined effects of depletion and erosion of the remaining in-place ore at yearend 2001 after accounting for the mine production of uranium as reported by domestic mining firms.

## Mine Production of Uranium

During 2001, a total of 2.6 million pounds  $U_3O_8$  of uranium were produced by mining, 15 percent less than the level of production in 2000 and 45 percent less than 1998 (Table 4). Mine production of uranium came from in-situ leaching and also waste mine-water, reclamation, and restoration activities to be processed into uranium concentrate. Overall, there were three commercially operating uranium mines during part or all of 2001, four less underground mines and three less in-situ leach mines than in 1998 (Table 4).

## Uranium Concentrate Processing and Shipments

Total U.S. uranium concentrate production in 2001 was 2.6 million pounds  $U_3O_8$ , 33 percent below the 2000 level and 58 percent below 1996 (Table 5). Milling of uranium, the processing of uranium concentrate from ore mined by conventional methods such as underground or openpit mines, was 0.2 million pounds  $U_3O_8$  (82 percent below the 2000 level and 79 percent below 1996). Uranium concentrate processing from nonconventional methods are in the "Other Processing" category, which includes production from in-situ leaching and until 1999 as a byproduct of phosphate processing. Compared with 2000, in-situ leach production decreased 17 percent and totaled 2.5 million pounds  $U_3O_8$  in 2001 (Table 5).

Shipments of uranium concentrate from domestic production facilities (mills and in-situ leach plants) totaled 2.2 million pounds in 2001 (Table 5). Shipments were 1.2 million pounds less than production over the last two years, after having exceeded production for the three prior years (Figure 6).

### Status of Uranium Processing Facilities

At the end of 2001, six mills with a conventional milling capacity of 13,600 tons of ore per day were inactive at year-end 2001 (Table 6). However, one

mill was active during part of 2001, and two others produced uranium concentrate from mine water during 2001.

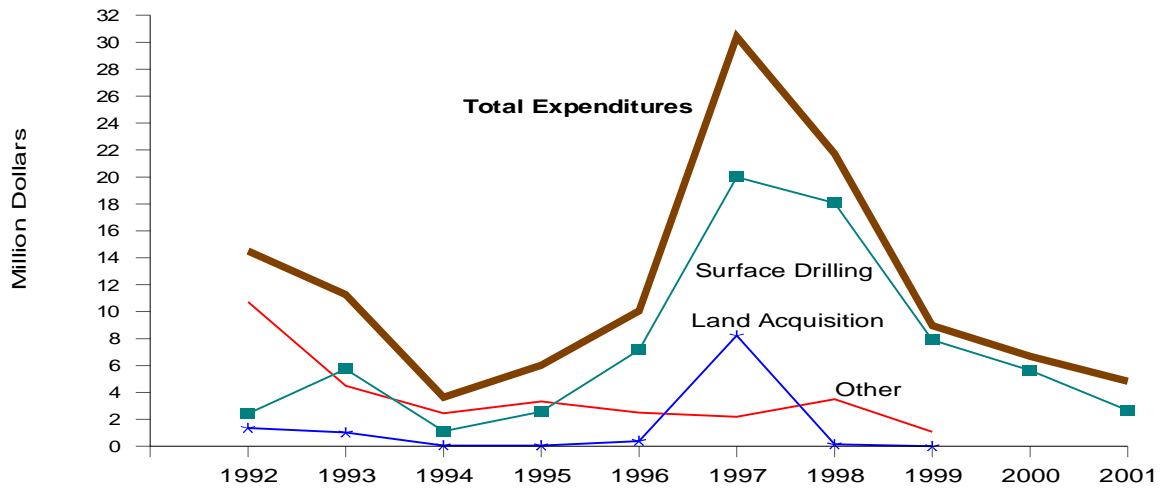
Three nonconventional uranium producing plants, all in-situ leach plants, were in commercial operation in the United States at the end of 2001. These plants had a combined rated capacity of 5.0 million pounds  $U_3O_8$  per year (Table 7). Eight nonconventional plants were inactive at the end of 2001, of which one is closed permanently. Three of the seven inactive in-situ leach plants had produced a small amount of uranium concentrate in 2001 from restoration activities.

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.

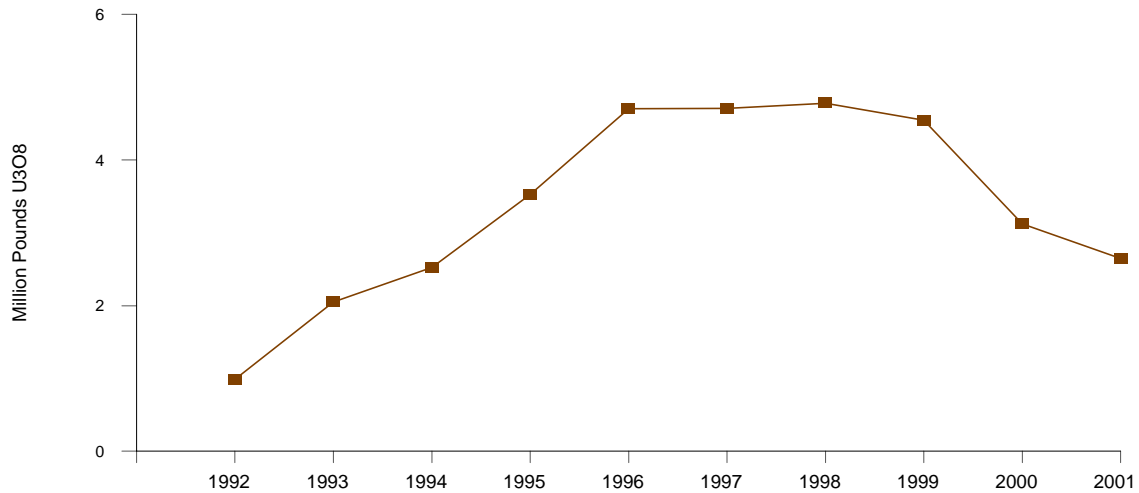
## Employment

Employment in the U.S. uranium raw materials industry in 2001 was reported as 423 person-years expended (Table 8). Compared with 1998 and 2000, 2001 employment overall decreased by 62 percent and 33 percent, respectively. Employment levels in individual categories changed significantly from 2000: mining declined by 48 percent, milling by 60 percent, processing by 11 percent, reclamation by 21 percent, and exploration employment was zero. Three States, Colorado, Texas and Wyoming accounted for 71 percent of the total employment in 2001 (Table 9).

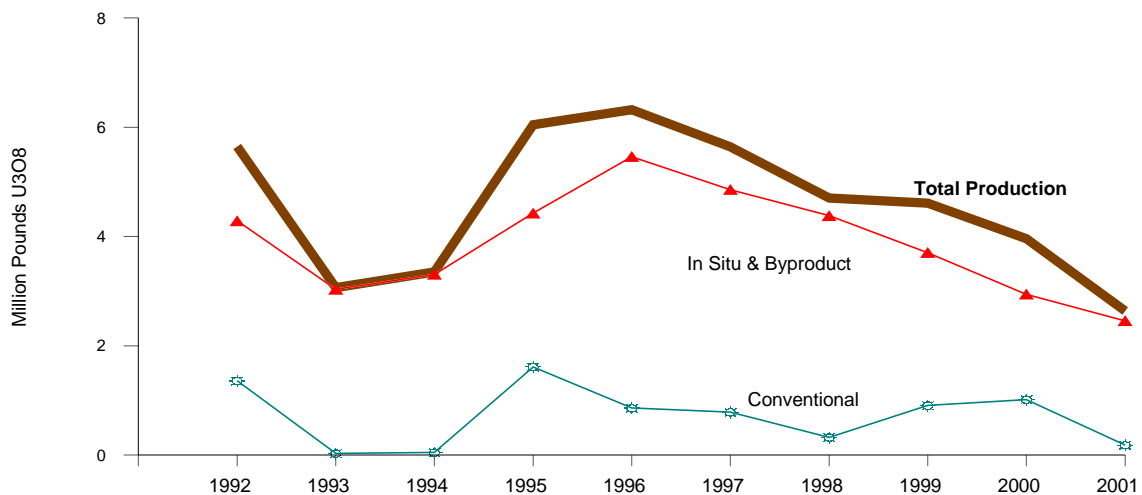
**Figure 1. U. S. Uranium Exploration and Development Expenditures, 1992-2001**



**Figure 2. U.S. Uranium Mine Production, 1992-2001**

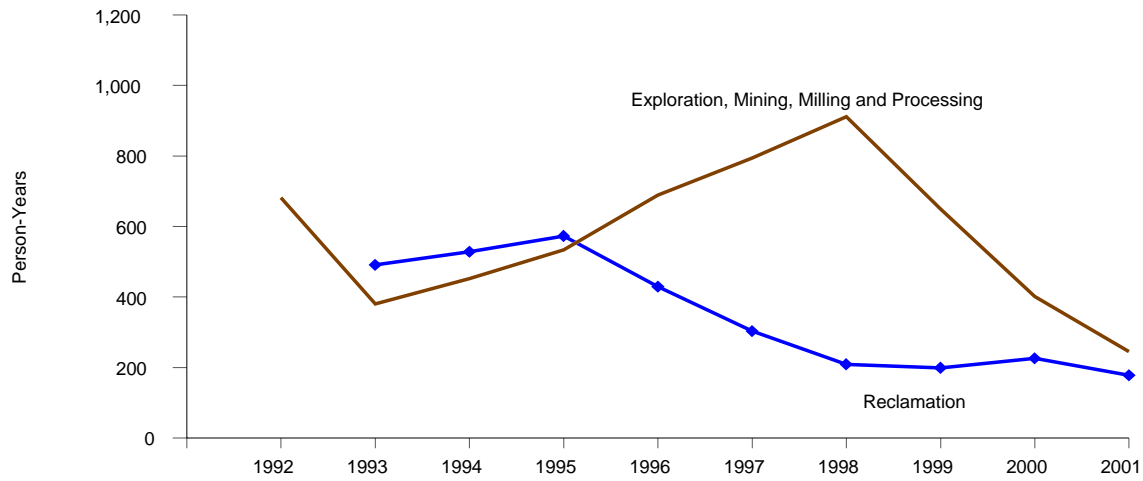


**Figure 3. U.S. Uranium Concentrate Production, 1992-2001**

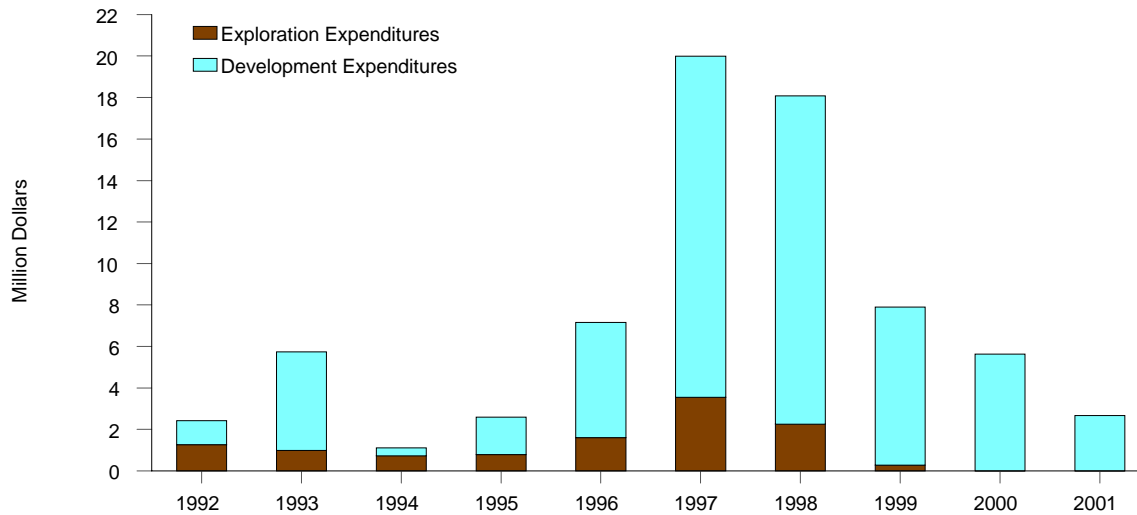


Sources: Energy Information Administration: 1992-2000-Uranium Industry Annual 2000 (May 2001). 2001-Form EIA-858, "Uranium Industry Annual Survey" (2001).

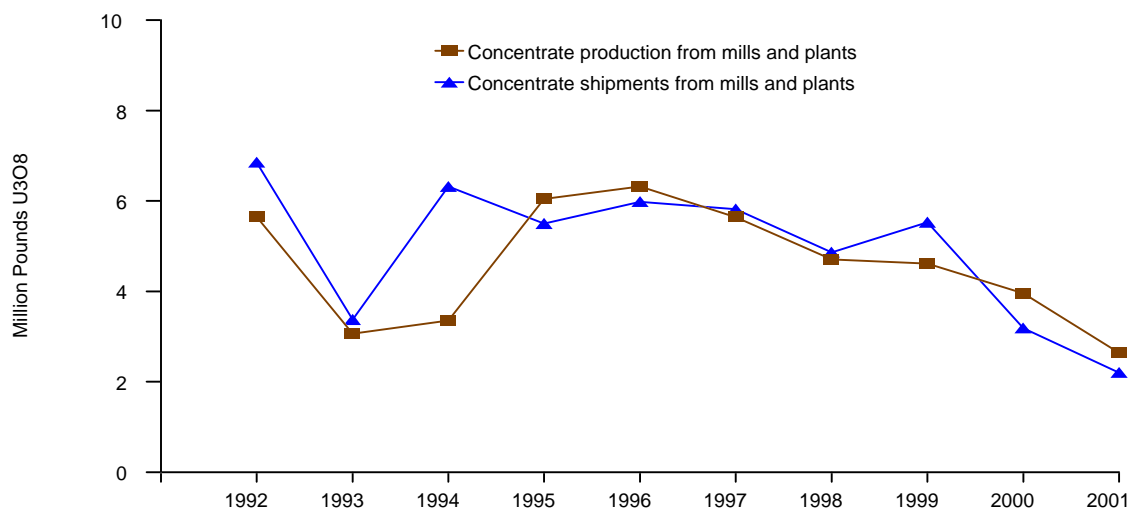
**Figure 4. Employment - U.S. Uranium Raw Materials Sector, 1992-2001**



**Figure 5. U.S. Uranium Exploration and Development Surface Drilling Expenditures, 1992-2001**



**Figure 6. U.S. Uranium Concentrate Production and Shipments, 1992-2001**



Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table 1. U.S. Uranium Land and Surface Drilling Activities, 1992-2001**

Year	Land Exploration		Surface Drilling Exploration			Surface Drilling Development			Surface Drilling Exploration and Development		
	Acres Acquired (thousand)	Acres Held at Year-End (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)
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
2000 ...	W	685	W	W	W	W	W	W	1,550	1,024	5,635
2001 ...	W	683	0	0	0	1,023	658	2,668	1,023	658	2,668

W=Data withheld to avoid disclosure.

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

Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table 2. Expenditures for Exploration and Development of Uranium in the United States, 1992-2001 (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
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
2000 .....	5,635	W	W	6,694	W	W
2001 .....	2,668	W	W	4,827	W	W

W=Data withheld to avoid disclosure.

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

Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table 3. U.S. Forward-Cost Uranium Reserves by Mining Method, 2001**

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	0.272	138	143	0.163	464
Openpit .....	10	0.139	29	163	0.079	257
In Situ Leaching .....	39	0.129	101	117	0.074	174
Other <sup>b</sup> .....	< 1	0.264	< 1	3	0.059	4
<b>Total .....</b>	<b>75</b>	<b>0.179</b>	<b>268</b>	<b>426</b>	<b>0.106</b>	<b>899</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" (2001).

**Table 4. U.S. Uranium Mine Production and Number of Mines and Sources, 1992-2001**

Mining Method	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Underground (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	W	0	0	0	W	W	W	W	W	0
Openpit (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	W	0	0	0	0	0	0	0	0	0
In Situ Leaching (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	W	W	2,448	3,372	4,379	4,084	3,721	3,830	2,995	W
Other <sup>a</sup> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	986	2,050	78	156	326	626	1,062	718	128	W
<b>Total Mine Production</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>3,123</b>	<b>2,647</b>
<b>Number of Mines Operated</b>										
Underground .....	4	0	0	0	1	1	4	3	1	0
Openpit .....	1	0	0	0	0	0	0	0	0	0
In Situ Leaching .....	4	5	5	5	6	7	6	6	4	3
Other Sources <sup>b</sup> .....	8	7	7	7	6	6	5	5	5	4
<b>Total Mines and Sources .....</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>	<b>10</b>	<b>7</b>

<sup>a</sup>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 2000, "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" through 2000.

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

Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table 5. U.S. Uranium Concentrate Processing Operations, 1992-2001**

Processing Operations	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Ore Fed to Process <sup>a</sup> (thousand tons).....	256	0	0	167	44	0	0	W	W	W
Percent U <sub>3</sub> O <sub>8</sub> <sup>b</sup> .....	0.229	—	—	0.520	0.500	—	—	W	W	W
Contained U <sub>3</sub> O <sub>8</sub> (thousand pounds) In Ore .....	1,171	0	0	1,739	444	0	0	W	W	W
Other Feed Materials <sup>c</sup> .....	181	42	78	163	409	911	387	W	W	W
Total Mill Feed (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	1,353	42	78	1,902	853	911	387	1,260	1,015	W
In-Process Inventory Change (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	-25	10	24	157	-137	52	-7	106	-133	W
<b>Concentrate Produced at Mills</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> )										
Theoretical <sup>d</sup> .....	1,377	31	54	1,744	990	859	393	1,154	1,164	W
<b>Actual</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>	<b>1,017</b>	<b>184</b>
Recovery as Percent .....	98.7	—	—	92.6	86.8	91.2	82.2	78.6	87.4	W
Tailings and Unaccountable (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	18	1	8	130	130	76	70	246	147	W
<b>Other Processing<sup>e</sup></b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>2,941</b>	<b>2,455</b>
<b>Total Uranium Concentrate Production</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>3,958</b>	<b>2,639</b>
<b>Total Concentrate Shipped From Mills and Plants</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>	<b>3,187</b>	<b>2,203</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: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).



**Table 6. Operating Status of Conventional Uranium Mills, End of the Year, 1998-2001**

Mill Owner(s)	Mill Name	Milling Capacity <sup>a</sup> (short tons of ore per day)	Operating Status at End of the Year			
			1998	1999	2000	2001
Cotter .....	Canon City	400	I	O	O	I
Dawn Mining .....	Dawn/Ford	450	I	I	I	I
Kennecott/Wyoming Coal Resources (Green Mountain Mining Venture) .....						
	Sweetwater	3,000	I	I	I	I
International Uranium .....	White Mesa	2,000	I	I	I	I
Rio Algom Mining .....	Ambrosia Lake	7,000	I	I	I	I
U.S. Energy/Plateau Resources ....	Shootaring	750	I	I	I	I

**Summary of Mill Status**

## Number of Mills

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

**Available Milling Capacity**

Operating (tons of ore per day) .....	--	--	0	400	400	0
Inactive (tons of ore per day) .....	--	--	14,400	13,200	13,200	13,600
Total Available Capacity (tons of ore per day) .....	--	--	14,400	13,600	13,600	13,600

<sup>a</sup>Milling capacity based on data reported on Form EIA-858 for 2001.<sup>b</sup>Number that milled uranium-bearing ore at the end of year.

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

-- = Not applicable.

Sources: Energy Information Administration: **1998-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).**Table 7. Operating Status of Nonconventional Uranium Plants, End of the Year 2001**

Plant Owner(s)	Plant Name	Plant Type	Rated Capacity <sup>a</sup>	Operating
			(thousand pounds U <sub>3</sub> O <sub>8</sub> per year)	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)
Malapai Resources .....	Christensen Ranch	In Situ Leach	650	I (R)
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
Rio Algom Mining .....	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 (Crow Butte Resources) .....				
	Crow Butte	In Situ Leach	1,000	O

<sup>a</sup>Capacity based on data reported on Form EIA-858 for 2001. NA = Not available.<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). O=Operating at the end of the year.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table 8. Employment in the U.S. Uranium Industry by Category, 1992-2001**  
(Person-Years)

Year	Employment Categories					Total
	Exploration	Mining	Milling	Processing	Reclamation <sup>a</sup>	
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
2000 ....	1	157	106	137	226	627
2001 ....	0	81	42	122	178	423

<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: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table 9. Employment in the U.S. Uranium Industry by State, 2001**  
(Person-Years)

State(s)	Total	Percent of Total
Wyoming .....	178	42
Colorado .....	76	18
Texas .....	46	11
Nebraska and New Mexico .....	85	20
Utah and Washington .....	37	9
<b>Total .....</b>	<b>423</b>	<b>100</b>

Notes: Totals may not equal sum of components because of independent rounding. Total employment includes 178 person years for reclamation.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

## 2. Uranium Marketing Activities in the United States

### Introduction

Owners and operators of U.S. civilian nuclear power reactors 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, producers, traders and uranium property holders. Foreign suppliers are non-U.S. based firms that market uranium into and from the United States. The U.S. uranium market transactions of both natural and enriched uranium during 2001 is illustrated in Figure 8. The uranium quantities throughout this chapter are expressed as  $U_3O_8$  equivalent ( $U_3O_8e$ ). Uranium market activities of owners and operators of U.S. civilian nuclear power reactors also include contracting for future supplies, unfilled uranium requirements, enrichment activities, the amount of uranium loaded into U.S. civilian nuclear power reactors, and the year-end status of uranium inventories.

### Uranium Market Activity of Owners and Operators of U.S. Civilian Nuclear Power Reactors

#### Uranium Purchases

In 2001, owners and operators of U.S. civilian nuclear power reactors received a total of 55.4 million pounds  $U_3O_8e$  (Figure 9), and the average price was \$10.15 per pound (Table 10 and Figure 10). Compared with 2000, the quantity is an increase of 7 percent, but a decrease in price of 8 percent. Foreign-origin uranium accounted for 42.2 million pounds (76 percent) of the deliveries (Figure 11) at an average price of \$10.05 per pound (Table 11). Approximately 24 percent of all uranium purchased was U.S.-origin (Table 12). In rank order, the top five foreign country origins were Canada (31 percent), Australia (19 percent), Russia (9 percent), Kazakhstan (6 percent), and Uzbekistan (5 percent) (Figure 12).

Owners and operators of U.S. civilian nuclear power reactors purchased uranium with 2001 deliveries from 26 suppliers, shown in the following list. Twelve of the 26 firms (designated with an asterisk) signed contracts in 2001 with uranium deliveries during 2001.

#### Uranium Sellers to Owners and Operators of U.S. Civilian Nuclear Power Reactors

British Nuclear Fuels  
Cameco\*  
COGEMA, Inc.\*  
ConverDyn  
Energy Resources of Australia  
Framatome ANP\*  
Globe Nuclear Services & Supply (GNSS)\*  
Itochu Corporation\*  
Nuclear Fuels Corp. of South Africa (NUFCOR)\*  
Palabora Mining  
Power Resources  
Rio Algom Mining  
Rio Grande Resources with Nuclear Fuels Corp.  
Riotinto (RTZ Minerals Services Limited)  
RWE NUKEM\*  
Siemens Power Corporation  
The Uranium Exchange Company  
UG U.S.A.\*  
Uranerz Exploration & Mining  
Urenco  
USEC, Inc.\*  
UUS, Inc.  
Westinghouse\*  
WMC (Olympic Dam)\*  
WOLFCO Trading\*  
World Wide Minerals

The owners and operators of U.S. civilian nuclear power reactors purchased uranium of several material types (Table 13). Uranium concentrate ( $U_3O_8$ ) accounted for 62 percent of the purchases, uranium hexafluoride ( $UF_6$ ) was 27 percent, and enriched uranium was 11 percent (Figure 13).

Domestic purchases of uranium (both U.S. and foreign-origin) in 2001 was 26.4 million pounds  $U_3O_8e$  (Table 14). The average price of these domestic purchases was \$10.45 per pound.

Foreign purchases of uranium (only foreign-origin) from foreign suppliers in 2001 totaled 28.0 million pounds  $U_3O_8$ . The average price of these foreign purchases was \$9.87 per pound.

### **Uranium Pricing Mechanisms, Price Distributions and Contract Types**

Contract-specified pricing mechanisms, which include fixed and base-escalated prices, accounted for 63 percent of the domestic purchases in 2001 by owners and operators of U.S. civilian nuclear power reactors (Table 14). Both spot-market and contract-specified pricing mechanisms almost equally represented foreign purchases of uranium.

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 owners and operators of U.S. civilian nuclear power reactors, sorted in increasing order by their overall average price for its deliveries in 2001, and provides the aggregated quantity and its average price for each distribution.

During 2001, 27 percent of the deliveries to owners and operators of U.S. civilian nuclear power reactors involved spot contracts, and the remaining 73 percent involved long-term contracts (Table 16). The average price for spot contracts was \$7.92 per pound, but for long-term contracts it was \$10.96 per pound. Enriched uranium was delivered mostly under long-term contracts in 2001 (Figure 14).

### **New Purchases**

The quantity of uranium delivered in 2001, under 29 purchase contracts signed in 2001, was 7.0 million pounds  $U_3O_8$ , and the average price was \$8.36 per pound (Table 17). Twenty-four new spot contracts accounted for 80 percent of the 2001 deliveries for these new purchase contracts.

Future deliveries reported for 2002 through 2011, for contracts signed in 2001, are between a minimum total of 49.2 million pounds to a maximum total of 76.2 million pounds (Table 18).

### **Anticipated Uranium Market Requirements**

Future deliveries for 2002-2011, based on owners and operators of U.S. civilian nuclear power reactors contracts reported in effect at the end of 2001, for all reported purchase contracts totaled a minimum 140.6 million pounds to a maximum of 218.9 million pounds (Table 19). Foreign suppliers would provide 55 percent of the existing maximum deliveries through 2011 (Figure 15 and Table 19).

At the end of 2001, cumulative unfilled uranium requirements for U.S. civilian nuclear reactors for 2002 through 2011 were reported to be 354.4 million pounds  $U_3O_8$  (Table 20). The quantity of maximum deliveries of uranium for the same period under existing purchase contracts totaled 218.9 million pounds (Table 21). These contracted deliveries and unfilled requirements combined represent the maximum anticipated market requirements of uranium. The total 10-year maximum requirements, as of year-end of 2001, was 573.3 million pounds.

The unfilled requirements category, as reported at the end of 2001, constitutes a small portion of maximum anticipated market requirements in 2002 (Figure 16). However, it increases to 73 percent of total maximum anticipated requirements by 2006 and to 92 percent by 2011. For the years 2003 through 2005, owners and operators of U.S. civilian nuclear power reactors maximum anticipated market requirements exceed their projected enrichment feed deliveries. However, for the years 2007 through 2011, the reported enrichment feed deliveries match their maximum anticipated market requirements (Figure 17).

### **Uranium Feed for Enrichment**

In 2001, owners and operators of U.S. civilian nuclear power reactors delivered 47.3 million pounds  $U_3O_8$  of natural uranium feed to domestic and foreign enrichment suppliers (Table 22). U.S.-origin uranium accounted for 11.3 million pounds (24 percent) of the feed deliveries (Table 23). Deliveries to U.S. enrichment plants accounted for 32.1 million pounds, or 68 percent of the total, and deliveries to

foreign enrichment plants was 15.2 million pounds, 32 percent of total feed deliveries in 2001.

U.S. civilian nuclear power reactors projected that the amount of natural uranium feed to be shipped for enrichment for the years 2002 through 2011 will vary between 52 million and 62 million pounds annually (Table 24).

### **Purchases of Enrichment Services**

In 2001, 10.4 million separative work units (SWU) were purchased by owners and operators of U.S. civilian nuclear power reactors under enrichment services contracts (Table 25). U.S. uranium enrichment plants provided 12 percent of the SWU and foreign enrichment plants the remaining 88 percent. The 8 firms that were reported as the sellers of enrichment services for these SWU deliveries in 2001 are shown in the following list.

#### **Enrichment Service Sellers to Owners and Operators of U.S. Civilian Nuclear Power Reactors**

China Nuclear Energy Industry Corp. (CNEIC)  
COGEMA, Inc.  
Framatome ANP  
Globe Nuclear Service & Supply (GNSS)  
RWE NUKEM  
Urenco  
USEC, Inc.  
Westinghouse

The long-term enrichment service contracts were dominant in 2001, and represented 94 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. civilian nuclear reactors during 2001 was 52.7 million pounds  $U_3O_8e$  (Table 27). This was 1.3 million pounds more than in 2000 (Figure 18).

## **Foreign Purchases of Uranium**

The owners and operators of U.S. civilian nuclear power reactors and U.S. suppliers purchased from foreign suppliers 46.7 million pounds  $U_3O_8e$  that was received in 2001 (Table 28). The average price for these foreign purchases was \$9.51 per pound  $U_3O_8e$ . This is 3 percent lower than the 2000 average price of \$9.84 per pound.

U.S. brokers and traders, a primary supplier of uranium, purchased 19.2 million pounds  $U_3O_8e$  of deliveries during 2001 at an average price of \$9.06 per pound (Table 29). Most of the uranium (18.3 million pounds or 95 percent) was from foreign suppliers. In 2000, by comparison, U.S. brokers and traders purchased 18.6 million pounds  $U_3O_8e$  at an average price of \$8.83 per pound (Figure 19).

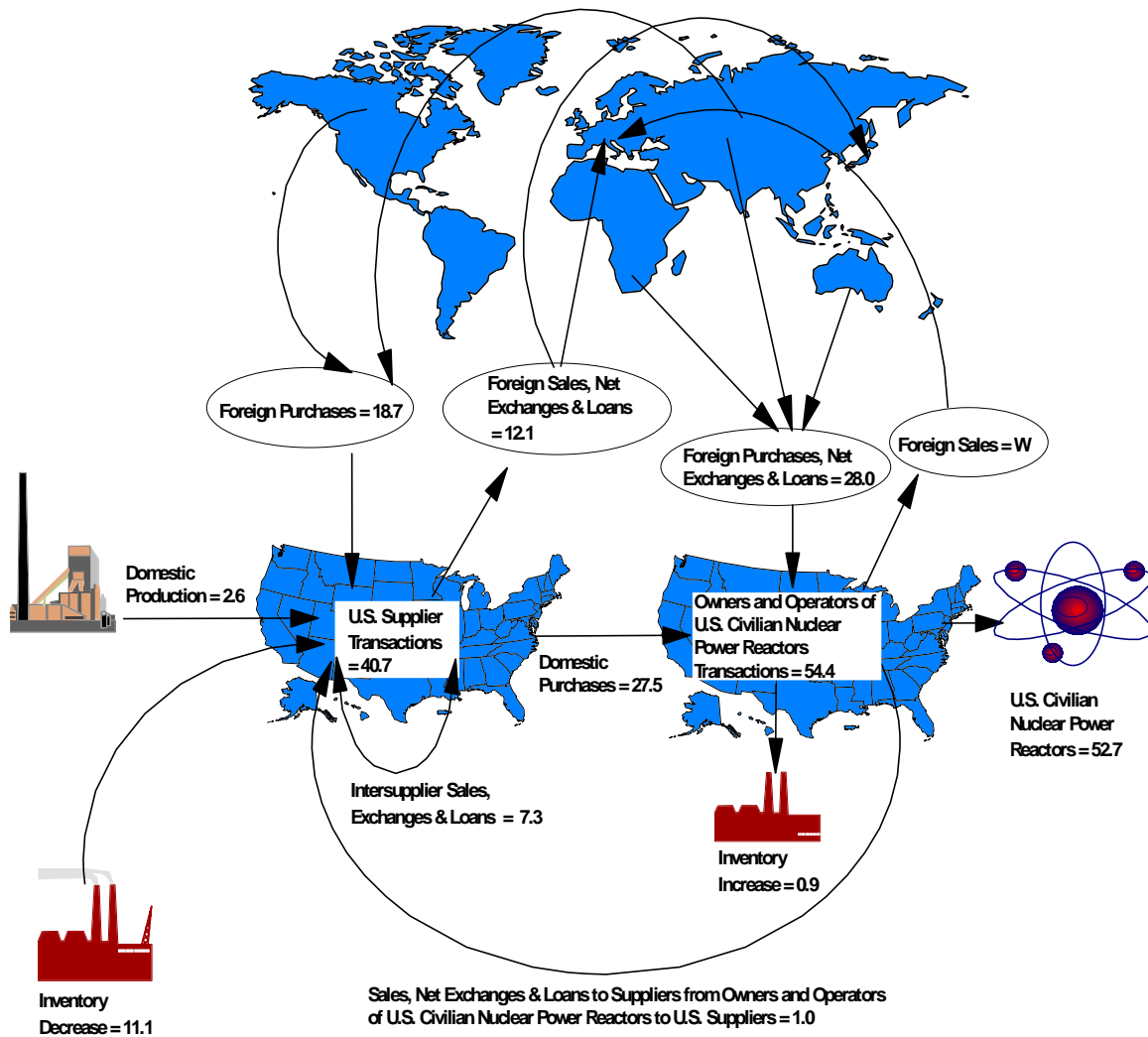
## **Foreign Sales of Uranium**

In 2001, uranium sold to foreign suppliers and foreign utilities totaled 11.7 million pounds  $U_3O_8e$ , 14 percent less than in 2000. The average price was \$8.79 per pound, 4 percent more than in 2000 (Table 30 and Figure 20). Of the foreign sales, 87 percent was foreign-origin and 13 percent was U.S.-origin uranium. U.S. brokers and traders sold 9.5 million pounds at an average price of \$8.07 per pound in 2001.

## **Uranium Inventories**

Total commercial inventories, as of December 31, 2001, were 101.1 million pounds  $U_3O_8e$ , a decrease of 10.2 million pounds from end of 2000 (Table 31). The owners and operators of U.S. civilian nuclear power reactors inventory level rose 0.9 million pounds, ending with 55.7 million pounds at the end of 2001 (Figure 21), but only the enriched uranium inventory increased from year-end 1999 to 2001 (Table 32 and Figure 22). Commercial natural and enriched  $UF_6$  inventories at the end of 2001 totaled 77.3 million pounds  $U_3O_8e$  (Table 33).

**Figure 8. Uranium Marketing Activity During 2001**

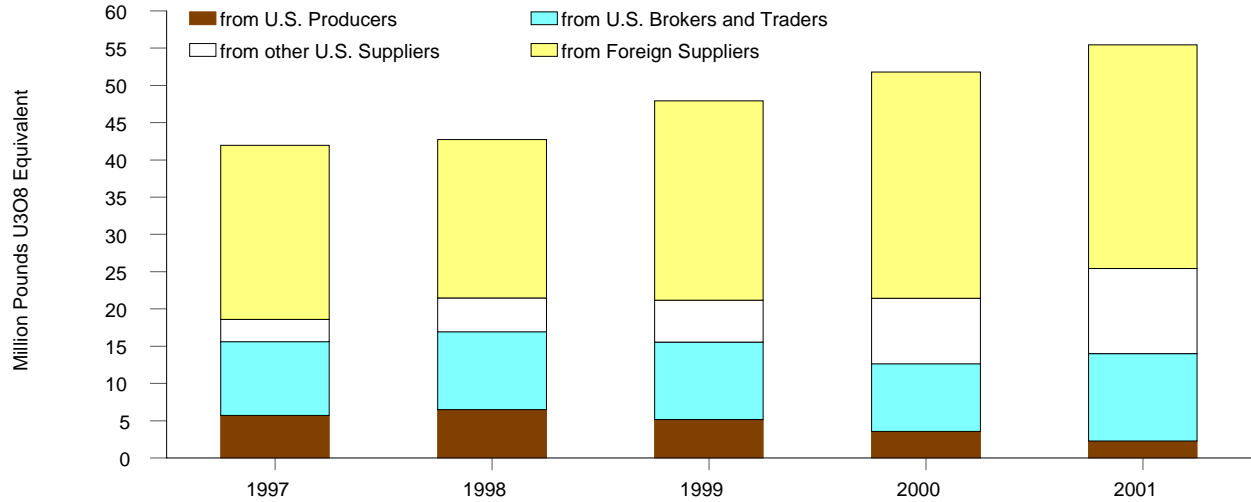


W = Data withheld to avoid disclosure.

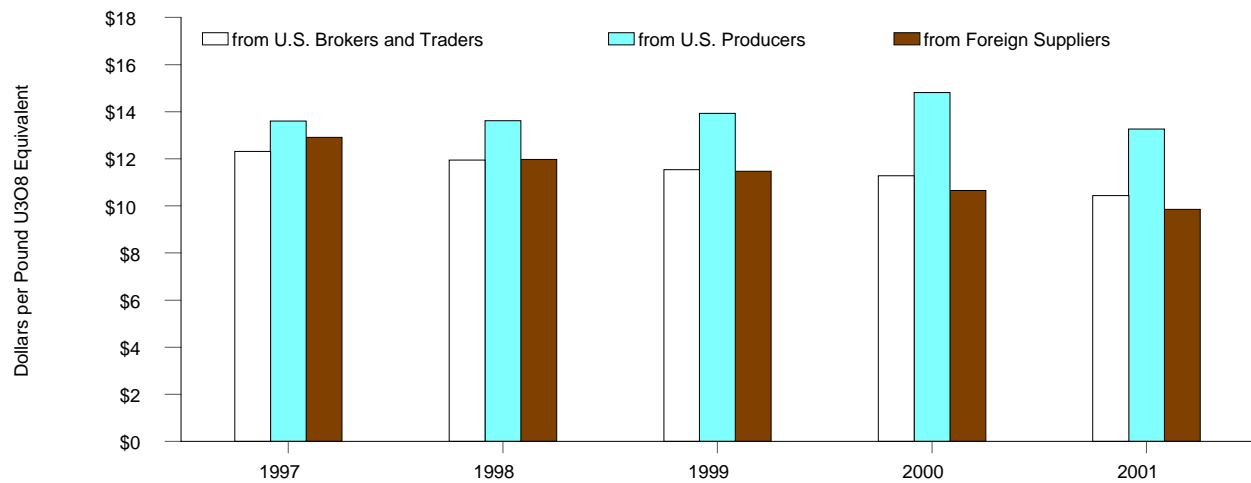
Note: Quantities are in million pounds U<sub>3</sub>O<sub>8</sub> equivalent.

Source: Prepared by the Energy Information Administration, Office of Coal Nuclear, Electric and Alternate Fuels, based on data reported on Form EIA-858 for 2001.

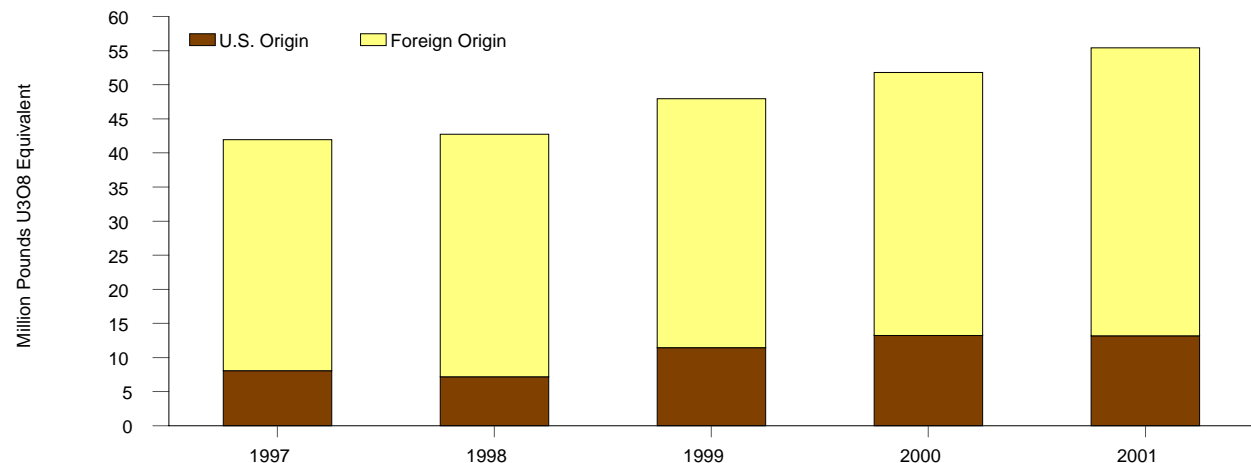
**Figure 9. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Supplier and Delivery Year, 1997-2001**



**Figure 10. Weighted-Average Price of Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Supplier and Delivery Year, 1997-2001**

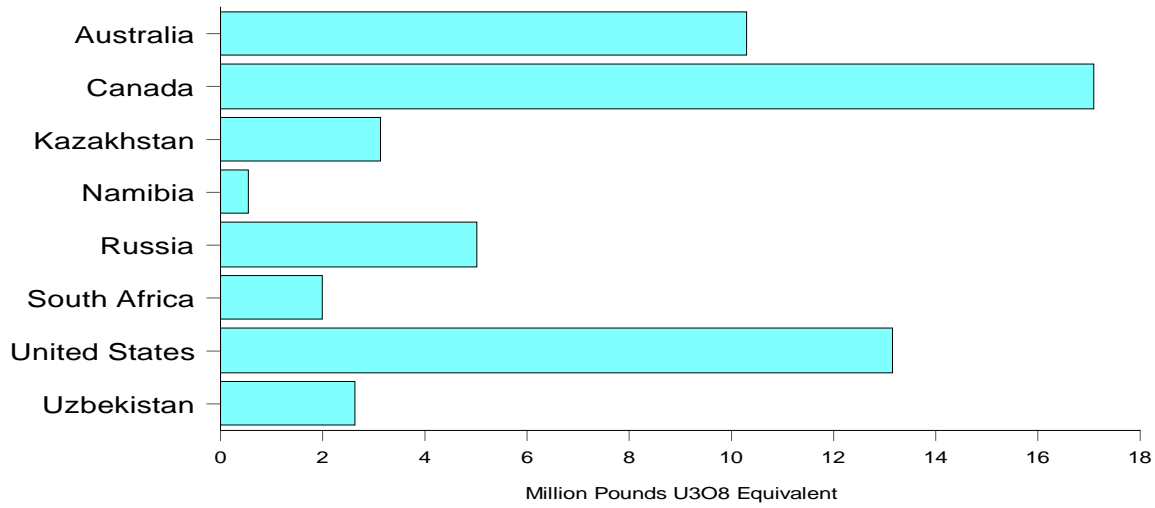


**Figure 11. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Origin and Delivery Year, 1997-2001**

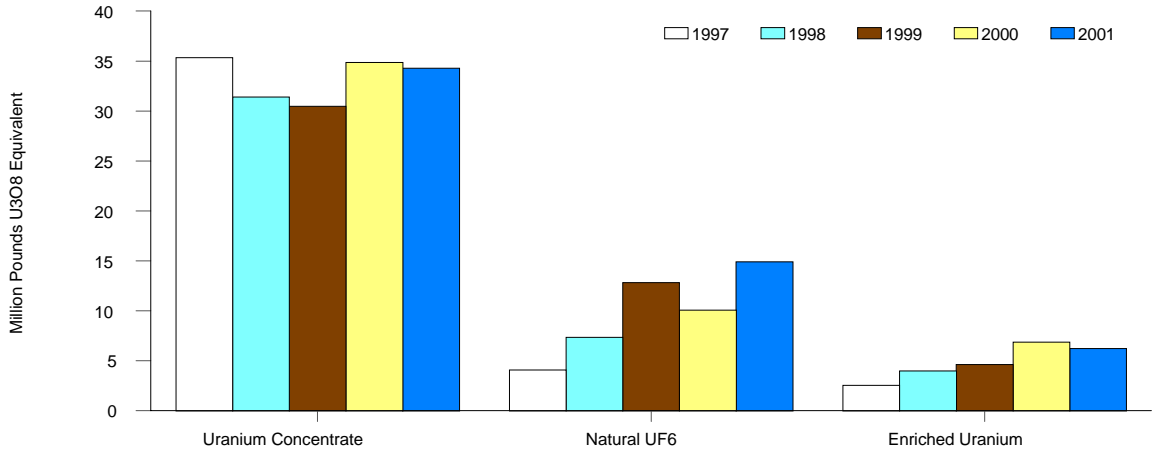


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

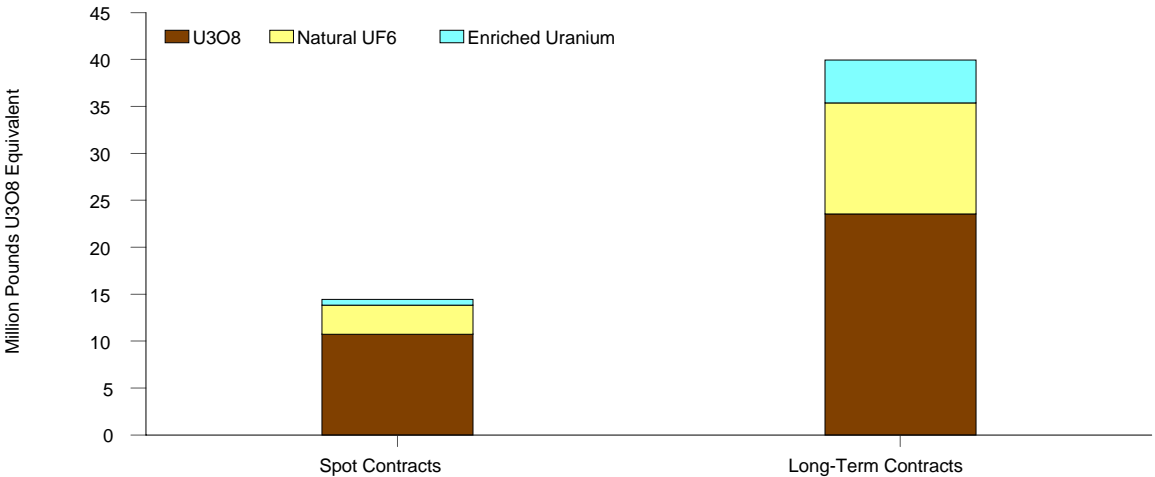
**Figure 12. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Selected Country Origin, 2001 Deliveries**



**Figure 13. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Material Type and Delivery Year, 1997-2001**



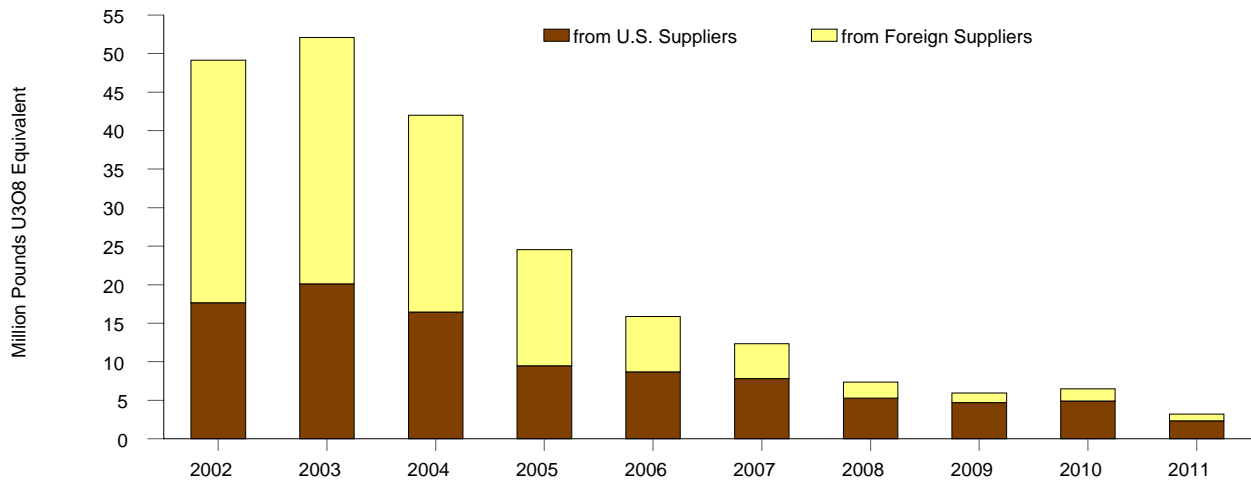
**Figure 14. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Contract Type and Material Type, 2001 Deliveries**



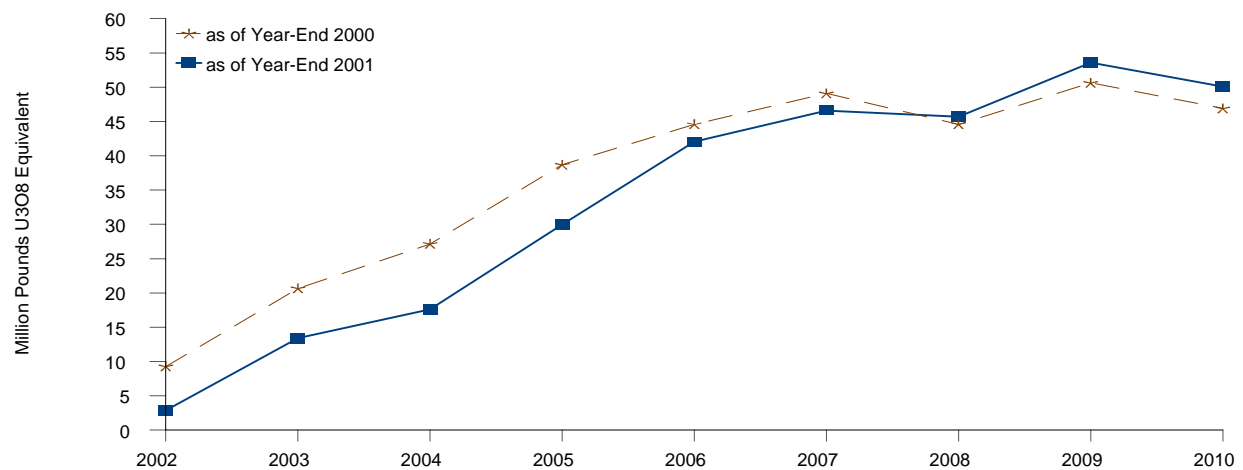
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).



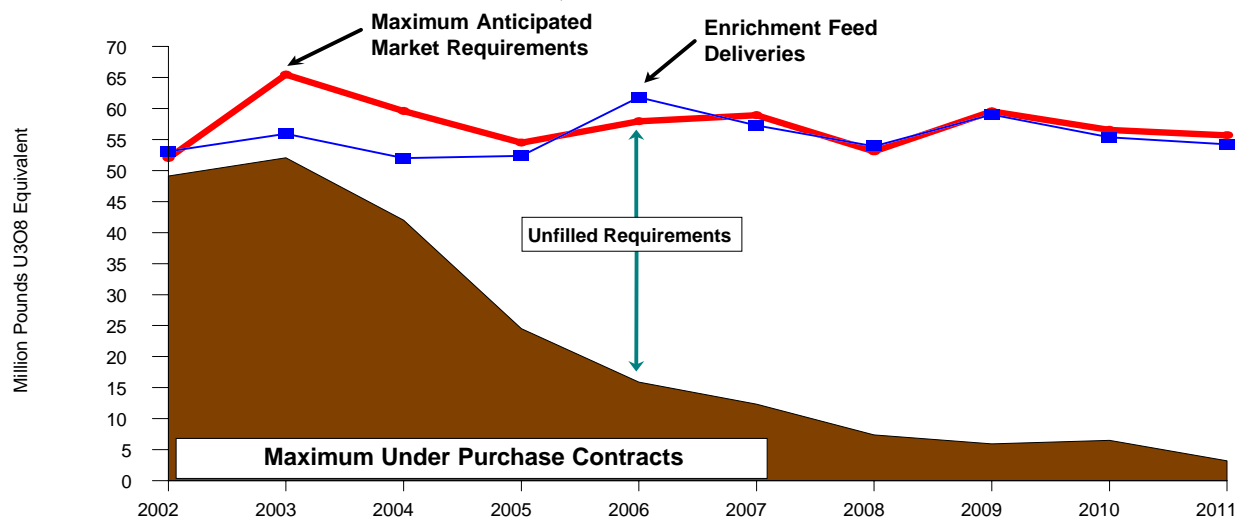
**Figure 15. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Purchases of Uranium by Supplier, Maximum, and Delivery Year, 2002-2011**



**Figure 16. Owners and Operators of U.S. Civilian Nuclear Power Reactors Annual Unfilled Uranium Requirements, 2002-2010**

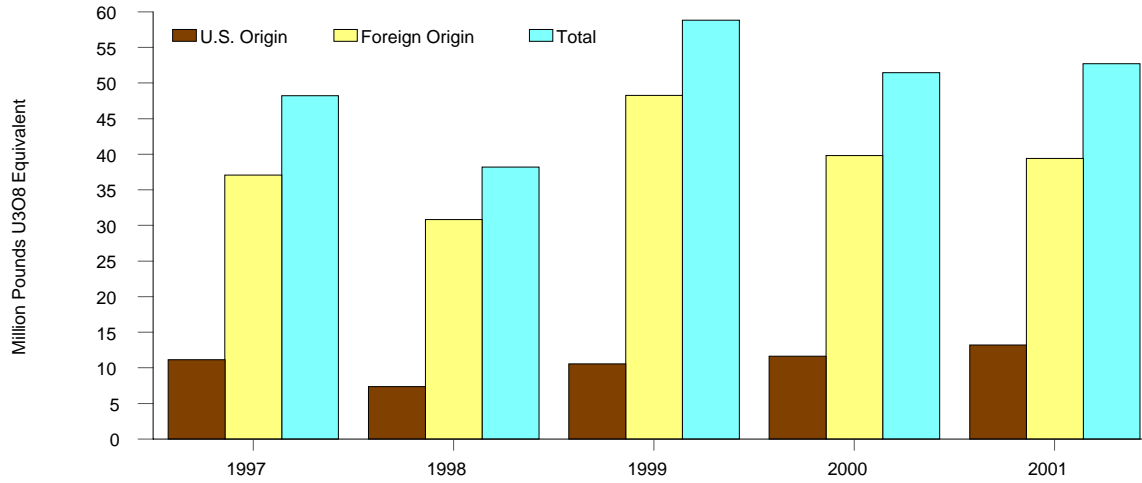


**Figure 17. Maximum Anticipated Uranium Market Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2002-2011**

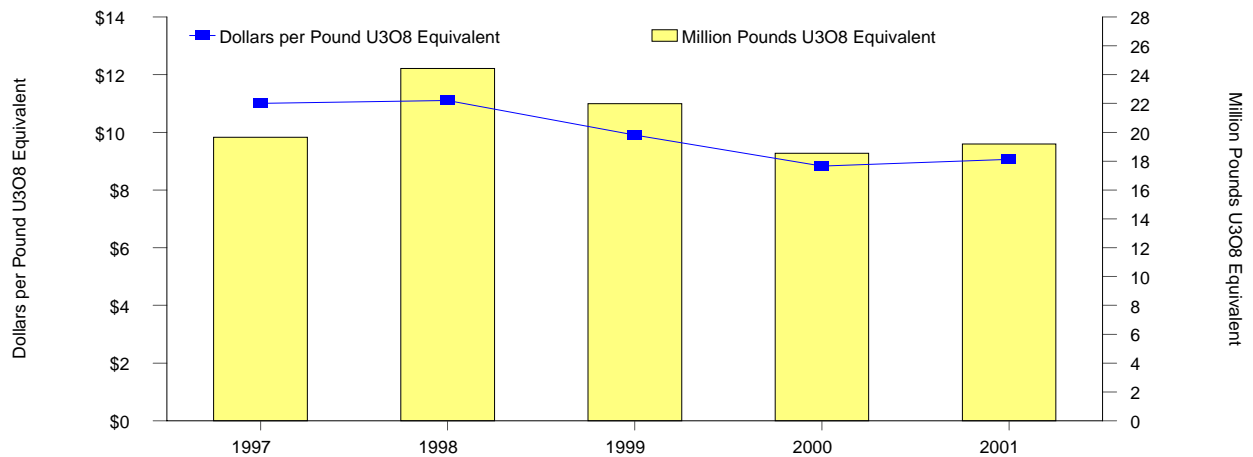


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

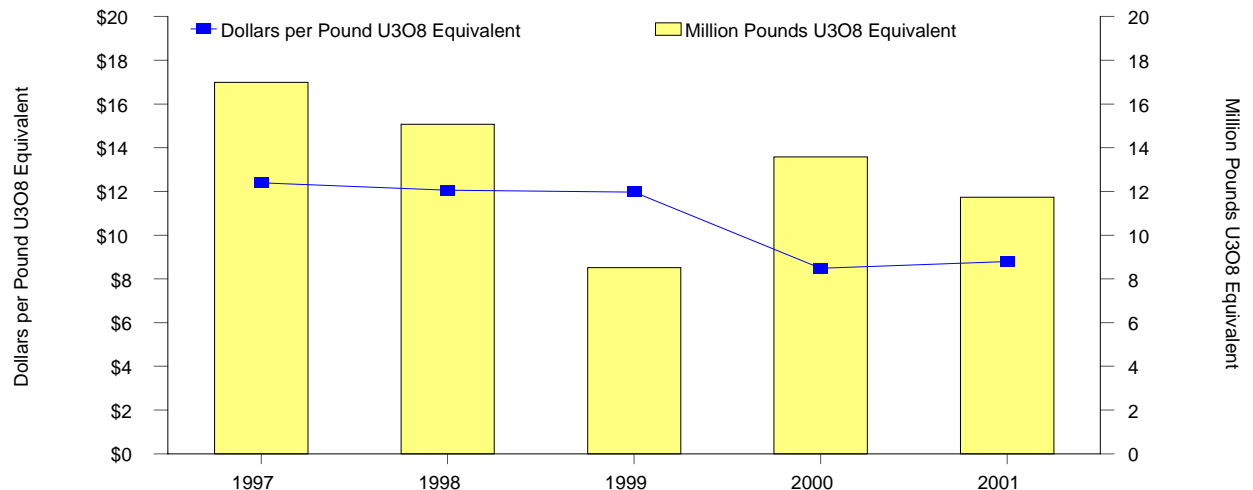
**Figure 18. Uranium in Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors by Year, 1997-2001**



**Figure 19. U.S. Broker and Trader Purchases of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1997-2001**

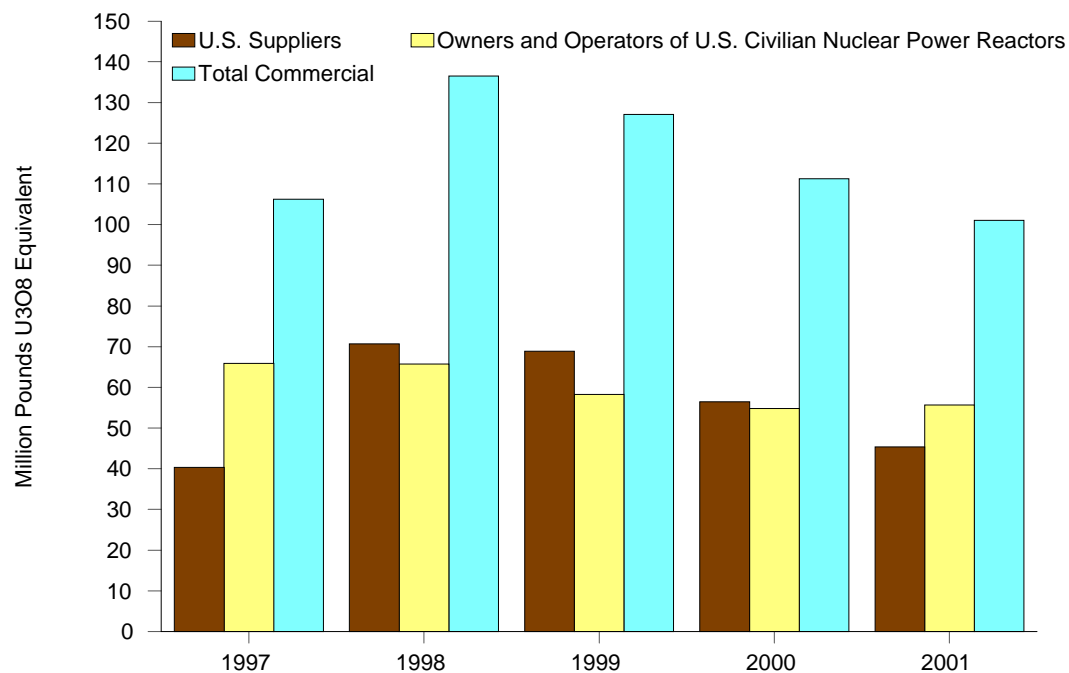


**Figure 20. Foreign Sales of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1997-2001**

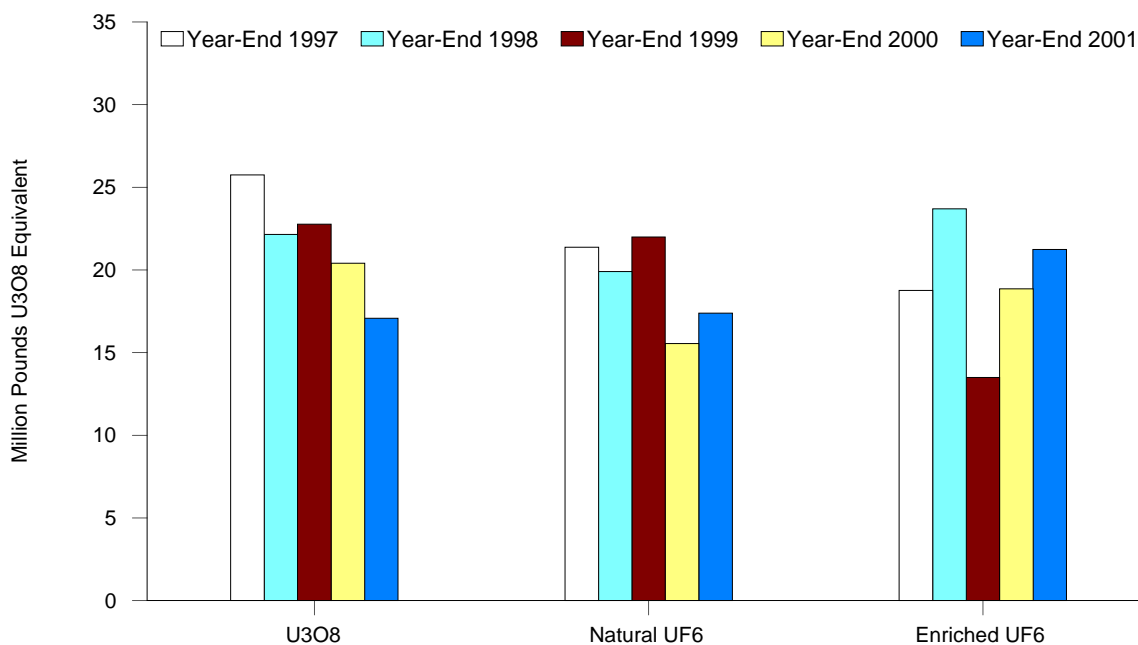


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Figure 21. Commercial Uranium Inventories at End of the Year, 1997-2001**



**Figure 22. Owners and Operators of U.S. Civilian Nuclear Power Reactors Uranium Inventories at End of the Year, 1997-2001**



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998-2001).

**Table 10. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1997	1998	1999	2000	2001
Received from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	5,732	6,488	5,161	3,560	2,302
Weighted-Average Price .....	13.60	13.61	13.93	14.81	13.26
Received from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	9,890	10,467	10,395	9,095	11,706
Weighted-Average Price .....	12.31	11.95	11.54	11.28	10.44
Received from other Owners and Operators of U.S. Civilian Nuclear Power Reactors:					
Purchases .....	W	W	W	0	0
Weighted-Average Price .....	W	W	W	—	—
Received from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	W	W	W	8,796	11,434
Weighted-Average Price .....	W	W	W	10.45	9.98
Received from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	23,361	21,252	26,767	30,359	29,984
Weighted-Average Price .....	12.91	11.97	11.47	10.65	9.86
<b>Total Received by Owners and Operators of U.S. Civilian Nuclear Power Reactors:</b>					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	<b>41,961</b>	<b>42,743</b>	<b>47,948</b>	<b>51,810</b>	<b>55,426</b>
Weighted-Average Price .....	<b>12.88</b>	<b>12.14</b>	<b>11.63</b>	<b>11.04</b>	<b>10.15</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" (1997-2001).

**Table 11. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1997	1998	1999	2000	2001
Received of U.S.-Origin Uranium:					
Purchases .....	8,072	7,181	11,448	13,258	13,187
Weighted-Average Price .....	13.36	13.37	12.24	11.52	10.50
Received of Foreign-Origin Uranium:					
Purchases .....	33,889	35,562	36,500	38,552	42,239
Weighted-Average Price .....	12.78	11.90	11.47	10.88	10.05
<b>Total:</b>					
Purchases .....	<b>41,961</b>	<b>42,743</b>	<b>47,948</b>	<b>51,810</b>	<b>55,426</b>
Weighted-Average Price .....	<b>12.88</b>	<b>12.14</b>	<b>11.63</b>	<b>11.04</b>	<b>10.15</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table 12. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Origin Country and Delivery Year, 1999-2001**  
(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	Deliveries in 1999		Deliveries in 2000		Deliveries in 2001	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
<b>All Purchases:</b>						
Australia .....	7,319	10.93	12,722	9.20	10,314	9.51
Bulgaria .....	0	—	W	W	W	W
Canada .....	12,489	11.26	10,455	11.20	17,120	9.91
China .....	695	12.14	621	11.56	W	W
Czech Republic .....	W	W	842	9.89	0	—
France .....	554	9.97	W	W	W	W
Gabon .....	0	—	0	—	W	W
Germany .....	W	W	0	—	W	W
Kazakhstan .....	W	W	W	W	3,149	7.95
Namibia .....	1,061	12.99	753	15.51	568	15.71
Niger .....	W	W	723	12.07	W	W
Russia .....	6,313	12.87	6,686	13.17	5,042	10.84
South Africa .....	2,719	10.72	2,347	8.96	2,022	10.36
Ukraine .....	2,008	8.98	W	W	0	—
Uzbekistan .....	2,273	12.64	1,923	12.96	2,643	12.30
<b>Total Foreign .....</b>	<b>36,500</b>	<b>11.47</b>	<b>38,552</b>	<b>10.88</b>	<b>42,239</b>	<b>10.05</b>
United States .....	11,448	12.24	13,258	11.52	13,187	10.50
<b>Total Purchases .....</b>	<b>47,948</b>	<b>11.63</b>	<b>51,810</b>	<b>11.04</b>	<b>55,426</b>	<b>10.15</b>
<b>Domestic Purchases:</b>						
Australia .....	932	11.31	3,005	9.47	1,884	10.22
Canada .....	1,350	11.07	1,471	11.84	4,527	11.26
China .....	W	W	W	W	W	W
France .....	W	W	W	W	W	W
Germany .....	W	W	0	—	W	W
Kazakhstan .....	W	W	W	W	2,452	7.89
Namibia .....	W	W	W	W	W	W
Niger .....	W	W	723	12.07	W	W
Russia .....	1,726	14.08	1,688	14.08	2,127	10.91
South Africa .....	1,262	11.52	1,054	8.99	575	12.58
Ukraine .....	W	W	W	W	0	—
Uzbekistan .....	W	W	W	W	W	W
United States .....	11,448	12.24	13,258	11.52	13,187	10.50
<b>Total Domestic Purchases .....</b>	<b>21,371</b>	<b>11.88</b>	<b>24,285</b>	<b>11.45</b>	<b>27,473</b>	<b>10.45</b>
<b>Foreign Purchases:</b>						
Australia .....	6,387	10.88	9,717	9.13	8,430	9.35
Bulgaria .....	0	—	W	W	W	W
Canada .....	11,139	11.28	8,984	11.10	12,593	9.42
China .....	W	W	W	W	W	W
Czech Republic .....	W	W	842	9.89	0	—
France .....	W	W	0	—	0	—
Gabon .....	0	—	0	—	W	W
Germany .....	W	W	0	—	0	—
Kazakhstan .....	0	—	0	—	697	8.14
Namibia .....	W	W	W	W	W	W
Niger .....	W	W	0	—	W	W
Russia .....	4,587	12.41	4,998	12.84	2,915	10.81
South Africa .....	1,457	10.02	1,293	8.95	1,447	9.48
Ukraine .....	W	W	W	W	0	—
Uzbekistan .....	W	W	W	W	W	W
<b>Total Foreign Purchases .....</b>	<b>26,577</b>	<b>11.45</b>	<b>27,525</b>	<b>10.68</b>	<b>27,953</b>	<b>9.87</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999-2001).

**Table 13. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Origin and Material Type, 2001 Deliveries**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	U <sub>3</sub> O <sub>8</sub>	Natural UF <sub>6</sub>	Enriched Uranium	Total
<b>Received of U.S.-Origin Uranium:</b>				
Purchases .....	3,332	5,845	4,010	13,187
Weighted-Average Price .....	10.91	9.43	11.96	10.50
<b>Received of Foreign-Origin Uranium:</b>				
Purchases .....	30,952	9,070	2,217	42,239
Weighted-Average Price .....	10.29	9.66	8.00	10.05
<b>Total:</b>				
Purchases .....	<b>34,284</b>	<b>14,915</b>	<b>6,227</b>	<b>55,426</b>
Weighted-Average Price .....	<b>10.35</b>	<b>9.57</b>	<b>10.54</b>	<b>10.15</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table 14. Average Price and Quantity for Purchased Uranium by Owners and Operators of U.S. Civilian Nuclear Power Reactors by Pricing Mechanisms and Delivery Year, 2000-2001**  
(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	
	2000	2001	2000	2001	2000	2001
<b>Contract-Specified Pricing</b>						
Weighted-Average Price .....	12.31	11.72	13.11	11.47	12.65	11.61
Quantity with Reported Price .....	16,551	16,549	12,012	11,904	28,563	28,453
<b>Spot-Market Pricing</b>						
Weighted-Average Price .....	9.11	8.04	8.56	8.64	8.73	8.42
Quantity with Reported Price .....	5,169	6,517	11,571	11,225	16,740	17,742
<b>Other Pricing</b>						
Weighted-Average Price .....	9.68	8.87	9.14	8.80	9.29	8.83
Quantity with Reported Price .....	1,172	3,377	3,006	4,824	4,178	8,201
<b>All Pricing Mechanisms</b>						
Weighted-Average Price .....	<b>11.45</b>	<b>10.45</b>	<b>10.68</b>	<b>9.87</b>	<b>11.04</b>	<b>10.15</b>
Quantity with Reported Price .....	<b>22,892</b>	<b>26,443</b>	<b>26,589</b>	<b>27,953</b>	<b>49,481</b>	<b>54,396</b>

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

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2000-2001).

**Table 15. Price Distributions of Uranium Purchases by Owners and Operators of U.S. Civilian Nuclear Power Reactors by Delivery Year, 1999-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Distributions	Deliveries in 1999		Deliveries in 2000		Deliveries in 2001	
	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 .....	5,697	8.60	6,185	7.02	6,800	6.93
Second .....	5,697	9.23	6,185	7.96	6,800	7.50
Third .....	5,697	9.82	6,185	8.94	6,800	8.32
Fourth .....	5,697	10.18	6,185	9.55	6,800	8.80
Fifth .....	5,697	11.12	6,185	10.27	6,800	9.19
Sixth .....	5,697	12.70	6,185	12.26	6,800	10.31
Seventh .....	5,697	14.08	6,185	14.19	6,800	13.09
Eighth .....	5,697	17.32	6,185	18.11	6,800	17.07
<b>Total .....</b>	<b>45,577</b>	<b>11.63</b>	<b>49,481</b>	<b>11.04</b>	<b>54,396</b>	<b>10.15</b>
<b>Quartile<sup>b</sup>:</b>						
First .....	8,575	9.76	7,404	8.42	9,778	8.18
Second .....	19,535	11.05	16,148	9.89	11,170	8.89
Third .....	10,611	12.26	14,511	11.03	21,585	10.08
Fourth .....	6,856	14.68	11,418	14.37	11,863	13.09
<b>Total .....</b>	<b>45,577</b>	<b>11.63</b>	<b>49,481</b>	<b>11.04</b>	<b>54,396</b>	<b>10.15</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 respondent'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" (1999-2001).

**Table 16. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Contract Type and Material Type, 2001 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		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
U <sub>3</sub> O <sub>8</sub> .....	10,751	8.09	23,533	11.38	34,284	10.35
Natural UF <sub>6</sub> .....	3,068	7.61	11,847	10.08	14,915	9.57
Enriched Uranium .....	622	6.61	4,575	11.08	5,197	10.54
<b>Total .....</b>	<b>14,441</b>	<b>7.92</b>	<b>39,955</b>	<b>10.96</b>	<b>54,396</b>	<b>10.15</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table 17. Contracts Signed by Owners and Operators of U.S. Civilian Nuclear Power Reactors in 2001 by Contract Type with 2001 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 Deliveries Received in 2001	Weighted-Average Price	Number of Purchase Contracts
Spot .....	5,609	8.28	24
Long-Term .....	1,373	8.67	5
<b>Total .....</b>	<b>6,982</b>	<b>8.36</b>	<b>29</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table 18. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Purchases of Uranium, Signed in 2001, by Delivery Year, 2002-2011**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Delivery	Minimum	Maximum
2002 .....	9,498	11,126
2003 .....	12,312	17,369
2004 .....	11,488	15,490
2005 .....	8,175	12,025
2006 .....	3,639	7,124
2007 .....	2,213	4,364
2008 .....	1,920	3,933
2009 .....	0	2,608
2010 .....	0	1,075
2011 .....	0	1,044
<b>Total .....</b>	<b>49,245</b>	<b>76,158</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).



**Table 19. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Purchases of Uranium from Suppliers, in Effect at the End of 2001, by Delivery Year, 2002-2011**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Delivery	Contracted Purchases from U.S. Suppliers		Contracted Purchases from Foreign Suppliers		Contracted Purchases from All Suppliers	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
2002 .....	14,132	17,655	24,133	31,469	38,265	49,124
2003 .....	14,924	20,099	23,696	31,971	38,620	52,070
2004 .....	13,128	16,446	18,151	25,549	31,279	41,995
2005 .....	5,758	9,470	9,935	15,065	15,693	24,535
2006 .....	4,320	8,685	4,092	7,198	8,412	15,883
2007 .....	2,439	7,824	2,176	4,505	4,615	12,329
2008 .....	2,488	5,312	0	2,052	2,488	7,364
2009 .....	0	4,719	623	1,216	623	5,935
2010 .....	0	4,905	635	1,589	635	6,494
2011 .....	0	2,344	0	848	0	3,192
<b>Total .....</b>	<b>57,189</b>	<b>97,459</b>	<b>83,441</b>	<b>121,462</b>	<b>140,630</b>	<b>218,921</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table 20. Unfilled Uranium Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2002-2011**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year	As of December 31, 2000		As of December 31, 2001	
	Annual	Cumulative	Annual	Cumulative
2002 .....	9,279	9,279	2,885	2,885
2003 .....	20,646	29,925	13,385	16,270
2004 .....	27,132	57,057	17,593	33,863
2005 .....	38,690	95,747	29,965	63,828
2006 .....	44,577	140,324	42,068	105,896
2007 .....	49,094	189,418	46,597	152,493
2008 .....	44,584	234,002	45,716	198,209
2009 .....	50,620	284,622	53,599	251,808
2010 .....	46,893	331,515	50,061	301,869
2011 .....	NR	—	52,504	354,373

NR = Not Reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2000-2001).

**Table 21. Maximum Anticipated Uranium Market Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2002-2011, as of December 31, 2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year	Maximum Under Purchase Contracts	Unfilled Requirements	Maximum Anticipated Market Requirements	Enrichment Feed Deliveries
2002 .....	49,124	2,885	52,009	53,084
2003 .....	52,070	13,385	65,455	55,925
2004 .....	41,995	17,593	59,588	52,008
2005 .....	24,535	29,965	54,500	52,381
2006 .....	15,883	42,068	57,951	61,791
2007 .....	12,329	46,597	58,926	57,267
2008 .....	7,364	45,716	53,080	53,943
2009 .....	5,935	53,599	59,534	59,029
2010 .....	6,494	50,061	56,555	55,351
2011 .....	3,192	52,504	55,696	54,221
<b>Total .....</b>	<b>218,921</b>	<b>354,373</b>	<b>573,294</b>	<b>555,000</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table 22. Owners and Operators of U.S. Civilian Nuclear Power Reactors Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1999-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Enrichment Plant Location	Deliveries in 1999			Deliveries in 2000			Deliveries in 2001		
	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total
China .....	0	W	W	0	776	776	0	W	W
France .....	278	4,994	5,272	557	3,685	4,242	552	4,786	5,338
Germany .....	0	1,385	1,385	W	W	2,210	0	1,589	1,589
Netherlands .....	0	W	W	W	W	1,633	0	W	W
Russia .....	0	1,136	1,136	W	W	1,977	W	W	935
United Kingdom .....	179	3,362	3,541	392	6,120	6,512	W	W	3,072
Europe <sup>a</sup> (France, Germany, Netherlands, or United Kingdom) and other .....	—	—	—	W	W	1,571	243	3,016	3,259
<b>Foreign Total .....</b>	<b>457</b>	<b>12,083</b>	<b>12,540</b>	<b>1,244</b>	<b>17,667</b>	<b>18,921</b>	<b>914</b>	<b>14,324</b>	<b>15,238</b>
United States .....	6,264	25,105	31,369	9,272	19,654	28,926	10,402	21,696	32,098
<b>Total .....</b>	<b>6,721</b>	<b>37,188</b>	<b>43,909</b>	<b>10,516</b>	<b>37,331</b>	<b>47,847</b>	<b>11,316</b>	<b>36,020</b>	<b>47,336</b>

<sup>a</sup>Specific country in Europe was not reported.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999-2001).

**Table 23. Owners and Operators of U.S. Civilian Nuclear Power Reactors Deliveries of Uranium Feed for Enrichment by Origin Country and Delivery Year, 1999-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin Country of Feed	Deliveries in 1999			Deliveries in 2000			Deliveries in 2001		
	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 .....	3,017	1,888	4,905	4,886	2,065	6,951	5,474	2,393	7,867
Brazil .....	W	W	W	0	0	0	0	0	0
Bulgaria .....	0	W	W	0	W	W	0	W	W
Canada .....	10,643	2,816	13,459	6,742	7,887	14,629	6,487	6,240	12,727
China .....	W	W	521	W	W	702	W	W	676
Czech Republic .....	0	W	W	0	W	W	0	0	0
France .....	W	W	555	0	W	W	0	0	0
Gabon .....	0	0	0	0	0	0	W	0	W
Germany .....	W	W	492	0	0	0	W	0	W
Kazakhstan .....	W	W	567	0	1,459	1,459	866	1,854	2,720
Namibia .....	W	W	552	W	W	862	W	W	221
Niger .....	W	W	673	0	486	486	W	W	W
Russia .....	6,128	782	6,910	5,823	784	6,607	W	W	6,748
South Africa .....	2,450	370	2,820	889	1,153	2,042	1,295	861	2,156
Tajikistan .....	W	0	W	W	0	W	W	0	W
Ukraine .....	0	3,169	3,169	0	1,211	1,211	0	W	W
Uzbekistan .....	1,388	919	2,307	571	858	1,429	637	705	1,342
Yugoslavia .....	W	0	W	0	0	0	0	0	0
<b>Foreign Total .....</b>	<b>25,105</b>	<b>12,083</b>	<b>37,188</b>	<b>19,654</b>	<b>17,677</b>	<b>37,331</b>	<b>21,696</b>	<b>14,324</b>	<b>36,020</b>
United States .....	6,264	457	6,721	9,272	1,244	10,516	10,402	914	11,316
<b>Total .....</b>	<b>31,369</b>	<b>12,540</b>	<b>43,909</b>	<b>28,926</b>	<b>18,921</b>	<b>47,847</b>	<b>32,098</b>	<b>15,238</b>	<b>47,336</b>

W = Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1999-2001).

**Table 24. Shipments of Uranium Feed by Owners and Operators of U.S. Civilian Nuclear Power Reactors to Domestic and Foreign Enrichment Suppliers, 2002-2011**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Shipment	Amount to be Shipped		Change from 2000 to 2001	
	As of December 31, 2000	As of December 31, 2001	Annual	Cumulative
2002 .....	48,388	53,084	4,696	4,696
2003 .....	58,320	55,925	-2,395	2,301
2004 .....	53,145	52,008	-1,137	1,164
2005 .....	49,373	52,381	3,008	4,172
2006 .....	52,703	61,791	9,088	13,260
2007 .....	56,640	57,267	627	13,887
2008 .....	48,513	53,943	5,430	19,317
2009 .....	54,024	59,029	5,005	24,322
2010 .....	51,884	55,351	3,467	27,789
2011 .....	NR	54,221	—	—

NR = Not reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2000-2001).

**Table 25. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchases of Enrichment Services by Origin Country and Delivery Year, 1997-2001**  
(Thousand Separative Work Units (SWU))

Deliveries	1997	1998	1999	2000	2001
<b>Country where Enrichment Service was performed:</b>					
China .....	W	W	145	292	W
France .....	734	696	822	1,010	1,368
Germany .....	W	W	302	554	412
Netherlands .....	0	323	245	471	224
Russia .....	1,765	2,364	3,424	2,931	5,790
United Kingdom .....	119	376	487	1,040	659
Europe <sup>a</sup> (France, Germany, Netherlands, or United Kingdom) and other .....	—	—	—	344	W
<b>Foreign Total .....</b>	<b>2,865</b>	<b>4,401</b>	<b>5,425</b>	<b>6,642</b>	<b>9,107</b>
United States .....	6,013	5,677	4,602	5,155	1,295
<b>Total .....</b>	<b>8,878</b>	<b>10,079</b>	<b>10,028</b>	<b>11,797</b>	<b>10,402</b>

<sup>a</sup>Specific country in Europe was not reported.

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" (1997-2001).

**Table 26. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchases of Enrichment Services by Contract Type in Delivery Year, 2001**  
(Thousand Separative Work Units (SWU))

Enrichment Service Contract Type	U.S. Enrichment	Foreign Enrichment	Total
Spot .....	W	W	655
Long-Term .....	W	W	9,747
<b>Total .....</b>	<b>1,295</b>	<b>9,107</b>	<b>10,402</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" (2001).

**Table 27. Uranium in Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors by Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin of Uranium	1997	1998	1999	2000	2001 <sup>P</sup>
Domestic-Origin Uranium .....	11,135	7,388	10,583	11,640	13,235
Foreign-Origin Uranium .....	37,069	30,811	48,244	39,829	39,496
<b>Total .....</b>	<b>48,204</b>	<b>38,199</b>	<b>58,827</b>	<b>51,469</b>	<b>52,731</b>

P = Preliminary data. Final 2000 fuel assembly data reported in the 2001 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" (1998-2001).

**Table 28. Foreign Purchases of Uranium by U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors by Delivery Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1997	1998	1999	2000	2001
<b>U.S. Suppliers:</b>					
Foreign Purchases .....	20,425	22,605	20,998	17,386	18,727
Weighted-Average Price .....	10.61	10.50	9.42	8.45	8.98
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors:</b>					
Foreign Purchases .....	22,545	21,102	26,577	27,525	27,953
Weighted-Average Price .....	12.89	11.96	11.45	10.68	9.87
<b>Total:</b>					
Foreign Purchases .....	<b>42,970</b>	<b>43,707</b>	<b>47,575</b>	<b>44,911</b>	<b>46,680</b>
Weighted-Average Price .....	<b>11.81</b>	<b>11.19</b>	<b>10.55</b>	<b>9.84</b>	<b>9.51</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table 29. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1997	1998	1999	2000	2001
<b>Received U.S.-Origin Uranium:</b>					
Purchases .....	3,162	2,732	3,301	2,965	1,194
Weighted-Average Price .....	12.78	13.50	12.85	10.92	10.38
<b>Received Foreign-Origin Uranium:</b>					
Purchases .....	16,501	21,686	18,679	15,591	17,999
Weighted-Average Price .....	10.66	10.80	9.39	8.44	8.97
<b>Total Received by U.S. Brokers and Traders:</b>					
Purchases .....	<b>19,663</b>	<b>24,418</b>	<b>21,980</b>	<b>18,556</b>	<b>19,193</b>
Weighted-Average Price .....	<b>11.00</b>	<b>11.10</b>	<b>9.91</b>	<b>8.83</b>	<b>9.06</b>
<b>Received from Foreign Suppliers:</b>					
Purchases .....	15,703	21,651	19,239	15,803	18,264
Weighted-Average Price .....	10.71	10.77	9.60	8.61	8.87

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table 30. Foreign Sales of Uranium from U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors by Origin and Delivery Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries to Foreign Suppliers and Utilities	1997	1998	1999	2000	2001
<b>U.S.-Origin Uranium:</b>					
Foreign Sales .....	6,472	3,904	3,795	1,044	1,545
Weighted-Average Price .....	14.81	15.75	13.60	13.60	11.84
<b>Foreign-Origin Uranium:</b>					
Foreign Sales .....	10,517	11,170	4,715	12,534	10,186
Weighted-Average Price .....	10.90	10.76	10.92	8.09	8.33
<b>Total Sent:</b>					
<b>Foreign Sales .....</b>	<b>16,989</b>	<b>15,074</b>	<b>8,510</b>	<b>13,578</b>	<b>11,731</b>
<b>Weighted-Average Price .....</b>	<b>12.39</b>	<b>12.05</b>	<b>11.97</b>	<b>8.48</b>	<b>8.79</b>
<b>From U.S. Producers, Owners and Operators of U.S. Civilian Nuclear Power Reactors, and other U.S. Suppliers:</b>					
Foreign Sales .....	8,584	4,565	3,761	2,369	2,195
Weighted-Average Price .....	13.05	14.39	14.58	11.62	11.95
<b>From U.S. Brokers and Traders:</b>					
Foreign Sales .....	8,405	10,509	4,749	11,209	9,536
Weighted-Average Price .....	11.72	11.04	10.32	8.06	8.07

Note: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators.  
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table 31. Inventories of Natural and Enriched Uranium as of End of Year, 1997-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1997	1998	1999	2000	2001 <sup>P</sup>
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors Inventories .....</b>					
Natural Uranium .....	47,123	42,051	44,761	35,952	34,467
Enriched Uranium <sup>a</sup> .....	18,753	23,708	13,488	18,851	21,244
<b>U.S. Supplier Inventories<sup>b</sup> .....</b>					
Natural Uranium .....	10,276	35,030	29,468	12,616	8,815
Enriched Uranium <sup>a</sup> .....	30,085	35,702	39,380	43,839	36,544
<b>Total Commercial Inventories .....</b>	<b>106,237</b>	<b>136,491</b>	<b>127,097</b>	<b>111,258</b>	<b>101,071</b>
<b>DOE-Owned Inventories<sup>c</sup> .....</b>					
Natural Uranium .....	53,238	24,454	53,054	53,054	53,054
Enriched Uranium .....	0	0	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).  
<sup>c</sup>DOE-owned inventories reported by the U.S. Department of Energy.  
P=Preliminary data. Final 2000 inventory data reported in the 2001 survey.  
Note: Totals may not equal sum of components because of independent rounding.  
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998-2001).

**Table 32. Commercial Uranium Inventories by Material Type at End of Year, 1999-2001**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Material Type	Owners and Operators of U.S. Civilian Nuclear Power Reactors			U.S. Suppliers			Total		
	1999	2000	2001 <sup>P</sup>	1999	2000	2001 <sup>P</sup>	1999	2000	2001 <sup>P</sup>
U <sub>3</sub> O <sub>8</sub> .....	22,763	20,404	17,075	15,728	10,945	6,744	38,492	31,349	23,819
Natural UF <sub>6</sub> .....	21,998	15,547	17,393	13,740	1,672	2,071	35,738	17,219	19,464
Enriched UF <sub>6</sub> .....	13,489	18,852	21,244	39,380	43,838	36,544	52,868	62,690	57,788
<b>Total Commercial Inventories .....</b>	<b>58,250</b>	<b>54,804</b>	<b>55,711</b>	<b>68,848</b>	<b>56,455</b>	<b>45,359</b>	<b>127,097</b>	<b>111,258</b>	<b>101,071</b>

P = Preliminary data. Final 2000 inventory data reported in the 2001 survey.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2000-2001).

**Table 33. Commercial Uranium Inventories by Type and Owner at End of Year, 1999-2001**  
(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		
	1999	2000	2001 <sup>P</sup>	1999	2000	2001 <sup>P</sup>	1999	2000	2001 <sup>P</sup>
Brokers and Traders .....	5,640	W	1,234	1,485	W	1,164	7,125	5,595	2,398
Converter, Enricher, Fabricators, and Producers .....	10,089	W	5,510	51,633	W	37,451	61,722	50,860	42,961
Owners and Operators of U.S. Civilian Nuclear Power Reactors .....	22,763	20,404	17,075	35,487	34,400	38,636	58,250	54,804	55,711
<b>Total Commercial Inventories ....</b>	<b>38,492</b>	<b>31,349</b>	<b>23,819</b>	<b>88,605</b>	<b>79,911</b>	<b>77,251</b>	<b>127,097</b>	<b>111,258</b>	<b>101,071</b>

P = Preliminary data. Final 2000 inventory data reported in the 2001 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" (2000-2001).

## Survey Methodology

### Survey Design

The 18th comprehensive survey of the U.S. uranium industry was conducted in 2002 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 2001. The data reported in this publication were developed from the 2001 survey and predecessor databases.

EIA asked respondents to the “Uranium Industry Annual Survey” to provide data current to the end of 2001 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 2001, 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 2001 or plan such expenditures in 2002; (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 of 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

<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.



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. 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.

## 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 keying 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 2001 Form EIA-858 survey, Schedule A, "Uranium Raw Materials Activities," was mailed to 33 firms and Schedule B, "Uranium Marketing Activities," was mailed to 73 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 2001 Uranium Industry Annual Survey**

Response Status	Schedule	
	A	B
Survey Schedules Mailed Out	33	73
Data Provided	32	64
Reported as Not Applicable	1	9

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

## 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

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. Resource quantities of EAR and SR are summarized for principal resource regions (Figure B2) and forward-cost categories in Table B1.

## Estimation of Reserves

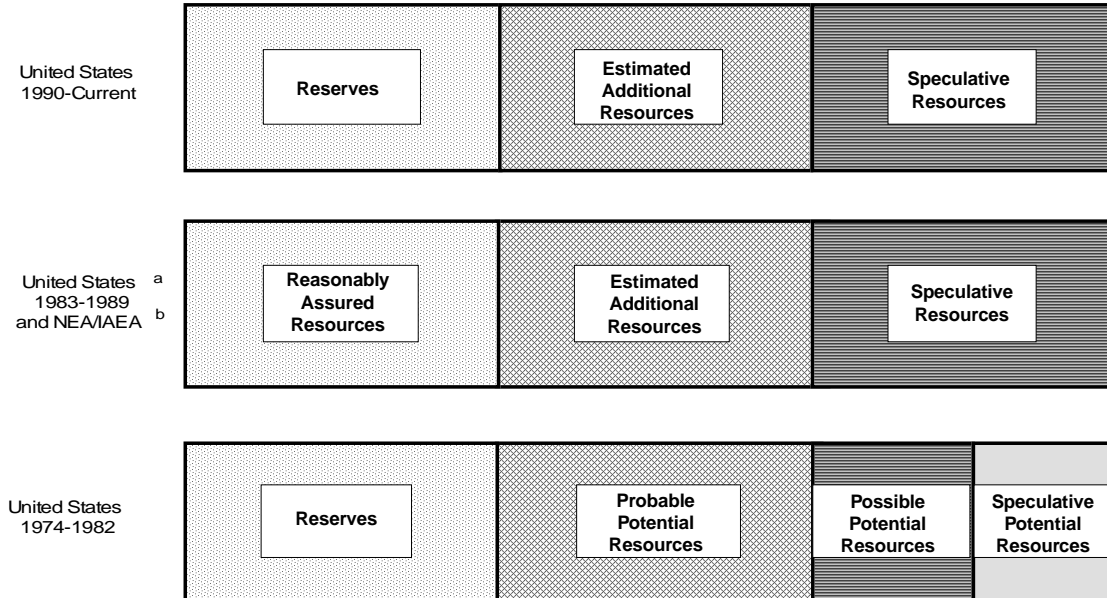
The U.S. uranium reserves reported annually by the EIA for specific forward cost categories represent the sums of quantities estimated to occur in known deposits on properties where statistical sampling of grade, ore configuration, and depth indicate that the quantities could

be recovered under current regulations at or less than the stated cost using current mining and milling technology. The reserves for 2001 are based on the historical data for about 800 (at the \$100 per pound mean forward cost category) uranium reserve properties evaluated under prior U.S. governmental uranium resource programs and on data for about 200 uranium properties reported by domestic uranium mining companies on the 2001 Form EIA-858. Current mining cost information is not available for all of the uranium reserve properties included in the 2001 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 1992 are shown in Table B2. The 2001 reserve estimates for the \$30- and the \$50-per-pound  $U_3O_8$  categories are summarized for the major uranium-industry States in Table B3.

**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 Region**  
(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 B2. U.S. Uranium Reserves by Forward-Cost Category, 1992-2001**  
(Million Pounds U<sub>3</sub>O<sub>8</sub>)

Year	\$30 per pound	\$50 per pound	\$100 per pound
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
2000 .....	271	904	1,430
2001 .....	268	899	1,422

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" (1992-2001).

**Table B3. U.S. Forward-Cost Uranium Reserves by State, 2001**

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	0.279	84	102	0.167	341
Wyoming .....	42	0.130	108	239	0.077	368
Arizona, Colorado, Utah .....	7	0.288	41	42	0.138	115
Texas .....	4	0.079	7	19	0.064	24
Other <sup>b</sup> .....	7	0.200	28	25	0.105	51
<b>Total .....</b>	<b>75</b>	<b>0.179</b>	<b>268</b>	<b>426</b>	<b>0.106</b>	<b>899</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" (2001).

## Appendix C

# Respondents to the Uranium Industry Annual Survey

Respondents to the Energy Information Administration's (EIA) 2001 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 2001 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)	NUC	FirstEnergy Nuclear Operating Company	NUC
AmerGen Energy Company	NUC	Florida Power Corporation	NUC
AmerenUE (Union Electric Company)	NUC	Florida Power & Light	NUC
Anaconda Uranium Corporation	UPH	Framatome ANP	FAB
Arizona Public Service Company	NUC	Geomex Minerals, Inc.	UPH
Calvert Cliffs Nuclear Power Plant, Inc.	NUC	Georgia Power Co. (Southern Nuclear)	NUC
Carolina Power & Light	NUC	Global Nuclear Fuels	FAB
CE Nuclear Power LLC	FAB	Green Mountain Mining Venture	UPH
Cobb Resources Corporation	UPH	HBS, Inc.	UPH
COGEMA, Inc.	BRO	Homestake Mining Company	UPH
COGEMA Mining, Inc.	MLG	IES Utilities/Nuclear Management Company	NUC
Consolidated Edison	NUC	Indiana Michigan Power	NUC
Consumers Energy/Palisades Nuclear Plant	NUC	International Uranium (USA) Corporation	MLG
ConverDyn	CON	Malapai Resources Company	MLG
Cotter Corporation	MLG	Mestena Uranium LLC	UPH
Crow Butte Resources, Inc.	MLG	Mining Unlimited, Inc.	UPH
Dawn Mining Company	UPH	Nebraska Public Power District	NUC
Detroit Edison	NUC	New York Nuclear Corp. / NYNCO Trading	BRO
Dominion Nuclear Connecticut, Inc.	NUC	Nine Mile Point Nuclear Station, LLC	NUC
Duke Power Company	NUC	North Atlantic Energy Service Corp.	NUC
Energy Northwest	NUC	NZU, Inc.	UPH
Entergy Nuclear Fuels Company	NUC	Omaha Public Power District	NUC
Entergy Nuclear Generation Company	NUC	Pacific Gas & Electric Company	NUC
Entergy Operations, Inc.	NUC	Pathfinder Mines Corporation	UPH
Everest Exploration, Inc.	UPH	Petrotomics Company (c/o Texaco, Inc)	UPH
Exelon Generation Company LLC	NUC	Power Resources, Inc.	MLG

**Table C1. Respondents to the 2001 Uranium Industry Annual Survey (Continued)**

<b>Company Name</b>	<b>Industry Activity Code<sup>a</sup></b>	<b>Company Name</b>	<b>Industry Activity Code<sup>a</sup></b>
PPL Susquehanna, LLC	NUC	Umetco Minerals Company	UPH
PSEG Nuclear LLC	NUC	United Nuclear Corporation	UPH
Rio Algom Mining LLC	MLG	The Uranium Exchange Company	TRA
Rio Grande Resources/Nuclear Fuels Corp.	UPH	Uranium King Corporation	UPH
RME Partners, L. P.	UPH	Uranium Resources, Inc.	MLG
Rochester Gas & Electric Corporation	NUC	U.S. Department of Energy, EM	GOV
RWE NUKEM, Inc.	TRA	USEC, Inc.	ENR
San Diego Gas & Electric	NUC	U.S. Energy Corp. (Plateau Resources, Ltd)	UPH
Section 2 Joint Venture-Continental Materials	UPH	USX Corporation, Texas Uranium Operations	UPH
Sheep Mountain Partners	UPH	UUS, Inc.	UPH
Siemens Power Corporation/Framatome ANP	FAB	Vermont Yankee Nuclear Power Corp.	NUC
Simons Associates	UPH	Virginia Electric and Power Company	NUC
South Carolina Electric & Gas	NUC	WEPCO/Nuclear Management Company	NUC
South Texas Project Nuclear Operating Co.	NUC	Western Nuclear, Inc.	UPH
Southern California Edison Company	NUC	Westinghouse Electric Company, CNFD	FAB
Strathmore Resources US	UPH	Wisconsin Public Service Corporation	NUC
Tennessee Valley Authority	NUC	Wolf Creek Nuclear Operating Corporation	NUC
TXU Electric	NUC	Xcel Energy	NUC
UG U.S.A., Inc.	TRA		

<sup>a</sup>BRO = Uranium brokerage company; CON = Uranium converter; ENR = Uranium enricher; FAB = Uranium fuel fabricator; GOV = U.S. Federal Government; MLG = Uranium concentrate milling/processing company (can involve ownership of a uranium property); NUC = Owners and Operators of U.S. Civilian Nuclear Power Reactors; TRA = Uranium trading company; UPH = Uranium property holder (can include activities related to uranium exploration, reserves, reclamation, and/or mining).

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" (2001).

## Appendix D

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

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

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

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

To convert from:	To:	Multiply by: <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 D1 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 D3 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

Thirteen principal tables of data from the Uranium Industry Annual 2001 (UIA) converted to equivalent metric values are shown on the following pages. The crosswalk given below shows the correlation between the tables of metric values and their corresponding tables in U.S. customary units in the main body of the UIA.

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

**Table D2. U.S. Uranium Land and Surface Drilling Activities, 1992-2001**

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 (thousand dollars)	Number of Holes	Meters (thousand)	Cost (thousand dollars)	Number of Holes	Meters (thousand)	Cost (thousand dollars)
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
2000 ...	W	2,772	W	W	W	W	W	W	1,550	312	5,635
2001 ...	W	2,764	0	0	0	1,023	201	2,668	1,023	201	2,668

W=Data withheld to avoid disclosure.

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

Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table D3. U.S. Forward-Cost Uranium Reserves by Mining Method, 2001**

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	0.231	53	129	0.138	178
Openpit .....	9	0.118	11	148	0.067	99
In Situ Leaching .....	36	0.109	39	106	0.063	67
Other <sup>b</sup> .....	< 1	0.224	< 1	3	0.050	1
<b>Total .....</b>	<b>68</b>	<b>0.151</b>	<b>103</b>	<b>386</b>	<b>0.090</b>	<b>346</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" (2001).

**Table D4. U.S. Uranium Mine Production and Number of Mines and Sources, 1992-2001**

Mining Method	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Underground (metric tons U) .....	W	0	0	0	W	W	W	W	W	0
Openpit (metric tons U) .....	W	0	0	0	0	0	0	0	0	0
In Situ Leaching (metric tons U) .....	W	W	942	1,297	1,684	1,571	1,431	1,473	1,152	W
Other <sup>a</sup> (metric tons U) .....	379	789	30	60	125	241	408	276	49	W
<b>Total Mine Production</b> (metric tons U) .....	<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>1,201</b>	<b>1,018</b>
<b>Number of Mines Operated</b>										
Underground .....	4	0	0	0	1	1	4	3	1	0
Openpit .....	1	0	0	0	0	0	0	0	0	0
In Situ Leaching .....	4	5	5	5	6	7	6	6	4	3
Other Sources <sup>b</sup> .....	8	7	7	7	6	6	5	5	5	4
<b>Total Mines and Sources</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>	<b>10</b>	<b>7</b>

<sup>a</sup>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 2000, "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" through 2000.

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

Sources: Energy Information Administration: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table D5. U.S. Uranium Concentrate Processing Operations, 1992-2001**

Processing Operations	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Ore Fed to Process<sup>a</sup></b> (thousand metric tons) .....	232	0	0	151	40	0	0	W	W	W
Percent U <sup>b</sup> .....	0.194	—	—	0.441	0.424	—	—	W	W	W
<b>Contained U (metric tons)</b>										
In Ore .....	451	0	0	669	171	0	0	W	W	W
Other Feed Materials <sup>c</sup> .....	70	16	30	63	157	350	149	W	W	W
<b>Total Mill Feed (metric tons U) .....</b>	<b>520</b>	<b>16</b>	<b>30</b>	<b>732</b>	<b>328</b>	<b>350</b>	<b>149</b>	<b>485</b>	<b>390</b>	<b>W</b>
<b>In-Process Inventory Change</b> (metric tons U) .....	<b>- 10</b>	<b>4</b>	<b>9</b>	<b>60</b>	<b>- 53</b>	<b>20</b>	<b>- 3</b>	<b>41</b>	<b>- 51</b>	<b>W</b>
<b>Concentrate Produced at Mills</b> (metric tons U)										
Theoretical <sup>d</sup> .....	530	12	21	671	381	330	151	444	448	W
<b>Actual .....</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>	<b>391</b>	<b>71</b>
Recovery as Percent .....	98.7	—	—	92.6	86.8	91.2	82.2	78.6	87.4	W
Tailings and Unaccountable (metric tons U) .....	7	0	3	50	50	29	27	95	57	W
<b>Other Processing<sup>e</sup></b> (metric tons U) .....	<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>1,131</b>	<b>944</b>
<b>Total Uranium Concentrate Production</b> (metric tons U) .....	<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>1,522</b>	<b>1,015</b>
<b>Total Concentrate Shipped From Mills and Plants</b> (metric tons U) .....	<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>	<b>1,226</b>	<b>847</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: **1992-2000-Uranium Industry Annual 2000** (May 2001). **2001-Form EIA-858, "Uranium Industry Annual Survey"** (2001).

**Table D6. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1997-2001**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1997	1998	1999	2000	2001
Received from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	2,205	2,496	1,985	1,369	885
Weighted-Average Price .....	35.35	35.38	36.21	38.52	34.47
Received from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	3,804	4,026	3,998	3,498	4,503
Weighted-Average Price .....	32.01	31.07	30.00	29.32	27.15
Received from other Owners and Operators of U.S. Civilian Nuclear Power Reactors:					
Purchases .....	W	W	W	0	0
Weighted-Average Price .....	W	W	W	—	—
Received from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	W	W	W	3,383	4,398
Weighted-Average Price .....	W	W	W	27.16	25.94
Received from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	8,986	8,175	10,296	11,677	11,533
Weighted-Average Price .....	33.56	31.11	29.83	27.70	25.64
<b>Total Received by Owners and Operators of U.S. Civilian Nuclear Power Reactors:</b>					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	<b>16,140</b>	<b>16,441</b>	<b>18,443</b>	<b>19,929</b>	<b>21,319</b>
Weighted-Average Price .....	<b>33.49</b>	<b>31.55</b>	<b>30.24</b>	<b>28.70</b>	<b>26.39</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" (1997-2001).

**Table D7. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1997-2001**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1997	1998	1999	2000	2001
Received of U.S.-Origin Uranium:					
Purchases .....	3,105	2,762	4,403	5,100	5,072
Weighted-Average Price .....	34.73	34.76	31.83	29.94	27.30
Received of Foreign-Origin Uranium:					
Purchases .....	13,035	13,679	14,040	14,829	16,247
Weighted-Average Price .....	33.23	30.94	29.83	28.28	26.12
<b>Total:</b>					
Purchases .....	<b>16,140</b>	<b>16,441</b>	<b>18,443</b>	<b>19,929</b>	<b>21,319</b>
Weighted-Average Price .....	<b>33.49</b>	<b>31.55</b>	<b>30.24</b>	<b>28.70</b>	<b>26.39</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table D8. Maximum Anticipated Uranium Market Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2002-2011, as of December 31, 2001**  
(Metric Tons U Equivalent)

Year	Maximum Under Purchase Contracts	Unfilled Requirements	Maximum Anticipated Market Requirements	Enrichment Feed Deliveries
2002 .....	18,895	1,110	20,005	20,419
2003 .....	20,029	5,149	25,177	21,511
2004 .....	16,153	6,767	22,920	20,005
2005 .....	9,437	11,526	20,963	20,148
2006 .....	6,109	16,181	22,291	23,768
2007 .....	4,742	17,923	22,666	22,028
2008 .....	2,833	17,585	20,417	20,749
2009 .....	2,283	20,617	22,900	22,705
2010 .....	2,498	19,256	21,754	21,291
2011 .....	1,228	20,196	21,423	20,856
<b>Total .....</b>	<b>84,207</b>	<b>136,309</b>	<b>220,516</b>	<b>213,479</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2001).

**Table D9. Owners and Operators of U.S. Civilian Nuclear Power Reactors Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 1999-2001**  
(Metric Tons U Equivalent)

Enrichment Plant Location	Deliveries in 1999			Deliveries in 2000			Deliveries in 2001		
	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total
China .....	0	W	W	0	298	298	0	W	W
France .....	107	1,921	2,028	214	1,417	1,632	212	1,841	2,053
Germany .....	0	533	533	W	W	850	0	611	611
Netherlands .....	0	W	W	W	W	628	0	W	W
Russia .....	0	437	437	W	W	760	W	W	360
United Kingdom .....	69	1,293	1,362	151	2,354	2,505	W	W	1,182
Europe <sup>a</sup> (France, Germany, Netherlands, or United Kingdom) and other...	W	W	604	93	1,160	1,254			
<b>Foreign Total .....</b>	<b>176</b>	<b>4,648</b>	<b>4,823</b>	<b>479</b>	<b>6,799</b>	<b>7,278</b>	<b>352</b>	<b>5,510</b>	<b>5,861</b>
United States .....	2,409	9,657	12,066	3,566	7,560	11,126	4,001	8,345	12,346
<b>Total .....</b>	<b>2,585</b>	<b>14,304</b>	<b>16,889</b>	<b>4,045</b>	<b>14,359</b>	<b>18,404</b>	<b>4,353</b>	<b>13,855</b>	<b>18,208</b>

<sup>a</sup>Specific country in Europe was not reported.

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" (1999-2001).

**Table D10. Uranium in Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors by Year, 1997-2001**  
(Metric Tons U Equivalent)

Origin of Uranium	1997	1998	1999	2000	2001 <sup>P</sup>
Domestic-Origin Uranium .....	4,283	2,842	4,071	4,477	5,091
Foreign-Origin Uranium .....	14,258	11,851	18,557	15,320	15,192
<b>Total .....</b>	<b>18,542</b>	<b>14,693</b>	<b>22,627</b>	<b>19,797</b>	<b>20,283</b>

P = Preliminary data. Final 2000 fuel assembly data reported in the 2001 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" (1998-2001).

**Table D11. Foreign Purchases of Uranium by U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors by Delivery Year, 1997-2001**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1997	1998	1999	2000	2001
<b>U.S. Suppliers:</b>					
Foreign Purchases .....	7,856	8,695	8,077	6,687	7,203
Weighted-Average Price .....	27.58	27.29	24.49	21.96	23.35
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors:</b>					
Foreign Purchases .....	8,672	8,117	10,223	10,587	10,752
Weighted-Average Price .....	33.52	31.10	29.76	27.77	25.67
<b>Total:</b>					
Foreign Purchases .....	<b>16,528</b>	<b>16,812</b>	<b>18,300</b>	<b>17,275</b>	<b>17,955</b>
Weighted-Average Price .....	<b>30.69</b>	<b>29.08</b>	<b>27.42</b>	<b>25.58</b>	<b>24.74</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table D12. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1997-2001**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1997	1998	1999	2000	2001
<b>Received U.S.-Origin Uranium:</b>					
Purchases .....	1,216	1,051	1,270	1,140	459
Weighted-Average Price .....	33.23	35.09	33.40	28.38	26.98
<b>Received Foreign-Origin Uranium:</b>					
Purchases .....	6,347	8,341	7,185	5,997	6,923
Weighted-Average Price .....	27.71	28.08	24.41	21.93	23.33
<b>Total Received by U.S. Brokers and Traders:</b>					
Purchases .....	<b>7,563</b>	<b>9,392</b>	<b>8,455</b>	<b>7,138</b>	<b>7,383</b>
Weighted-Average Price .....	<b>28.60</b>	<b>28.87</b>	<b>25.76</b>	<b>22.96</b>	<b>23.56</b>
<b>Received from Foreign Suppliers:</b>					
Purchases .....	6,040	8,328	7,400	6,079	7,025
Weighted-Average Price .....	27.84	28.01	24.96	22.39	23.05

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1997-2001).

**Table D13. Foreign Sales of Uranium from U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors by Origin and Delivery Year, 1997-2001**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries to Foreign Suppliers and Utilities	1997	1998	1999	2000	2001
<b>U.S.-Origin Uranium:</b>					
Foreign Sales .....	2,489	1,502	1,460	402	594
Weighted-Average Price .....	38.51	40.94	35.36	35.36	30.79
<b>Foreign-Origin Uranium:</b>					
Foreign Sales .....	4,045	4,297	1,814	4,821	3,918
Weighted-Average Price .....	28.35	27.98	28.39	21.04	21.66
<b>Total Sent:</b>					
<b>Foreign Sales .....</b>	<b>6,535</b>	<b>5,798</b>	<b>3,273</b>	<b>5,223</b>	<b>4,512</b>
<b>Weighted-Average Price .....</b>	<b>32.22</b>	<b>31.33</b>	<b>31.11</b>	<b>22.04</b>	<b>22.86</b>
From U.S. Producers, Owners and Operators of U.S. Civilian Nuclear Power Reactors, and other U.S. Suppliers:					
Foreign Sales .....	3,302	1,756	1,447	911	844
Weighted-Average Price .....	33.94	37.41	37.91	30.20	31.06
From U.S. Brokers and Traders:					
Foreign Sales .....	3,233	4,042	1,827	4,312	3,668
Weighted-Average Price .....	30.46	28.70	26.84	20.95	20.97

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" (1997-2001).

**Table D14. Inventories of Natural and Enriched Uranium as of End of Year, 1997-2001**  
(Metric Tons U Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1997	1998	1999	2000	2001 <sup>P</sup>
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors Inventories .....</b>					
Natural Uranium .....	25,339	25,294	22,406	21,080	21,429
Enriched Uranium <sup>a</sup> .....	18,126	16,175	17,217	13,829	13,258
Enriched Uranium <sup>a</sup> .....	7,213	9,119	5,188	7,251	8,171
<b>U.S. Supplier Inventories<sup>b</sup> .....</b>					
Natural Uranium .....	15,524	27,207	26,482	21,715	16,868
Enriched Uranium <sup>a</sup> .....	3,952	13,474	11,335	4,853	3,391
Enriched Uranium <sup>a</sup> .....	11,572	13,733	15,147	16,862	14,057
<b>Total Commercial Inventories .....</b>	<b>40,864</b>	<b>52,501</b>	<b>48,888</b>	<b>42,795</b>	<b>38,877</b>
<b>DOE-Owned Inventories<sup>c</sup> .....</b>					
Natural Uranium .....	20,478	9,406	20,407	20,407	20,407
Enriched Uranium .....	20,478	9,406	20,407	20,407	20,407
Enriched Uranium .....	0	0	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).

<sup>c</sup>DOE-owned inventories reported by the U.S. Department of Energy.

P=Preliminary data. Final 2000 inventory data reported in the 2001 survey.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1998-2001).



# 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.

**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 costs (uranium):** The operating and capital costs that will be incurred in any future production of uranium from in-place reserves. Included are costs for labor, materials, power and fuel, royalties, payroll taxes, insurance, and general and administrative costs that are dependent upon the quantity of production and, thus, applicable as variable costs of production. Excluded from forward costs 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. *Note:* By use of forward costing, estimates of reserves for ore deposits in differing geological settings can be aggregated and reported as the maximum amount that can theoretically be extracted to recover the specified costs of uranium oxide production under the listed forward cost categories.

**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 year following contract execution.

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

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

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

**Nuclear electric power (nuclear power):** Electricity generated by an electric power plant whose turbines are driven by steam produced by the heat from the fission of nuclear fuel in a reactor.

**Nuclear reactor:** An apparatus in which a nuclear fission chain reaction can be initiated, controlled, and sustained at a specific rate. A reactor includes fuel (fissionable material), moderating material to control the rate of fission, 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.

**Person Year:** One whole year, or fraction thereof, worked by an employee, including contracted manpower. It is expressed as a quotient (to two decimal places) of the time units worked during a year (hours, weeks, or months) divided by the like

total time units in a year. For example: 80 hours worked is 0.04 (rounded) of a person year; 8 weeks worked is 0.15 (rounded) of a person year; 12 months worked is 1.0 person year. Contracted manpower includes survey crews, drilling crews, consultants, and other persons who worked under contract to support your firm's ongoing operations.

**Processing of uranium:** Uranium-recovery operations at a mill, in-situ leach plant, byproduct plant, or other type of recovery operation.

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

**Reserve Cost Categories of \$15, \$30, \$50, and \$100 per Pound U<sub>3</sub>O<sub>8</sub>:** Classification of uranium reserves estimated by using break-even cutoff grades that are calculated based on forward-operating costs of less than \$15, \$30, \$50, and \$100 per pound U<sub>3</sub>O<sub>8</sub>.

**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<sub>f</sub> into a mass P of product assay x<sub>p</sub> and waste of mass W and assay x<sub>w</sub> 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

$$V(x) = (1-2x) \ln ((1-x) / x).$$

**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<sub>3</sub>O<sub>8</sub> 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 <sup>235</sup>U and <sup>238</sup>U. The isotope <sup>235</sup>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 <sup>238</sup>U is also important because it absorbs neutrons to produce a radioactive isotope that subsequently decays to the isotope <sup>239</sup>Pu, which also is fissionable by thermal neutrons.

**Uranium concentrate:** A yellow or brown powder obtained by the milling of uranium ore, processing of in situ leach mining solutions, or as a byproduct of phosphoric acid production.

**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<sub>3</sub>O<sub>8</sub>. The estimate of the uranium endowment is made before consideration of economic availability and any associated uranium resources.

**Uranium hexafluoride (UF<sub>6</sub>):** A white solid obtained by chemical treatment of U<sub>3</sub>O<sub>8</sub> and which forms a vapor at temperatures above 56 degrees Centigrade. UF<sub>6</sub> 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<sub>3</sub>O<sub>8</sub> per ton or 0.05 to 0.20 percent U<sub>3</sub>O<sub>8</sub>).

**Uranium oxide:** Uranium concentrate or yellowcake. Abbreviated as U<sub>3</sub>O<sub>8</sub>.

**Uranium property:** A specific tract of land with known uranium reserves that could be developed for mining.

**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 hole 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 amounts of uranium in ore that could be exploited within the chosen forward-cost levels are estimated utilizing available sampling, engineering, geologic, and economic data 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:** A natural uranium concentrate that takes its name from its color and texture. Yellowcake typically contains 70 to 90 percent U<sub>3</sub>O<sub>8</sub> by weight. It is used as feedstock for uranium fuel enrichment and fuel pellet fabrication.