

# Uranium Industry Annual 2002

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# Preface

The *Uranium Industry Annual 2002* (UIA 2002) provides current statistical data on the U.S. uranium industry's activities relating to uranium raw materials and uranium marketing. The UIA 2002 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 1993 through 2012 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 2002, 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 9 and 11, Tables 12, 22, 23, and 25) of this report.

Data on uranium raw materials activities for 1993 through 2002, 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 1998 through 2012, 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 2002 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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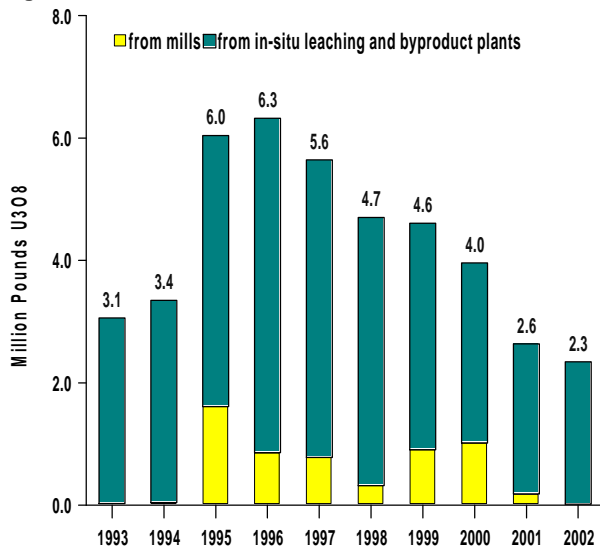
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# Summary

## U.S. Uranium Raw Material Activities

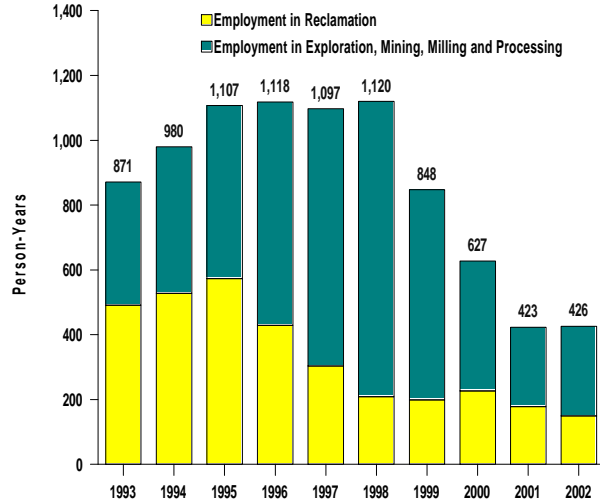
Total U.S. uranium exploration and development expenditures in 2002 were \$0.4 million, a decrease of 93 percent from the 2001 level (Table H1). U.S. uranium concentrate production totaled 2.3 million pounds in 2002, a 63 percent decline from 1996. Almost all of the concentrate production came from in-situ leaching in 2002 (Figure H1).

Figure H1. U.S. Uranium Concentrate Production, 1993-2002



Employment in the U.S. uranium raw materials industry totaled 426 person-years in 2002, a decrease of 62 percent from the 1998 level (Figure H2).

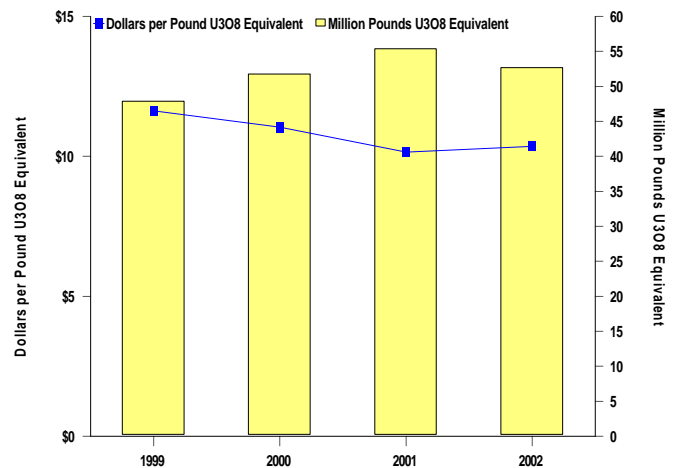
Figure H2. U.S. Uranium Raw Materials Employment, 1993-2002



## Uranium Marketing Activities in the United States

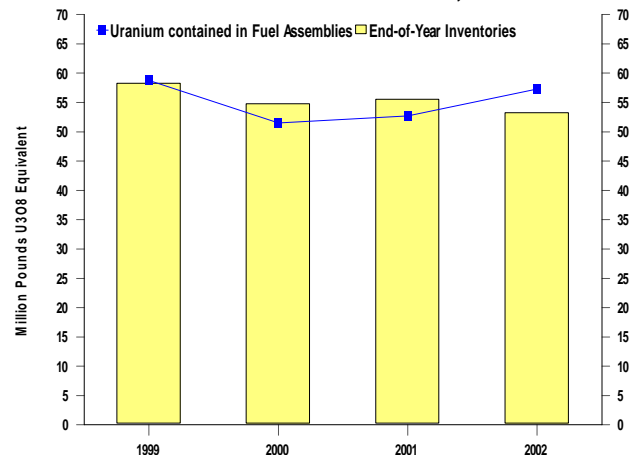
Owners and operators of U.S. civilian nuclear power reactors purchased from U.S. and foreign suppliers a total of 52.7 million pounds U<sub>3</sub>O<sub>8</sub>e (equivalent) of deliveries during 2002 (Table H2). The average price paid was \$10.36 per pound U<sub>3</sub>O<sub>8</sub>e, a decrease of 11 percent compared with the 1999 price (Figure H3).

Figure H3. Uranium Purchases by Owners and Operators of U.S. Civilian Nuclear Power Reactors, 1999-2002



Fuel assemblies loaded into U.S. civilian nuclear power reactors during 2002 contained 57.3 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 2002 was 53.3 million pounds U<sub>3</sub>O<sub>8</sub>e, a decrease of 9 percent from the 1999 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, 1999-2002





**Table H1. Raw Materials Summary Statistics of the U.S. Uranium Industry, 1993-2002**

Items	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Exploration and Development</b>										
Surface Drilling (million feet) .....	1.1	0.7	1.3	3.0	4.9	4.6	2.5	1.0	0.7	W
(million meters) .....	0.3	0.2	0.4	0.9	1.5	1.4	0.8	0.3	0.2	W
Expenditures <sup>a</sup> (million dollars) .....	11.3	3.7	6.0	10.1	30.4	21.7	9.0	6.7	4.8	0.4
<b>Reserves at End of Year</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> , \$US30 per pound) .....	292	294	290	285	281	276	274	271	268	266
(thousand metric tons U, \$US80 per kilogram) .....	112	113	112	110	108	106	105	104	103	102
<b>Mine Production of Uranium</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	2.1	2.5	3.5	4.7	4.7	4.8	4.5	3.1	2.6	2.4
(thousand metric tons U) .....	0.8	1.0	1.4	1.8	1.8	1.8	1.8	1.2	1.0	0.9
<b>Uranium Concentrate Production</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	3.1	3.4	6.0	6.3	5.6	4.7	4.6	4.0	2.6	<sup>E</sup> 2.3
(thousand metric tons U) .....	1.2	1.3	2.3	2.4	2.2	1.8	1.8	1.5	1.0	<sup>E</sup> 0.9
<b>Uranium Concentrate Shipments</b>										
(million pounds U <sub>3</sub> O <sub>8</sub> ) .....	3.4	6.3	5.5	6.0	5.8	4.9	5.5	3.2	2.2	3.8
(thousand metric tons U) .....	1.3	2.4	2.1	2.3	2.2	1.9	2.1	1.2	0.8	1.5
<b>Employment</b> (person-years) .....	871	980	1,107	1,118	1,097	1,120	848	627	423	426

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

W=Data withheld to avoid disclosure. E=Estimate.

Sources: Energy Information Administration: **1993-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858**, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

**Table H2. Transaction Summary Statistics of the U.S. Uranium Industry, 1999-2002**

Deliveries	1999		2000		2001		2002	
	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) .....	47.9	11.63	51.8	11.04	55.4	10.15	52.7	10.36
(thousand metric tons U; dollars per kilogram U) .....	18.4	30.24	19.9	28.70	21.3	26.39	20.3	26.93
<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) .....	47.6	10.55	44.9	9.84	46.7	9.51	52.7	10.05
(thousand metric tons U; dollars per kilogram U) .....	18.3	27.42	17.3	25.58	18.0	24.74	20.3	26.14
<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) .....	8.5	11.97	13.6	8.48	11.7	8.79	15.4	10.04
(thousand metric tons U; dollars per kilogram U) .....	3.3	31.11	5.2	22.04	4.5	22.86	5.9	26.11

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

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

Sources: Energy Information Administration: **1999-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858**, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities.

**Table H3. Summary Statistics of Uranium Fuel and Commercial Inventories, 1999-2002**

Items	1999	2000	2001	2002 <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) .....	58.8	51.5	52.7	57.3
(thousand metric tons U) .....	22.6	19.8	20.3	22.0
<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) .....	58.3	54.8	55.6	53.3
(thousand metric tons U) .....	22.4	21.1	21.4	20.5
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) .....	127.1	111.3	103.8	101.1
(thousand metric tons U) .....	48.9	42.8	39.9	38.9

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

P=Preliminary data. Final 2001 data reported in the 2002 survey.

Sources: Energy Information Administration: **1999-2000-Uranium Industry Annual 2001** (May 2002). **2001-2002-Form EIA-858**, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities.

# 1. U.S. Uranium Raw Materials Industry

## Introduction

The U.S. uranium raw materials industry's decline continued through 2002 for the sixth consecutive year. Expenditures for exploration, drilling, and related activities were less than one million dollars (Figure 1), mine production of uranium declined slightly (Figure 2), total uranium concentrate production decreased somewhat (Figure 3), and total employment for uranium exploration, mining, milling, processing and reclamation leveled out (Figure 4).

## Exploration and Development

U.S. uranium exploration companies held 826 thousand acres for all exploration purposes at the end of 2002 (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. Total U.S. uranium exploration and development expenditures in 2002 were \$0.4 million, including surface drilling, land acquisitions, other exploration and development expenditures (Table 2). This total represents a 93 percent decrease from the 2001.

## U.S. Uranium Reserves Estimates

The EIA's yearend 2002 estimate of U.S. uranium reserve areas (Figure 5) for the \$30- and \$50-per-pound  $U_3O_8$  forward cost categories were 266 and 896 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 2001 reserve estimates, the 2002 reserves show modest decreases that reflect combined effects of depletion and erosion of the remaining in-place ore at yearend 2002 after accounting for the mine production of uranium as reported by domestic mining firms.

## Mine Production of Uranium

During 2002, a total of 2.4 million pounds  $U_3O_8$  of uranium were produced, 9 percent less than the level of production in 2001 (Table 4). Mine production of uranium came mostly from in-situ leaching activities. Overall, there were three commercially operating uranium in-situ leach mines during part or all of 2002.

## Uranium Processing

Total U.S. uranium concentrate production in 2002 was estimated at 2.3 million pounds  $U_3O_8$ , 11 percent below the 2001 level (Table 5). Shipments of uranium concentrate from domestic production facilities (mills and in-situ leach plants) totaled 3.8 million pounds in 2002 (Table 5). Shipments were 1.5 million pounds more than production, after being lower than production for the two prior years (Figure 6).

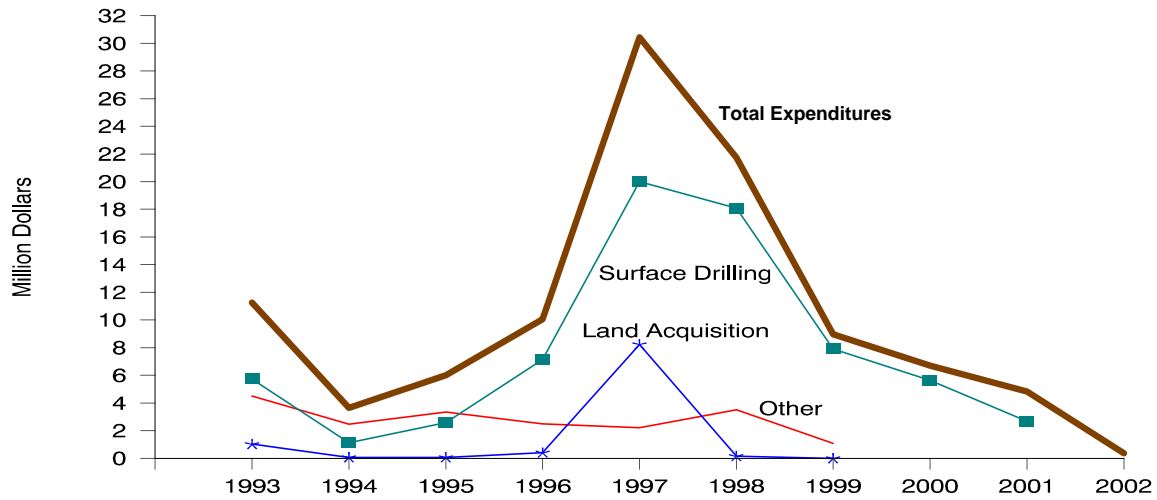
## Processing Facilities Status

At the end of 2002, four conventional mills with a milling capacity of 12,400 tons of ore per day were inactive, and two others were permanently closed at the end of 2002 (Table 6). Two in-situ leach uranium processing plants were in commercial operation in the United States at the end of 2002 (Table 7). These plants had a combined rated capacity of 3.0 million pounds  $U_3O_8$  per year. Seven nonconventional plants were inactive at the end of 2002, and one is closed permanently.

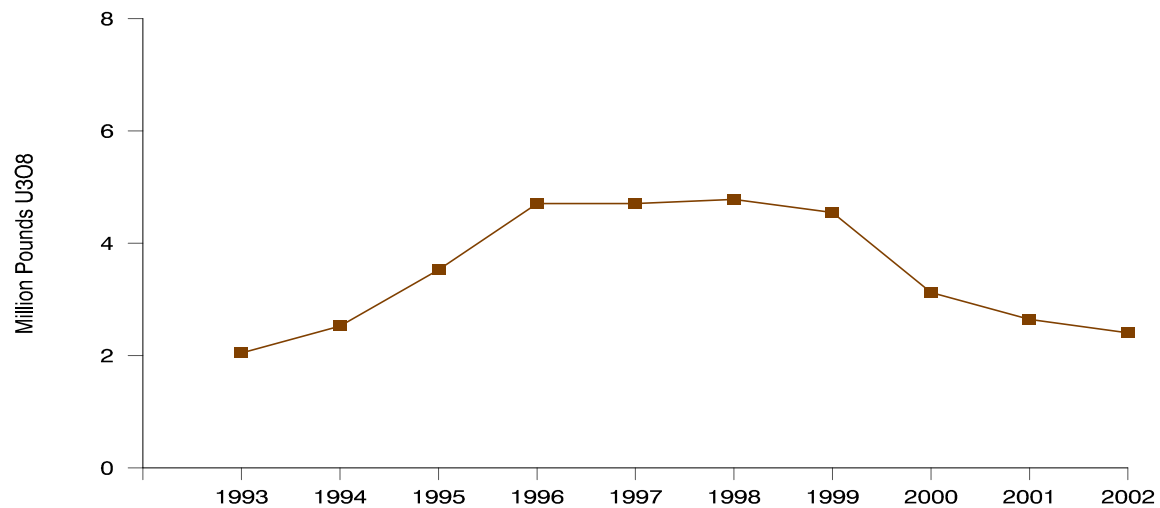
## Employment

Employment in the U.S. uranium raw materials industry in 2002 was reported as 426 person-years expended (Table 8). Employment in milling and processing rose by 24 percent from 2001. Wyoming accounted for 40 percent of the total employment in 2002 (Table 9).

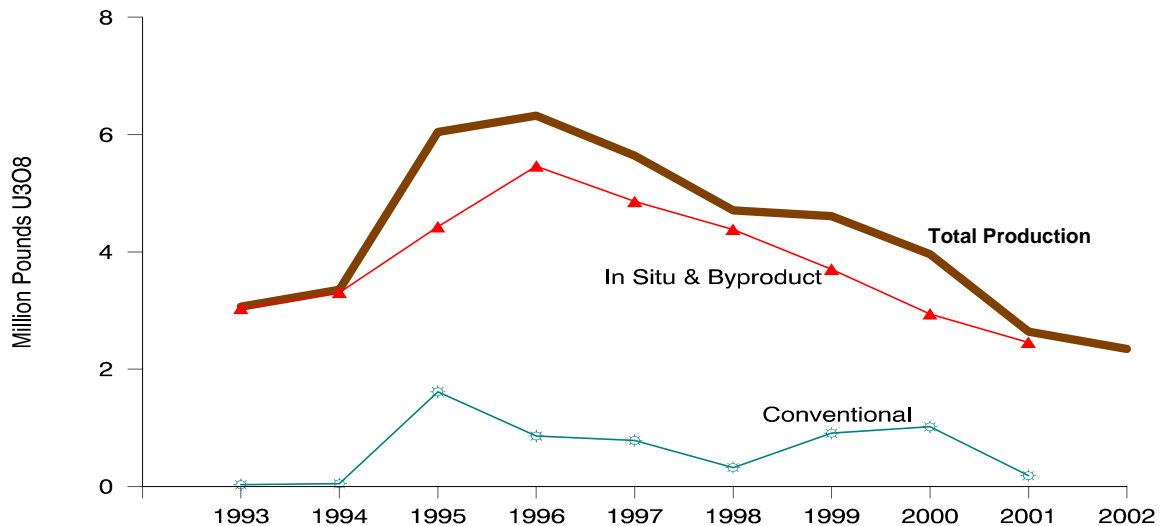
**Figure 1. U. S. Uranium Exploration and Development Expenditures, 1993-2002**



**Figure 2. U.S. Uranium Mine Production, 1993-2002**

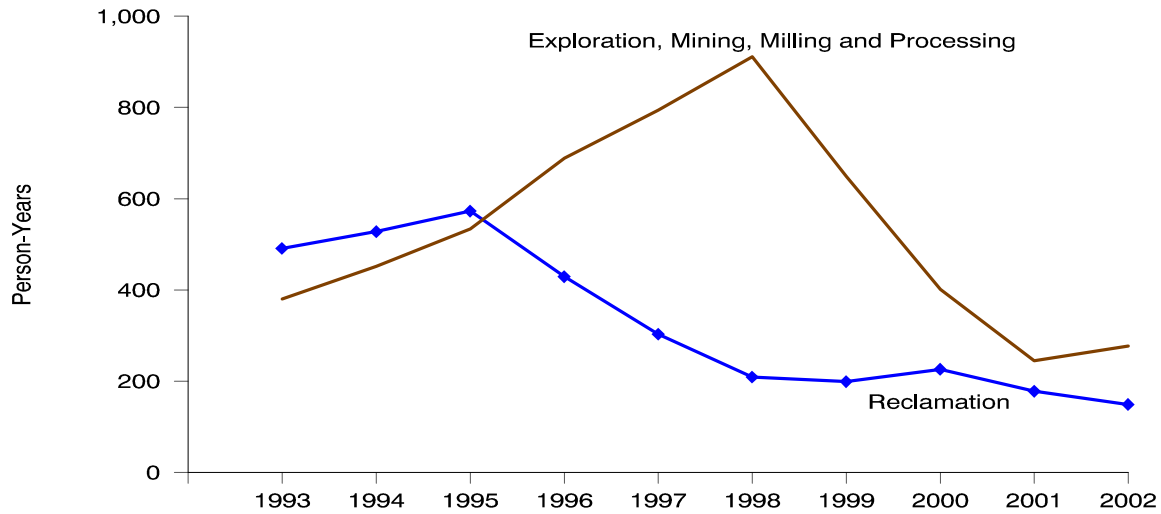


**Figure 3. U.S. Uranium Concentrate Production, 1993-2002**



Source: Energy Information Administration: 1993-2002-Form EIA-858, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

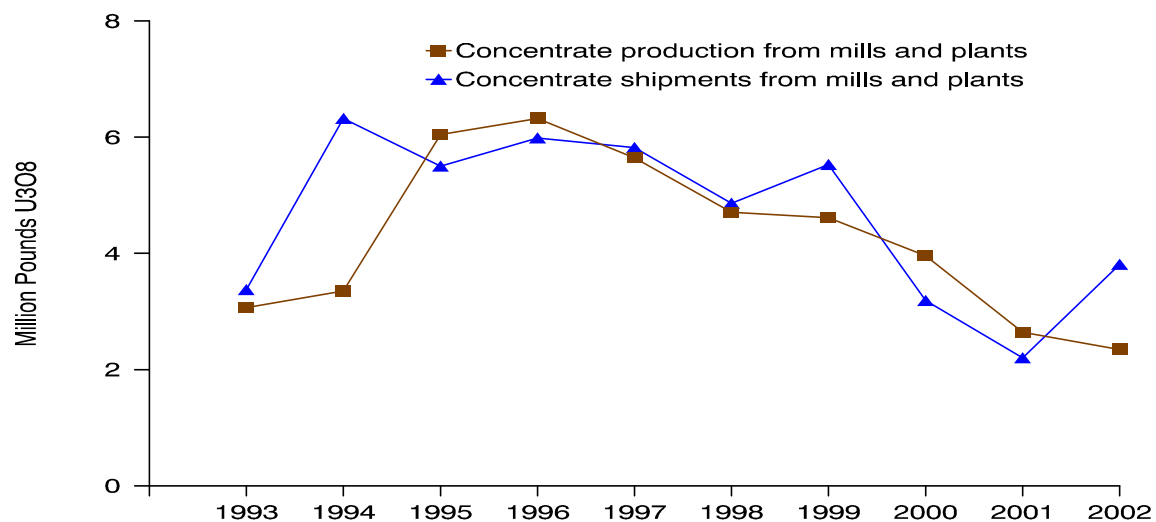
**Figure 4. Employment - U.S. Uranium Raw Materials Sector, 1993-2002**



**Figure 5. Major U.S. Uranium Reserve Areas**



**Figure 6. U.S. Uranium Concentrate Production and Shipments, 1993-2002**



Source: Energy Information Administration: 1993-2002-Form EIA-858, "Uranium Industry Annual Survey," Schedule A: Uranium Raw Material Activities.

**Table 1. U.S. Uranium Land and Surface Drilling Activities, 1993-2002**

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)
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
2002 ...	W	826	W	W	W	W	W	W	W	W	W

W=Data withheld to avoid disclosure.

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

Source: Energy Information Administration: 1993-2002-Form EIA-858, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

**Table 2. Expenditures for Exploration and Development of Uranium in the United States, 1993-2002 (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
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
2002 .....	W	W	W	352	W	W

W=Data withheld to avoid disclosure.

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

Source: Energy Information Administration: 1993-2002-Form EIA-858, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

**Table 3. U.S. Forward-Cost Uranium Reserves by Mining Method, 2002**

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	0.128	99	117	0.073	171
Other <sup>b</sup> .....	< 1	0.264	< 1	3	0.059	4
<b>Total .....</b>	<b>75</b>	<b>0.179</b>	<b>266</b>	<b>425</b>	<b>0.105</b>	<b>896</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," Schedule A: Uranium Raw Material Activities.

**Table 4. U.S. Uranium Mine Production and Number of Mines and Sources, 1993-2002**

Mining Method	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Underground (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	0	0	0	W	W	W	W	W	0	0
Openpit (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	0	0	0	0	0	0	0	0	0	0
In Situ Leaching (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	W	2,448	3,372	4,379	4,084	3,721	3,830	2,995	W	W
Other <sup>a</sup> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	2,050	78	156	326	626	1,062	718	128	W	W
<b>Total Mine Production</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>2,405</b>
<b>Number of Mines Operated</b>										
Underground .....	0	0	0	1	1	4	3	1	0	0
Openpit .....	0	0	0	0	0	0	0	0	0	0
In Situ Leaching .....	5	5	5	6	7	6	6	4	3	3
Other Sources <sup>b</sup> .....	7	7	7	6	6	5	5	5	4	3
<b>Total Mines and Sources .....</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>	<b>6</b>

<sup>a</sup>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.

Source: Energy Information Administration: 1993-2002-Form EIA-858, "Uranium Industry Annual Survey," Schedule A: Uranium Raw Material Activities.

**Table 5. U.S. Uranium Concentrate Processing Operations, 1993-2002**

Processing Operations	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Ore Fed to Process<sup>a</sup></b> (thousand tons) .....	0	0	167	44	0	0	W	W	W	W
Percent U <sub>3</sub> O <sub>8</sub> <sup>b</sup> .....	—	—	0.520	0.500	—	—	W	W	W	W
<b>Contained U<sub>3</sub>O<sub>8</sub> (thousand pounds)</b>										
In Ore .....	0	0	1,739	444	0	0	W	W	W	W
Other Feed Materials <sup>c</sup> .....	42	78	163	409	911	387	W	W	W	W
<b>Total Mill Feed</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	42	78	1,902	853	911	387	1,260	1,015	W	W
<b>In-Process Inventory Change</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	10	24	157	-137	52	-7	106	-133	W	W
<b>Concentrate Produced at Mills</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> )										
Theoretical <sup>d</sup> .....	31	54	1,744	990	859	393	1,154	1,164	W	W
<b>Actual</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>	<b>W</b>
Recovery as Percent .....	—	—	92.6	86.8	91.2	82.2	78.6	87.4	W	W
Tailings and Unaccountable (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	1	8	130	130	76	70	246	147	W	W
<b>Other Processing<sup>e</sup></b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>W</b>
<b>Total Uranium Concentrate Production</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>E 2,344</b>
<b>Total Concentrate Shipped From Mills and Plants</b> (thousand pounds U <sub>3</sub> O <sub>8</sub> ) .....	<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>	<b>3,810</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. E=Estimate.

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

Source: Energy Information Administration: 1993-2002-Form EIA-858, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

**Table 6. Operating Status of Conventional Uranium Mills, End of the Year, 1999-2002**

Mill Owner(s)	Mill Name	Milling Capacity <sup>a</sup> (short tons of ore per day)	Operating Status at End of the Year			
			1999	2000	2001	2002
Cotter .....	Canon City	400	O	O	I	I
Dawn Mining .....	Dawn/Ford	0	I	I	I	CP
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	0	I	I	I	CP

**Summary of Mill Status**

Number of Mills

Operating <sup>b</sup> .....	--	--	1	1	0	0
Inactive <sup>c</sup> .....	--	--	5	5	6	4
Total .....	--	--	6	6	6	4

**Available Milling Capacity**

Operating (tons of ore per day) .....	--	--	400	400	0	0
Inactive (tons of ore per day) .....	--	--	13,200	13,200	13,600	12,400
Total Available Capacity (tons of ore per day) .....	--	--	13,600	13,600	13,600	12,400

<sup>a</sup>Milling capacity based on data reported on Form EIA-858 for 2002.

<sup>b</sup>Milled uranium-bearing ore (conventional milling) at the end of year.

<sup>c</sup>No conventional milling operations, but one mill (Ambrosia Lake) recovered uranium by processing mine water solution during 2002 and two mills (Canon City and White Mesa) have alternate/byproduct feed operations at the end of 2002.

O=Operating at the end of the year. I=Inactive at the end of the year. CP=Closed permanently (will not be restarted).

-- = Not applicable.

Source: Energy Information Administration: 1999-2002-Form EIA-858, "Uranium Industry Annual Survey," Schedule A: Uranium Raw Material Activities.

**Table 7. Operating Status of Nonconventional Uranium Plants, End of the Year 2002**

Plant Owners/Operators	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	R
Everest Exploration .....	Hobson	In-Situ Leach	1,000	CI
Malapai Resources .....	Christensen Ranch	In-Situ Leach	650	R
Malapai Resources .....	Holiday-El Mesquite	In-Situ Leach	600	R
Malapai Resources .....	Irigaray	In-Situ Leach	350	R
Power Resources .....	Highland	In-Situ Leach	2,000	CT
Power Resources .....	Smith Ranch-Highland	In-Situ Leach	2,000	O
Uranium Resources .....	Kingsville Dome	In-Situ Leach	1,300	CI
Uranium Resources .....	Rosita	In-Situ Leach	1,000	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 2002.

<sup>b</sup>R=Reclamation (restoration in process or completed). CI=Closed indefinitely (following year restart not planned). CT=Closed temporarily (restart planned for following year). CP=Closed permanently (will not be restarted). O=Operating at the end of the year.

Source: Energy Information Administration: 2002-Form EIA-858, "Uranium Industry Annual Survey," Schedule A: Uranium Raw Material Activities.



**Table 8. Employment in the U.S. Uranium Industry by Category, 1993-2002**  
(Person-Years)

Year	Employment Categories					Total
	Exploration	Mining	Milling	Processing	Reclamation	
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
2002 ....	W	W	104	100	149	426

W=Data withheld to avoid disclosure.

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

Source: Energy Information Administration: **1993-2002**-Form EIA-858, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

**Table 9. Employment in the U.S. Uranium Industry by State, 2002**  
(Person-Years)

State(s)	Total	Percent of Total
Wyoming .....	169	40
Colorado and Texas .....	100	23
Nebraska and New Mexico .....	88	21
Utah and Washington .....	70	16
<b>Total .....</b>	<b>426</b>	<b>100</b>

Notes: Totals may not equal sum of components because of independent rounding. Total employment includes 149 person years for reclamation.

Source: Energy Information Administration: **2002**-Form EIA-858, "Uranium Industry Annual Survey;" Schedule A: Uranium Raw Material Activities.

## 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 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 2002, owners and operators of U.S. civilian nuclear power reactors received a total of 52.7 million pounds  $U_3O_8e$  (Figure 7), and the average price was \$10.36 per pound (Table 10 and Figure 8). Compared with 2001, the quantity is an decrease of 5 percent, but a increase in price of 2 percent. Foreign-origin uranium accounted for 46.5 million pounds (88 percent) of the deliveries (Figure 9) at an average price of \$10.29 per pound (Table 11). Approximately 12 percent of all uranium purchased was U.S.-origin (Table 12). In rank order, the top five foreign country origins were Canada (33 percent), Australia (21 percent), Russia (12 percent), Kazakhstan (10 percent), and Uzbekistan (7 percent) (Figure 10).

Owners and operators of U.S. civilian nuclear power reactors purchased uranium with 2002 deliveries from 21 suppliers, shown in the following list. Nine of the 21 firms (designated with an asterisk) signed contracts in 2002 with uranium deliveries during 2002.

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

Cameco\*  
COGEMA, Inc.\*  
ConverDyn  
Energy Resources of Australia  
Globe Nuclear Services & Supply (GNSS)\*  
Heathgate Resources Pty.\*  
Itochu Corporation\*  
Northern States Power (Xcel Energy)\*  
Nufcor International, Ltd.  
Power Resources, Inc.  
Rio Algom Mining LLC  
Rio Grande Resources with Nuclear Fuels Corp.  
Riotinto (RTZ Minerals Services Limited)  
RWE NUKEM\*  
The Uranium Exchange Company  
UG U.S.A.\*  
Uranerz Exploration & Mining  
Urenco  
USEC, Inc.\*  
WMC (Olympic Dam)  
World Wide Minerals, Ltd.

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 66 percent of the purchases, uranium hexafluoride ( $UF_6$ ) was 28 percent, and enriched uranium was 6 percent (Figure 11).

Domestic purchases of uranium (both U.S. and foreign-origin) in 2002 was 21.5 million pounds  $U_3O_8e$  (Table 14). The average price of these domestic purchases was \$10.35 per pound.

Foreign purchases of uranium (only foreign-origin) from foreign suppliers in 2002 totaled 28.5 million pounds  $U_3O_8e$ . The average price of these foreign purchases was \$10.37 per pound.

## Uranium Pricing Mechanisms, Price Distributions and Contract Types

Contract-specified pricing mechanisms, which include fixed and base-escalated prices, accounted for 72 percent of the domestic purchases in 2002 by owners and operators of U.S. civilian nuclear power reactors (Table 14). Spot-market pricing represented 51 percent of foreign purchases.

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 2002, and provides the aggregated quantity and its average price for each distribution.

During 2002, 17 percent of the deliveries to owners and operators of U.S. civilian nuclear power reactors involved spot contracts, and the remaining 83 percent involved long-term contracts (Table 16). The average price for spot contracts was \$9.29 per pound, but for long-term contracts it was \$10.58 per pound. Enriched uranium was delivered only under long-term contracts in 2002 (Figure 12).

### New Purchases

The quantity of uranium delivered in 2002, under 24 purchase contracts signed in 2002, was 7.8 million pounds  $U_3O_8$ , and the average price was \$9.56 per pound (Table 17). Twenty-two new spot contracts accounted for almost of the 2002-signed purchase contracts.

Future deliveries reported for 2003 through 2012, for contracts signed in 2002, are between a minimum total of 20.0 million pounds to a maximum total of 29.2 million pounds (Table 18).

## Anticipated Uranium Market Requirements

Future deliveries for 2003-2012, based on owners and operators of U.S. civilian nuclear power reactors contracts reported in effect at the end of 2002, for all reported purchase contracts totaled a minimum 129.1 million pounds to a maximum of 206.9 million pounds (Table 19). Foreign suppliers would provide 56 percent of the existing maximum deliveries through 2012 (Figure 13 and Table 19).

At the end of 2002, cumulative unfilled uranium requirements for U.S. civilian nuclear reactors for 2003 through 2012 were reported to be 385.0 million pounds  $U_3O_8$  (Table 20). The quantity of maximum deliveries of uranium for the same period under existing purchase contracts totaled 206.9 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 2002, was 592.0 million pounds.

The unfilled requirements category, as reported at the end of 2002, constitutes a small portion of maximum anticipated market requirements in 2003 (Figure 14). However, it increases to 70 percent of total maximum anticipated requirements by 2007 and to 95 percent by 2012. For the years 2003 through 2012, owners and operators of U.S. civilian nuclear power reactors maximum anticipated market requirements exceed their projected enrichment feed deliveries (Figure 15).

### Uranium Feed for Enrichment

In 2002, owners and operators of U.S. civilian nuclear power reactors delivered 54.7 million pounds  $U_3O_8$  of natural uranium feed to domestic and foreign enrichment suppliers (Table 22). U.S.-origin uranium accounted for 8.2 million pounds (15 percent) of the feed deliveries (Table 23). Deliveries

to U.S. enrichment plants accounted for 29.0 million pounds, or 53 percent of the total, and deliveries to foreign enrichment plants was 25.6 million pounds, 47 percent of total feed deliveries in 2002.

U.S. civilian nuclear power reactors projected that the amount of natural uranium feed to be shipped for enrichment for the years 2003 through 2012 will vary between 48 million and 63 million pounds annually (Table 24).

### **Purchases of Enrichment Services**

In 2002, 11.5 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 15 percent of the SWU and foreign enrichment plants the remaining 85 percent. The 8 firms that were reported as the sellers of enrichment services for these SWU deliveries in 2002 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.  
Globe Nuclear Service & Supply (GNSS)  
RWE NUKEM  
UG U.S.A.  
Urenco  
USEC, Inc.  
Westinghouse

The long-term enrichment service contracts were dominant in 2002, and represented 97 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 3 percent of SWU deliveries.

### **Fuel Assemblies**

The total amount of uranium contained in fuel assemblies loaded into U.S. civilian nuclear reactors during 2002 was 57.3 million pounds  $U_3O_8$  (Table 27). This was 4.5 million pounds more than in 2001 (Figure 16).

### **Foreign Purchases of Uranium**

The owners and operators of U.S. civilian nuclear power reactors and U.S. suppliers purchased from foreign suppliers 52.7 million pounds  $U_3O_8$  that was received in 2002 (Table 28). The average price for these foreign purchases was \$10.05 per pound  $U_3O_8$ . This is 6 percent higher than the 2001 average price of \$9.51 per pound.

U.S. brokers and traders, a primary supplier of uranium, purchased 19.9 million pounds  $U_3O_8$  of deliveries during 2002 at an average price of \$9.69 per pound (Table 29). Most of the uranium (18.6 million pounds or 94 percent) was from foreign suppliers. In 2001, by comparison, U.S. brokers and traders purchased 19.2 million pounds  $U_3O_8$  at an average price of \$9.06 per pound (Figure 17).

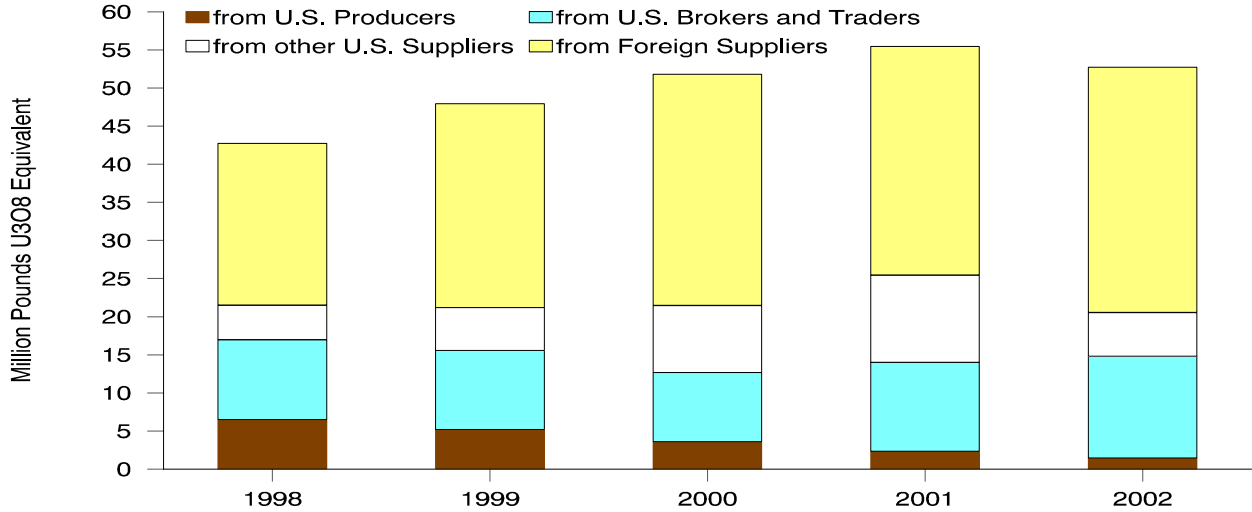
### **Foreign Sales of Uranium**

In 2002, uranium sold to foreign suppliers and foreign utilities totaled 15.4 million pounds  $U_3O_8$ , 31 percent more than in 2001. The average price was \$10.04 per pound, 14 percent more than in 2001 (Table 30 and Figure 18). Of the foreign sales, 80 percent was foreign-origin and 20 percent was U.S.-origin uranium. U.S. brokers and traders sold 10.4 million pounds at an average price of \$9.76 per pound in 2002.

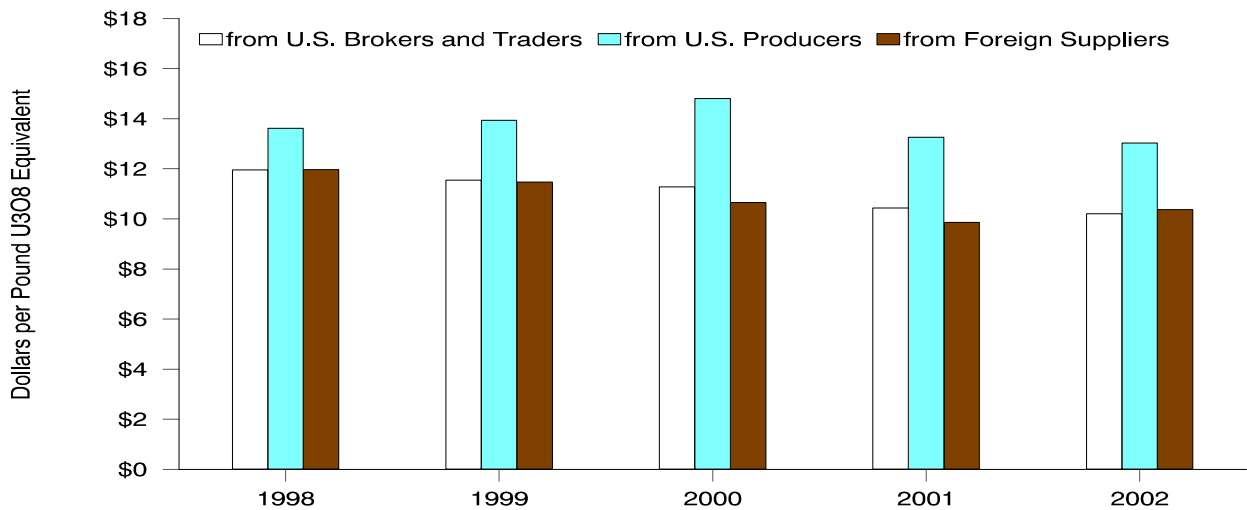
### **Uranium Inventories**

Total commercial inventories, as of December 31, 2002, were 101.1 million pounds  $U_3O_8$ , a decrease of 2.6 million pounds from end of 2001 (Table 31). The owners and operators of U.S. civilian nuclear power reactors inventory level declined 2.4 million pounds, ending with 53.3 million pounds at the end of 2002 (Figure 19), but only the uranium concentrate inventory decreased from year-end 2000 to 2002 (Table 32 and Figure 20). Commercial natural and enriched  $UF_6$  inventories at the end of 2002 totaled 80.6 million pounds  $U_3O_8$  (Table 33).

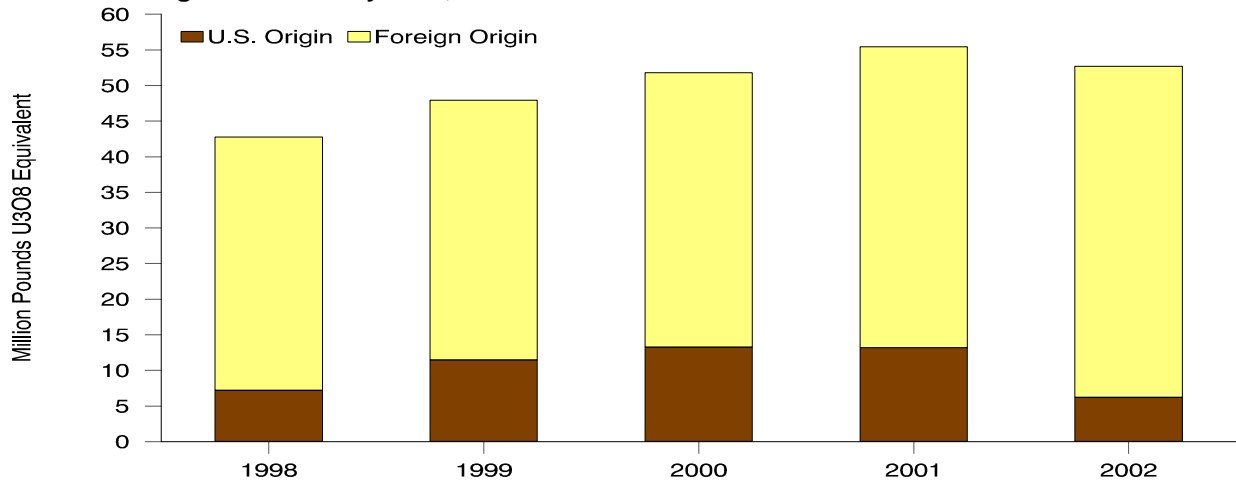
**Figure 7. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Supplier and Delivery Year, 1998-2002**



**Figure 8. Weighted-Average Price of Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Supplier and Delivery Year, 1998-2002**

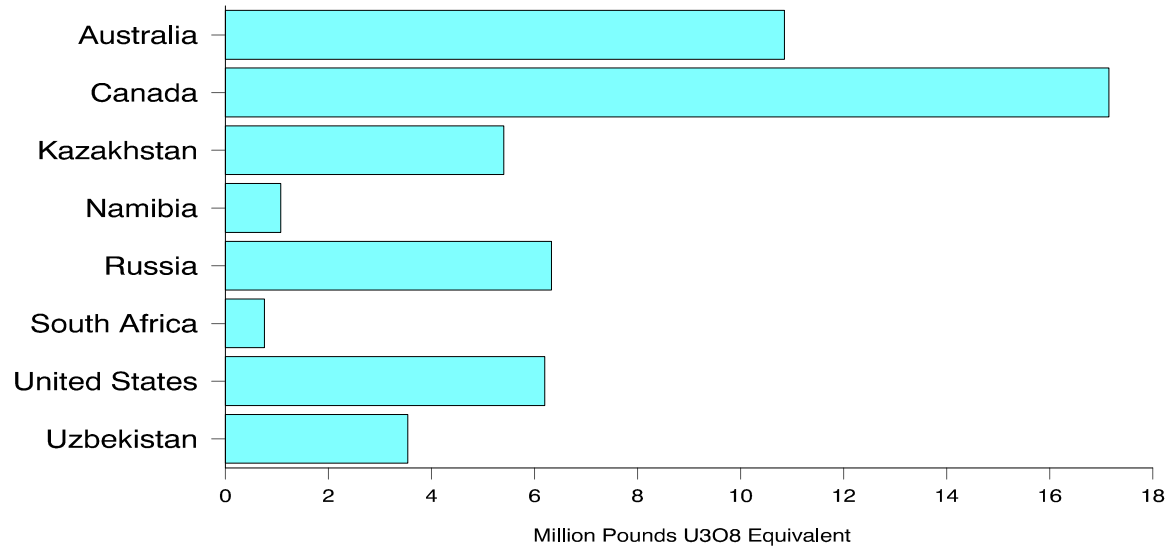


**Figure 9. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Origin and Delivery Year, 1998-2002**

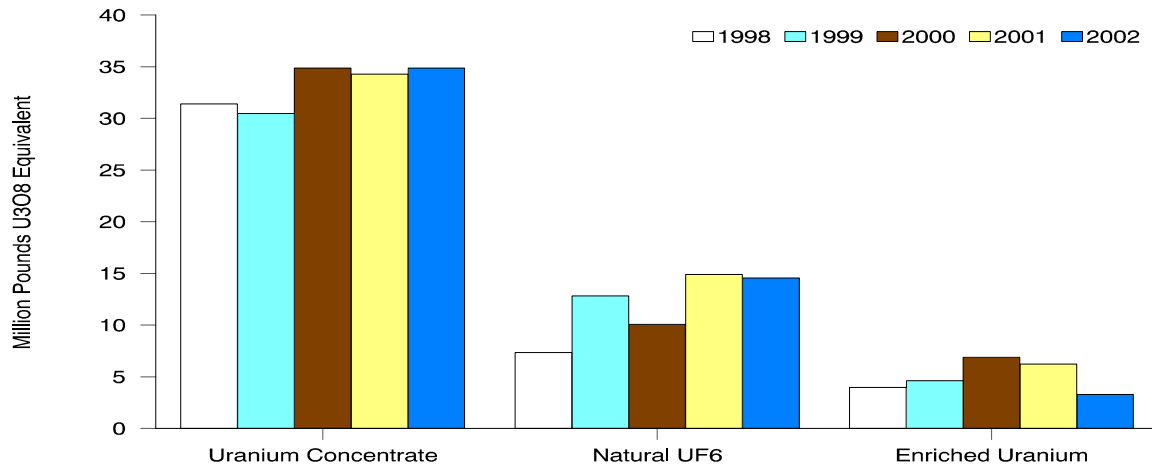


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

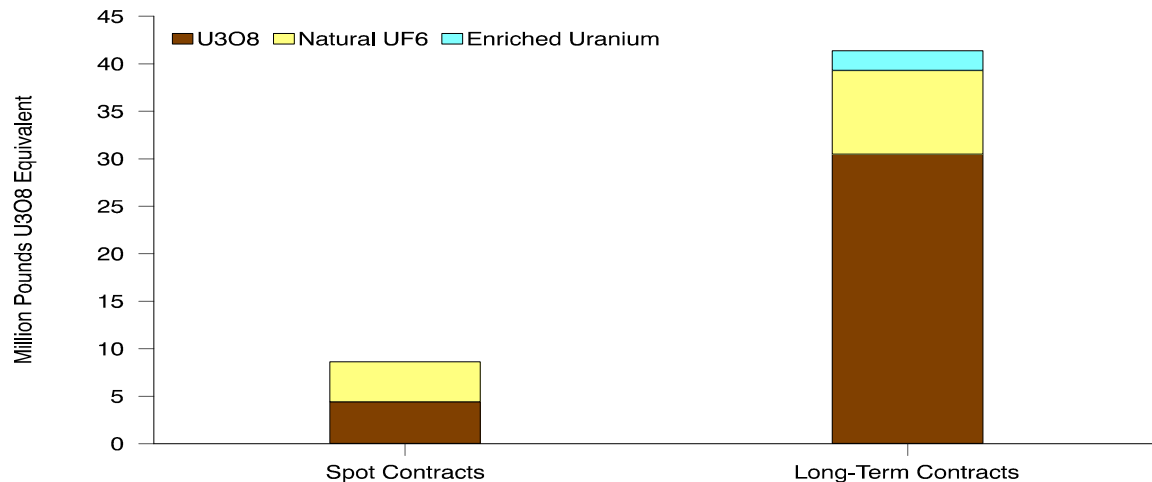
**Figure 10. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Selected Country Origin, 2002 Deliveries**



**Figure 11. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Material Type and Delivery Year, 1998-2002**

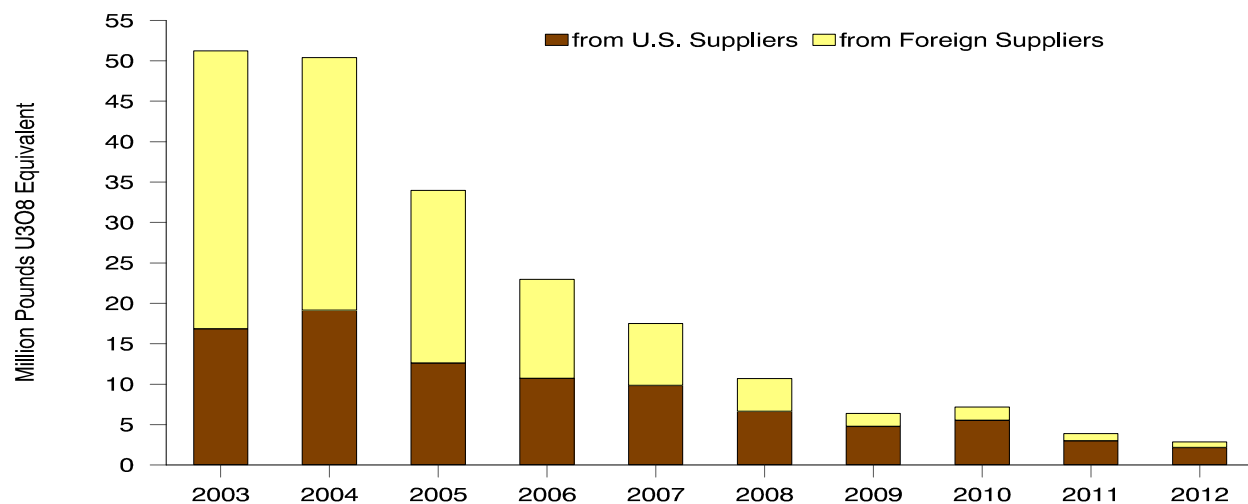


**Figure 12. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Contract Type and Material Type, 2002 Deliveries**

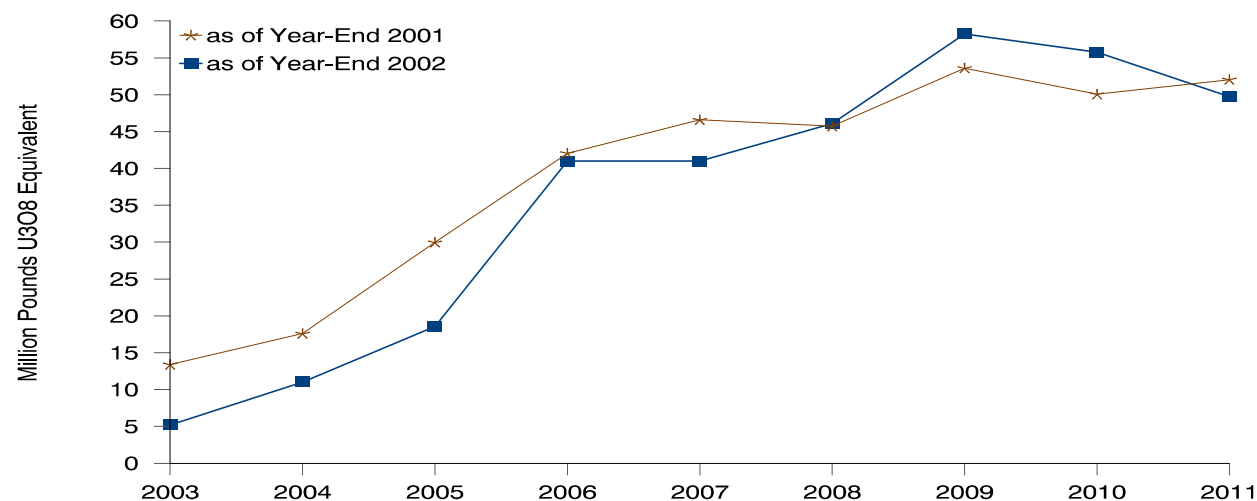


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

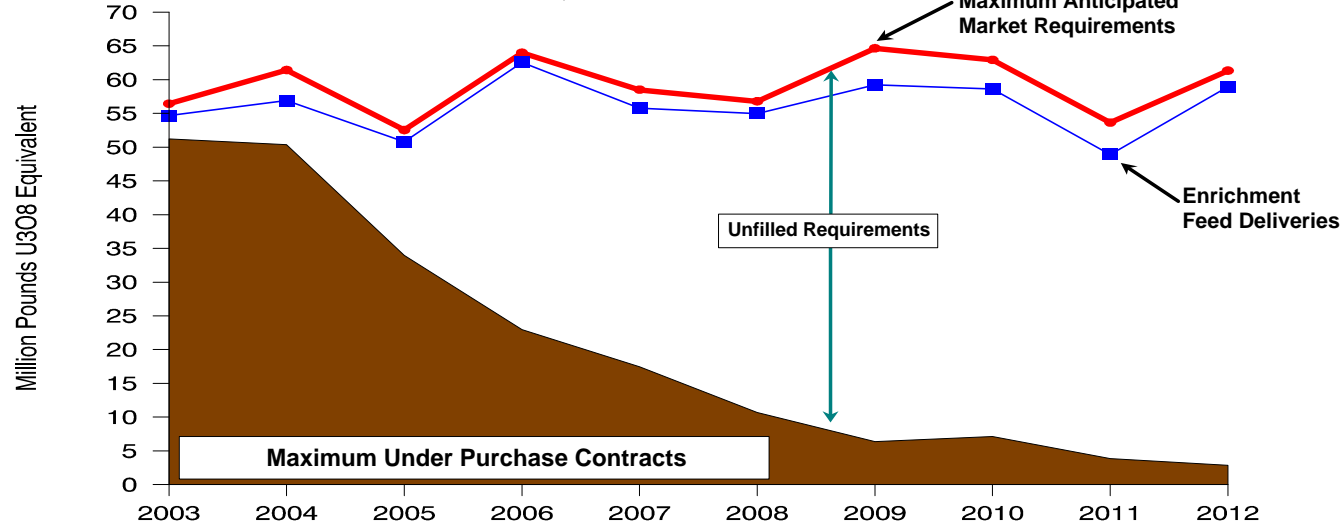
**Figure 13. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Purchases of Uranium by Supplier, Maximum, and Delivery Year, 2003-2012**



**Figure 14. Owners and Operators of U.S. Civilian Nuclear Power Reactors Annual Unfilled Uranium Requirements, 2003-2011**

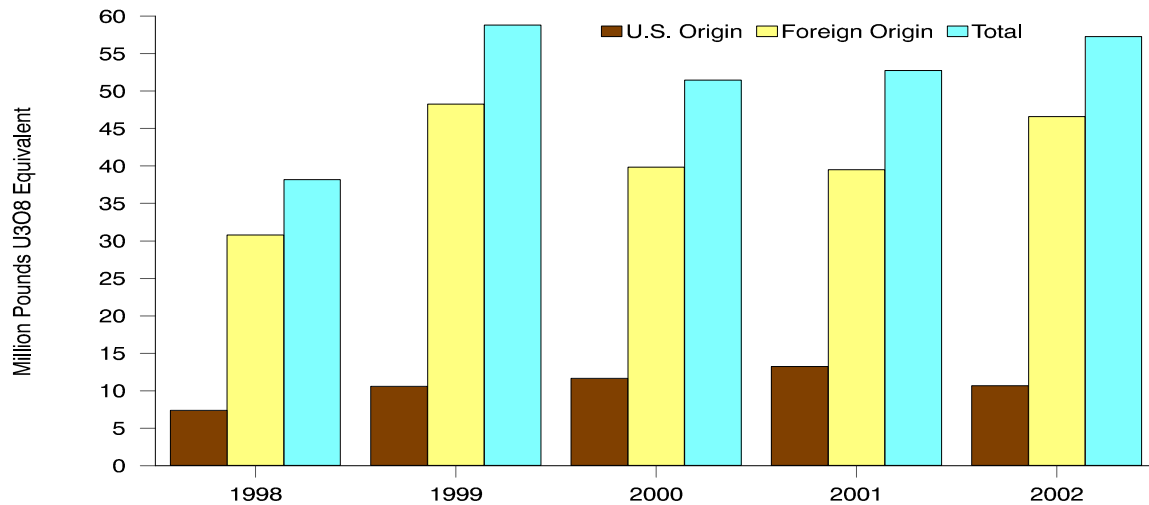


**Figure 15. Maximum Anticipated Uranium Market Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2003-2012**

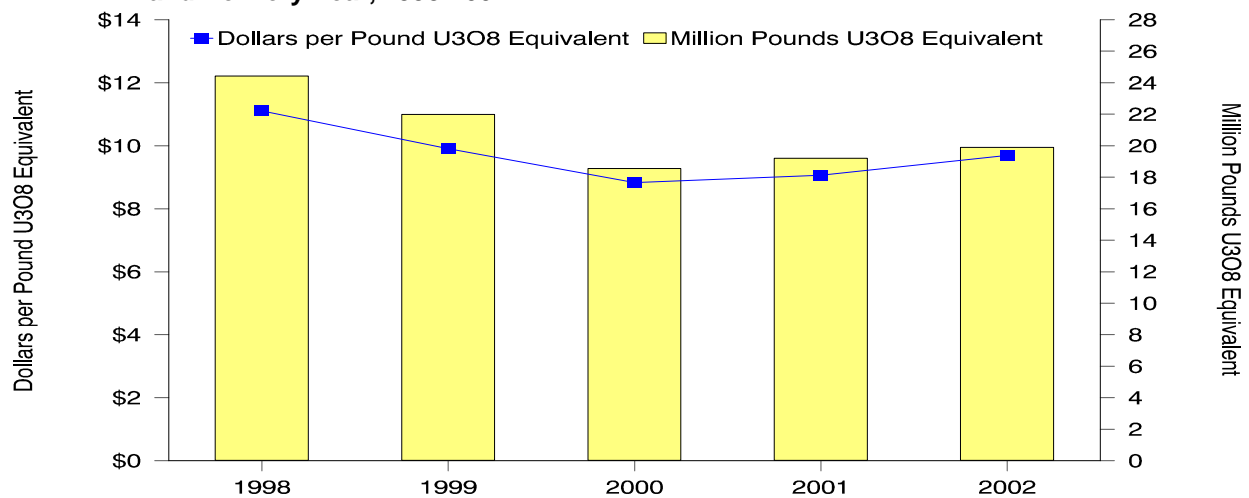


Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

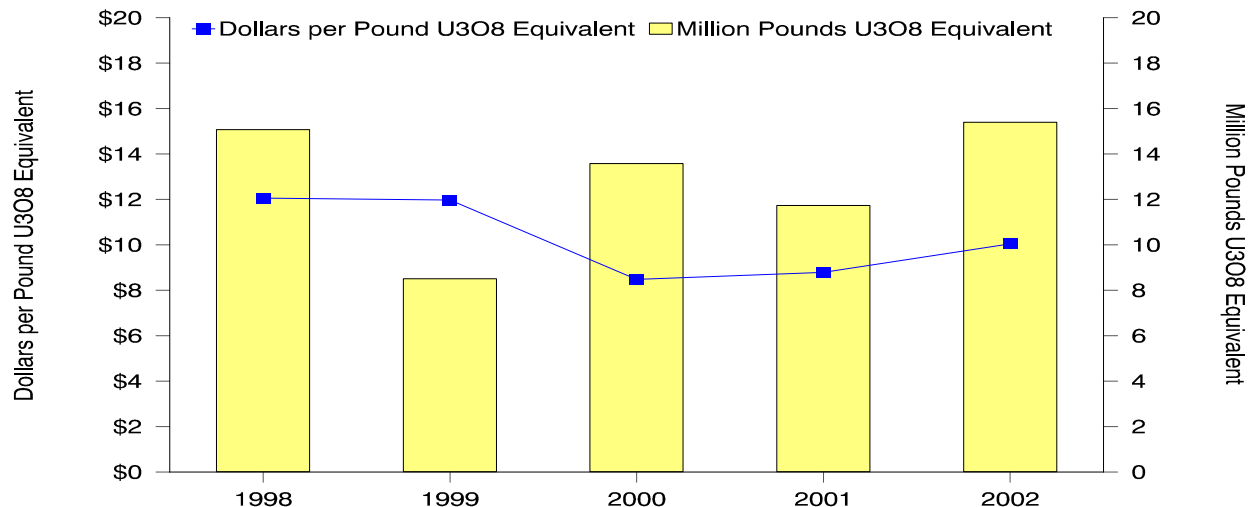
**Figure 16. Uranium in Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors by Year, 1998-2002**



**Figure 17. U.S. Broker and Trader Purchases of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1998-2002**



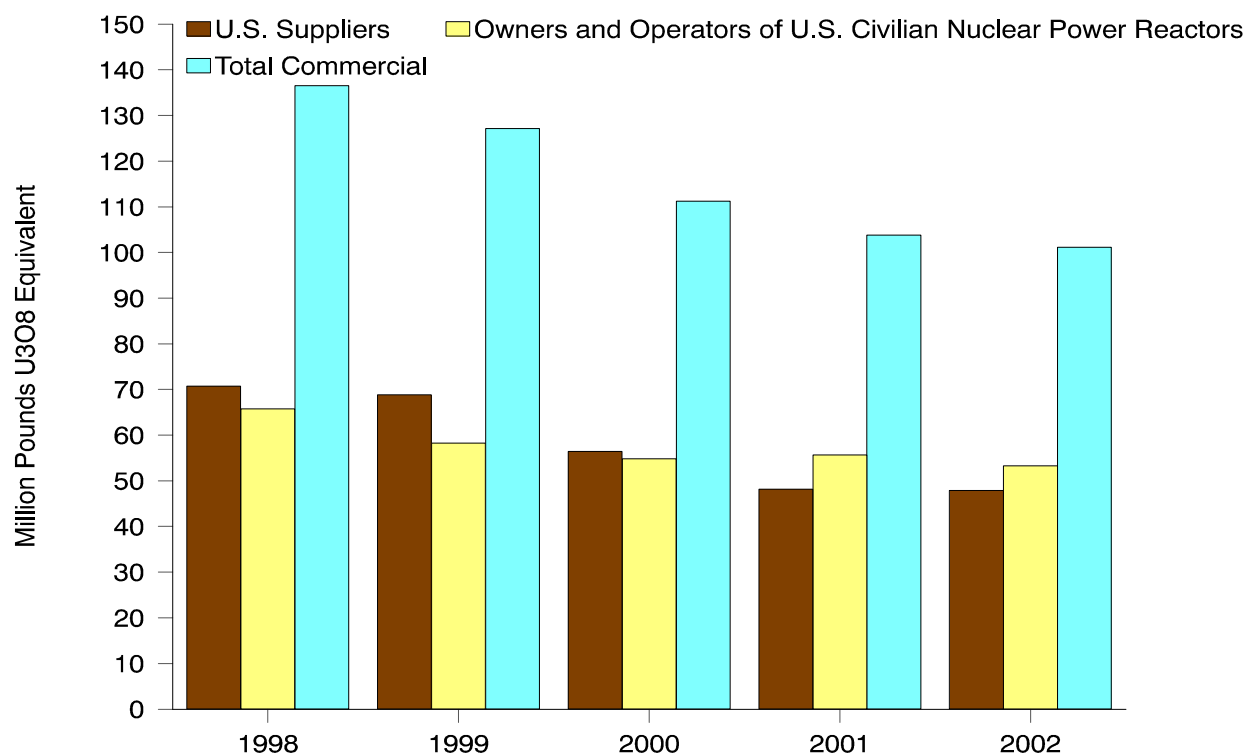
**Figure 18. Foreign Sales of Uranium by Quantity, Weighted-Average Price, and Delivery Year, 1998-2002**



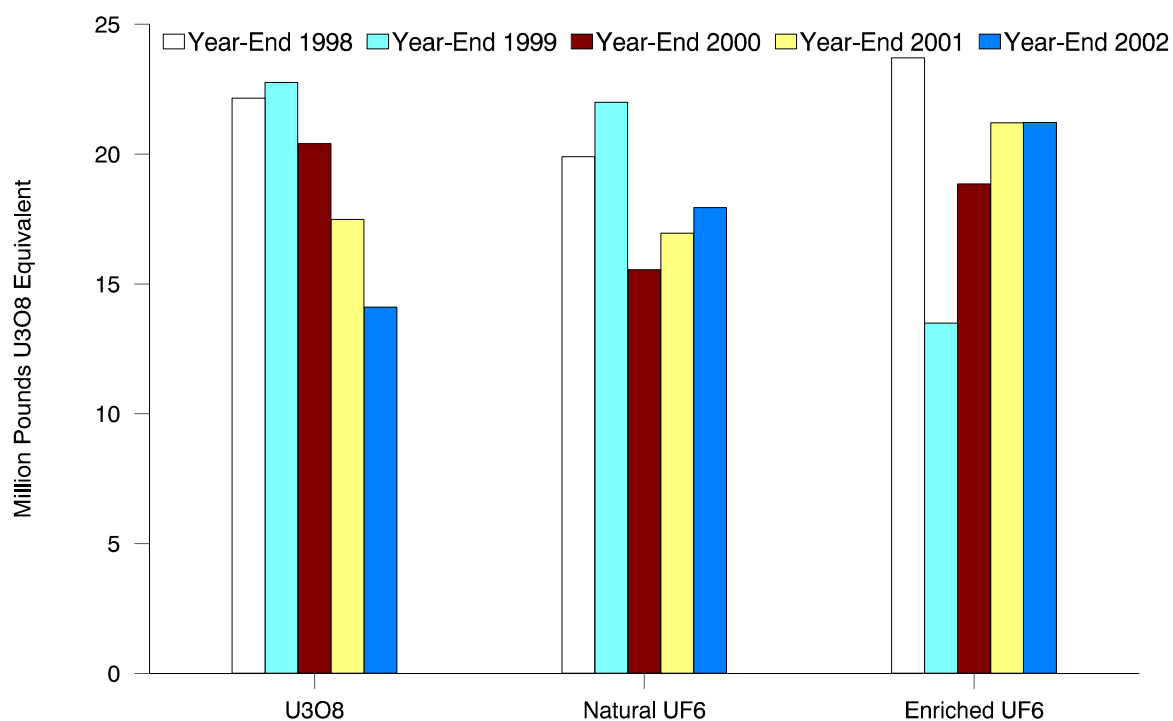
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).



**Figure 19. Commercial Uranium Inventories at End of the Year, 1998-2002**



**Figure 20. Owners and Operators of U.S. Civilian Nuclear Power Reactors Uranium Inventories at End of the Year, 1998-2002**



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1999-2002).

**Table 10. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1998-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1998	1999	2000	2001	2002
Received from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	6,488	5,161	3,560	2,302	1,455
Weighted-Average Price .....	13.61	13.93	14.81	13.26	13.03
Received from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	10,467	10,395	9,095	11,706	13,350
Weighted-Average Price .....	11.95	11.54	11.28	10.44	10.21
Received from other Owners and Operators of U.S. Civilian Nuclear Power Reactors:					
Purchases .....	W	W	0	0	W
Weighted-Average Price .....	W	W	—	—	W
Received from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	W	W	8,796	11,434	W
Weighted-Average Price .....	W	W	10.45	9.98	W
Received from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	21,252	26,767	30,359	29,984	32,182
Weighted-Average Price .....	11.97	11.47	10.65	9.86	10.37
<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>42,743</b>	<b>47,948</b>	<b>51,810</b>	<b>55,426</b>	<b>52,709</b>
Weighted-Average Price .....	<b>12.14</b>	<b>11.63</b>	<b>11.04</b>	<b>10.15</b>	<b>10.36</b>

W=Data withheld to avoid disclosure.

— = Not applicable.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

**Table 11. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1998-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1998	1999	2000	2001	2002
Received of U.S.-Origin Uranium:					
Purchases .....	7,181	11,448	13,258	13,187	6,206
Weighted-Average Price .....	13.37	12.24	11.52	10.50	10.89
Received of Foreign-Origin Uranium:					
Purchases .....	35,562	36,500	38,552	42,239	46,503
Weighted-Average Price .....	11.90	11.47	10.88	10.05	10.29
<b>Total:</b>					
Purchases .....	<b>42,743</b>	<b>47,948</b>	<b>51,810</b>	<b>55,426</b>	<b>52,709</b>
Weighted-Average Price .....	<b>12.14</b>	<b>11.63</b>	<b>11.04</b>	<b>10.15</b>	<b>10.36</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

**Table 12. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Origin Country and Delivery Year, 2000-2002**  
(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 2000		Deliveries in 2001		Deliveries in 2002	
	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price	Purchases	Weighted-Average Price
<b>All Purchases:</b>						
Australia .....	12,722	9.20	10,314	9.51	10,857	9.74
Bulgaria .....	W	W	W	W	0	—
Canada .....	10,455	11.20	17,120	9.91	17,153	10.85
China .....	621	11.56	W	W	W	W
Czech Republic .....	842	9.89	0	—	0	—
France .....	W	W	W	W	0	—
Gabon .....	0	—	W	W	W	W
Germany .....	0	—	W	W	W	W
Kazakhstan .....	W	W	3,149	7.95	5,410	8.51
Namibia .....	753	15.51	568	15.71	1,082	12.80
Nlger .....	723	12.07	W	W	W	W
Portugal .....	0	—	0	—	W	W
Russia .....	6,686	13.17	5,042	10.84	6,334	10.77
South Africa .....	2,347	8.96	2,022	10.36	764	9.38
Ukraine .....	W	W	0	—	W	W
United Kingdom .....	0	—	0	—	W	W
Uzbekistan .....	1,923	12.96	2,643	12.30	3,546	10.84
<b>Total Foreign .....</b>	<b>38,552</b>	<b>10.88</b>	<b>42,239</b>	<b>10.05</b>	<b>46,503</b>	<b>10.29</b>
United States .....	13,258	11.52	13,187	10.50	6,206	10.89
<b>Total Purchases .....</b>	<b>51,810</b>	<b>11.04</b>	<b>55,426</b>	<b>10.15</b>	<b>52,709</b>	<b>10.36</b>
<b>Domestic Purchases:</b>						
Australia .....	3,005	9.47	1,884	10.22	2,762	10.16
Canada .....	1,471	11.84	4,527	11.26	4,782	11.20
China .....	W	W	W	W	W	W
France .....	W	W	W	W	0	—
Germany .....	0	—	W	W	W	W
Kazakhstan .....	W	W	2,452	7.89	4,782	8.42
Namibia .....	W	W	W	W	W	W
Niger .....	723	12.07	W	W	0	—
Portugal .....	0	—	0	—	W	W
Russia .....	1,688	14.08	2,127	10.91	673	13.23
South Africa .....	1,054	8.99	575	12.58	W	W
Ukraine .....	W	W	0	—	W	W
Uzbekistan .....	W	W	W	W	2,839	10.92
United States .....	13,258	11.52	13,187	10.50	6,206	10.89
<b>Total Domestic Purchases .....</b>	<b>24,285</b>	<b>11.45</b>	<b>27,473</b>	<b>10.45</b>	<b>22,680</b>	<b>10.35</b>
<b>Foreign Purchases:</b>						
Australia .....	9,717	9.13	8,430	9.35	8,095	9.62
Bulgaria .....	W	W	W	W	0	—
Canada .....	8,984	11.10	12,593	9.42	12,371	10.72
China .....	W	W	W	W	0	—
Czech Republic .....	842	9.89	0	—	0	—
Gabon .....	0	—	W	W	W	W
Kazakhstan .....	0	—	697	8.14	628	9.25
Namibia .....	W	W	W	W	W	W
Niger .....	0	—	W	W	W	W
Russia .....	4,998	12.84	2,915	10.81	5,661	10.44
South Africa .....	1,293	8.95	1,447	9.48	W	W
Ukraine .....	W	W	0	—	W	W
United Kingdom .....	0	—	0	—	W	W
Uzbekistan .....	W	W	W	W	707	10.53
<b>Total Foreign Purchases .....</b>	<b>27,525</b>	<b>10.68</b>	<b>27,953</b>	<b>9.87</b>	<b>30,029</b>	<b>10.37</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2000-2002).

**Table 13. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Origin and Material Type, 2002 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 .....	2,613	2,707	886	6,206
Weighted-Average Price .....	11.29	10.23	12.13	10.89
<b>Received of Foreign-Origin Uranium:</b>				
Purchases .....	32,250	11,852	2,401	46,503
Weighted-Average Price .....	10.39	10.19	8.81	10.29
<b>Total:</b>				
Purchases .....	<b>34,863</b>	<b>14,559</b>	<b>3,287</b>	<b>52,709</b>
Weighted-Average Price .....	<b>10.46</b>	<b>10.20</b>	<b>9.76</b>	<b>10.36</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**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, 2001-2002**  
(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	
	2001	2002	2001	2002	2001	2002
<b>Contract-Specified Pricing</b>						
Weighted-Average Price .....	11.72	10.73	11.47	11.83	11.61	11.15
Quantity with Reported Price .....	16,549	15,462	11,904	9,601	28,453	25,063
<b>Spot-Market Pricing</b>						
Weighted-Average Price .....	8.04	9.79	8.64	9.51	8.42	9.57
Quantity with Reported Price .....	6,517	4,142	11,225	14,449	17,742	18,591
<b>Other Pricing</b>						
Weighted-Average Price .....	8.87	8.42	8.80	10.00	8.83	9.53
Quantity with Reported Price .....	3,377	1,854	4,824	4,472	8,201	6,326
<b>All Pricing Mechanisms</b>						
Weighted-Average Price .....	<b>10.45</b>	<b>10.35</b>	<b>9.87</b>	<b>10.37</b>	<b>10.15</b>	<b>10.36</b>
Quantity with Reported Price .....	<b>26,443</b>	<b>21,458</b>	<b>27,953</b>	<b>28,522</b>	<b>54,396</b>	<b>49,980</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;" Schedule B: Uranium Marketing Activities (2001-2002).

**Table 15. Price Distributions of Uranium Purchases by Owners and Operators of U.S. Civilian Nuclear Power Reactors by Delivery Year, 2000-2002**  
(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 2000		Deliveries in 2001		Deliveries in 2002	
	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 .....	6,185	7.02	6,800	6.93	6,248	7.91
Second .....	6,185	7.96	6,800	7.50	6,248	9.00
Third .....	6,185	8.94	6,800	8.32	6,248	9.24
Fourth .....	6,185	9.55	6,800	8.80	6,248	9.35
Fifth .....	6,185	10.27	6,800	9.19	6,248	9.58
Sixth .....	6,185	12.26	6,800	10.31	6,248	9.97
Seventh .....	6,185	14.19	6,800	13.09	6,248	11.61
Eighth .....	6,185	18.11	6,800	17.07	6,248	16.21
<b>Total .....</b>	<b>49,481</b>	<b>11.04</b>	<b>54,396</b>	<b>10.15</b>	<b>49,980</b>	<b>10.36</b>
<b>Quartile<sup>b</sup>:</b>						
First .....	7,404	8.42	9,778	8.18	9,886	8.95
Second .....	16,148	9.89	11,170	8.89	7,756	9.61
Third .....	14,511	11.03	21,585	10.08	23,672	10.42
Fourth .....	11,418	14.37	11,863	13.09	8,666	12.48
<b>Total .....</b>	<b>49,481</b>	<b>11.04</b>	<b>54,396</b>	<b>10.15</b>	<b>49,980</b>	<b>10.36</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;" Schedule B: Uranium Marketing Activities (2000-2002).

**Table 16. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchased Uranium by Contract Type and Material Type, 2002 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> .....	4,407	9.10	30,456	10.65	34,863	10.46
Natural UF <sub>6</sub> .....	4,210	9.49	8,826	10.54	13,036	10.20
Enriched Uranium .....	0	—	2,081	9.76	2,081	9.76
<b>Total .....</b>	<b>8,617</b>	<b>9.29</b>	<b>41,363</b>	<b>10.58</b>	<b>49,980</b>	<b>10.36</b>

— = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table 17. Contracts Signed in 2002 by Owners and Operators of U.S. Civilian Nuclear Power Reactors by Contract Type with 2002 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 2002	Weighted-Average Price	Number of Purchase Contracts
Spot .....	W	W	22
Long-Term .....	W	W	2
<b>Total .....</b>	<b>7,793</b>	<b>9.56</b>	<b>24</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table 18. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Purchases of Uranium, Signed in 2002, by Delivery Year, 2003-2012**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Delivery	Minimum	Maximum
2003 .....	2,922	3,373
2004 .....	5,104	6,277
2005 .....	5,341	7,101
2006 .....	3,607	5,020
2007 .....	1,715	3,530
2008 .....	1,315	3,530
2009 .....	0	400
2010 .....	0	0
2011 .....	0	0
2012 .....	0	0
<b>Total .....</b>	<b>20,004</b>	<b>29,231</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table 19. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Purchases of Uranium from Suppliers, in Effect at the End of 2002, by Delivery Year, 2003-2012**  
(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
2003 .....	12,925	16,844	26,121	34,374	39,046	51,218
2004 .....	14,961	19,140	22,303	31,239	37,264	50,379
2005 .....	7,765	12,597	14,683	21,373	22,448	33,970
2006 .....	5,674	10,716	7,555	12,238	13,229	22,954
2007 .....	3,488	9,810	4,338	7,676	7,826	17,486
2008 .....	2,926	6,623	1,532	4,065	4,458	10,688
2009 .....	0	4,757	613	1,604	613	6,361
2010 .....	550	5,506	1,536	1,640	2,086	7,146
2011 .....	631	2,962	914	914	1,545	3,876
2012 .....	0	2,157	607	708	607	2,865
<b>Total .....</b>	<b>48,920</b>	<b>91,112</b>	<b>80,202</b>	<b>115,831</b>	<b>129,122</b>	<b>206,943</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table 20. Unfilled Uranium Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2003-2012**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year	As of December 31, 2001		As of December 31, 2002	
	Annual	Cumulative	Annual	Cumulative
2003 .....	13,385	13,385	5,199	5,199
2004 .....	17,593	30,978	11,013	16,212
2005 .....	29,965	60,943	18,547	34,759
2006 .....	42,068	103,011	41,002	75,761
2007 .....	46,597	149,608	41,004	116,765
2008 .....	45,716	195,324	46,089	162,854
2009 .....	53,599	248,923	58,251	221,105
2010 .....	50,061	298,984	55,755	276,860
2011 .....	52,504	351,488	49,733	326,593
2012 .....	NR	—	58,437	385,030

NR = Not Reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2001-2002).

**Table 21. Maximum Anticipated Uranium Market Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2003-2012, as of December 31, 2002**  
(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
2003 .....	51,218	5,199	56,417	54,647
2004 .....	50,379	11,013	61,392	56,883
2005 .....	33,970	18,547	52,517	50,788
2006 .....	22,954	41,002	63,956	62,552
2007 .....	17,486	41,004	58,490	55,756
2008 .....	10,688	46,089	56,777	54,946
2009 .....	6,361	58,251	64,612	59,231
2010 .....	7,146	55,755	62,901	58,602
2011 .....	3,876	49,733	53,609	48,904
2012 .....	2,865	58,437	61,302	58,939
<b>Total .....</b>	<b>206,943</b>	<b>385,030</b>	<b>591,973</b>	<b>561,248</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table 22. Owners and Operators of U.S. Civilian Nuclear Power Reactors Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 2000-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Enrichment Plant Location	Deliveries in 2000			Deliveries in 2001			Deliveries in 2002		
	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total
China .....	0	776	776	0	W	W	0	W	W
France .....	557	3,685	4,242	552	4,786	5,338	1,260	11,186	12,446
Germany .....	W	W	2,210	0	1,589	1,589	W	W	1,189
Netherlands .....	W	W	1,633	0	W	W	0	1,873	1,873
Russia .....	W	W	1,977	W	W	935	0	W	W
United Kingdom.....	392	6,120	6,512	W	W	3,072	474	4,497	4,971
Europe <sup>a</sup> (France, Germany, Netherlands, or United Kingdom) and other .....	W	W	1,571	243	3,016	3,259	W	W	4,137
<b>Foreign Total .....</b>	<b>1,244</b>	<b>17,667</b>	<b>18,921</b>	<b>914</b>	<b>14,324</b>	<b>15,238</b>	<b>2,578</b>	<b>23,063</b>	<b>25,641</b>
United States .....	9,272	19,654	28,926	10,402	21,696	32,098	5,625	23,398	29,023
<b>Total .....</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>	<b>8,203</b>	<b>46,461</b>	<b>54,664</b>

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

W = Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2000-2002).



**Table 23. Owners and Operators of U.S. Civilian Nuclear Power Reactors Deliveries of Uranium Feed for Enrichment by Origin Country and Delivery Year, 2000-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin Country of Feed	Deliveries in 2000			Deliveries in 2001			Deliveries in 2002		
	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 .....	4,886	2,065	6,951	5,474	2,393	7,867	4,192	5,413	9,605
Bulgaria .....	0	W	W	0	W	W	0	0	0
Canada .....	6,742	7,887	14,629	6,487	6,240	12,727	7,288	9,325	16,613
China .....	W	W	702	W	W	676	W	0	W
Czech Republic .....	0	W	W	0	0	0	0	W	W
France .....	0	W	W	0	0	0	0	0	0
Gabon .....	0	0	0	W	0	W	W	0	W
Germany .....	0	0	0	W	0	W	0	W	W
Kazakhstan .....	0	1,459	1,459	866	1,854	2,720	1,568	2,738	4,306
Namibia .....	W	W	862	W	W	221	644	528	1,172
Niger .....	0	486	486	W	W	W	0	W	W
Portugal .....	0	0	0	0	0	0	0	W	W
Russia .....	5,823	784	6,607	W	W	6,748	W	W	8,512
South Africa .....	889	1,153	2,042	1,295	861	2,156	W	W	1,087
Tajikistan .....	W	0	W	W	0	W	0	0	0
Ukraine .....	0	1,211	1,211	0	W	W	0	W	W
Uzbekistan .....	571	858	1,429	637	705	1,342	1,142	3,195	4,337
<b>Foreign Total .....</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>	<b>23,398</b>	<b>23,063</b>	<b>46,461</b>
United States .....	9,272	1,244	10,516	10,402	914	11,316	5,625	2,578	8,203
<b>Total .....</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>	<b>29,023</b>	<b>25,641</b>	<b>54,664</b>

W = Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2000-2002).

**Table 24. Shipments of Uranium Feed by Owners and Operators of U.S. Civilian Nuclear Power Reactors to Domestic and Foreign Enrichment Suppliers, 2003-2012**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Year of Shipment	Amount to be Shipped		Change from 2001 to 2002	
	As of December 31, 2001	As of December 31, 2002	Annual	Cumulative
2003 .....	55,925	54,647	-1,278	-1,278
2004 .....	52,008	56,883	4,875	3,597
2005 .....	52,381	50,788	-1,593	2,004
2006 .....	61,791	62,552	761	2,765
2007 .....	57,267	55,756	-1,511	1,254
2008 .....	53,943	54,946	1,003	2,257
2009 .....	59,029	59,231	202	2,459
2010 .....	55,351	58,602	3,251	5,710
2011 .....	54,221	48,904	-5,317	393
2012 .....	NR	58,939	—	—

NR = Not reported. — = Not applicable.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2001-2002).

**Table 25. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchases of Enrichment Services by Origin Country and Delivery Year, 1998-2002**  
(Thousand Separative Work Units (SWU))

Deliveries	1998	1999	2000	2001	2002
<b>Country where Enrichment Service was performed:</b>					
China .....	W	145	292	W	W
France .....	696	822	1,010	1,368	1,958
Germany .....	W	302	554	412	635
Netherlands .....	323	245	471	224	432
Russia .....	2,364	3,424	2,931	5,790	5,048
United Kingdom .....	376	487	1,040	659	804
Europe <sup>a</sup> (France, Germany, Netherlands, or United Kingdom) and other .....	—	—	344	W	W
<b>Foreign Total .....</b>	<b>4,401</b>	<b>5,425</b>	<b>6,642</b>	<b>9,107</b>	<b>9,802</b>
United States .....	5,677	4,602	5,155	1,295	1,690
<b>Total .....</b>	<b>10,079</b>	<b>10,028</b>	<b>11,797</b>	<b>10,402</b>	<b>11,492</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;" Schedule B: Uranium Marketing Activities (1998-2002).

**Table 26. Owners and Operators of U.S. Civilian Nuclear Power Reactors Purchases of Enrichment Services by Contract Type in Delivery Year, 2002**  
(Thousand Separative Work Units (SWU))

Enrichment Service Contract Type	U.S. Enrichment	Foreign Enrichment	Total
Spot .....	59	329	389
Long-Term .....	1,631	9,473	11,104
<b>Total .....</b>	<b>1,690</b>	<b>9,802</b>	<b>11,492</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table 27. Uranium in Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors by Year, 1998-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Origin of Uranium	1998	1999	2000	2001	2002 <sup>P</sup>
Domestic-Origin Uranium .....	7,388	10,583	11,640	13,220	10,663
Foreign-Origin Uranium .....	30,811	48,244	39,829	39,512	46,596
<b>Total .....</b>	<b>38,199</b>	<b>58,827</b>	<b>51,469</b>	<b>52,733</b>	<b>57,259</b>

P = Preliminary data. Final 2001 fuel assembly data reported in the 2002 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;" Schedule B: Uranium Marketing Activities (1999-2002).

**Table 28. Foreign Purchases of Uranium by U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors by Delivery Year, 1998-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1998	1999	2000	2001	2002
<b>U.S. Suppliers:</b>					
Foreign Purchases .....	22,605	20,998	17,386	18,727	22,670
Weighted-Average Price .....	10.50	9.42	8.45	8.98	9.65
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors:</b>					
Foreign Purchases .....	21,102	26,577	27,525	27,953	30,029
Weighted-Average Price .....	11.96	11.45	10.68	9.87	10.37
<b>Total:</b>					
Foreign Purchases .....	<b>43,707</b>	<b>47,575</b>	<b>44,911</b>	<b>46,680</b>	<b>52,699</b>
Weighted-Average Price .....	<b>11.19</b>	<b>10.55</b>	<b>9.84</b>	<b>9.51</b>	<b>10.05</b>

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

**Table 29. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1998-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent; Dollars per Pound U<sub>3</sub>O<sub>8</sub> Equivalent)

Deliveries	1998	1999	2000	2001	2002
<b>Received U.S.-Origin Uranium:</b>					
Purchases .....	2,732	3,301	2,965	1,194	W
Weighted-Average Price .....	13.50	12.85	10.92	10.38	W
<b>Received Foreign-Origin Uranium:</b>					
Purchases .....	21,686	18,679	15,591	17,999	W
Weighted-Average Price .....	10.80	9.39	8.44	8.97	W
<b>Total Received by U.S. Brokers and Traders:</b>					
Purchases .....	<b>24,418</b>	<b>21,980</b>	<b>18,556</b>	<b>19,193</b>	<b>19,896</b>
Weighted-Average Price .....	<b>11.10</b>	<b>9.91</b>	<b>8.83</b>	<b>9.06</b>	<b>9.69</b>
<b>Received from Foreign Suppliers:</b>					
Purchases .....	21,651	19,239	15,803	18,264	18,614
Weighted-Average Price .....	10.77	9.60	8.61	8.87	9.59

W = Data withheld to avoid disclosure.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

**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, 1998-2002**  
(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	1998	1999	2000	2001	2002
<b>U.S.-Origin Uranium:</b>					
Foreign Sales .....	3,904	3,795	1,044	1,545	3,004
Weighted-Average Price .....	15.75	13.60	13.60	11.84	10.57
<b>Foreign-Origin Uranium:</b>					
Foreign Sales .....	11,170	4,715	12,534	10,186	12,385
Weighted-Average Price .....	10.76	10.92	8.09	8.33	9.92
<b>Total Sent:</b>					
<b>Foreign Sales .....</b>	<b>15,074</b>	<b>8,510</b>	<b>13,578</b>	<b>11,731</b>	<b>15,389</b>
<b>Weighted-Average Price .....</b>	<b>12.05</b>	<b>11.97</b>	<b>8.48</b>	<b>8.79</b>	<b>10.04</b>
<b>From U.S. Producers, Owners and Operators of U.S. Civilian Nuclear Power Reactors, and other U.S. Suppliers:</b>					
Foreign Sales .....	4,565	3,761	2,369	2,195	4,974
Weighted-Average Price .....	14.39	14.58	11.62	11.95	10.64
<b>From U.S. Brokers and Traders:</b>					
Foreign Sales .....	10,509	4,749	11,209	9,536	10,415
Weighted-Average Price .....	11.04	10.32	8.06	8.07	9.76

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1998-2002).

**Table 31. Inventories of Natural and Enriched Uranium as of End of Year, 1998-2002**  
(Thousand Pounds U<sub>3</sub>O<sub>8</sub> Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1998	1999	2000	2001	2002 <sup>P</sup>
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors Inventories .....</b>					
Natural Uranium .....	42,051	44,761	35,952	34,433	32,052
Enriched Uranium <sup>a</sup> .....	23,708	13,488	18,851	21,204	21,217
<b>U.S. Supplier Inventories<sup>b</sup> .....</b>	<b>70,732</b>	<b>68,848</b>	<b>56,455</b>	<b>48,147</b>	<b>47,875</b>
Natural Uranium .....	35,030	29,468	12,616	9,192	14,968
Enriched Uranium <sup>a</sup> .....	35,702	39,380	43,839	38,955	32,908
<b>Total Commercial Inventories .....</b>	<b>136,491</b>	<b>127,097</b>	<b>111,258</b>	<b>103,783</b>	<b>101,145</b>
<b>DOE-Owned Inventories<sup>c</sup> .....</b>					
Natural Uranium .....	24,454	53,054	53,054	53,054	51,789
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 2001 inventory data reported in the 2002 survey.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (1999-2002).

**Table 32. Commercial Uranium Inventories by Material Type at End of Year, 2000-2002**  
(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		
	2000	2001	2002 <sup>P</sup>	2000	2001	2002 <sup>P</sup>	2000	2001	2002 <sup>P</sup>
U <sub>3</sub> O <sub>8</sub> .....	20,404	17,480	14,116	10,945	7,121	6,445	31,349	24,601	20,561
Natural UF <sub>6</sub> .....	15,548	16,952	17,936	1,671	2,071	8,522	17,219	19,023	26,458
Enriched UF <sub>6</sub> .....	18,851	21,204	21,217	43,839	38,955	32,908	62,690	60,159	54,125
<b>Total Commercial Inventories .....</b>	<b>54,804</b>	<b>55,636</b>	<b>53,269</b>	<b>56,455</b>	<b>48,147</b>	<b>47,875</b>	<b>111,258</b>	<b>103,783</b>	<b>101,145</b>

P = Preliminary data. Final 2001 inventory data reported in the 2002 survey.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2001-2002).

**Table 33. Commercial Uranium Inventories by Type and Owner at End of Year, 2000-2002**  
(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		
	2000	2001	2002 <sup>P</sup>	2000	2001	2002 <sup>P</sup>	2000	2001	2002 <sup>P</sup>
Brokers and Traders .....	W	W	W	W	W	W	5,595	2,185	4,445
Converter, Enricher, Fabricators, and Producers .....	W	W	W	W	W	W	50,860	45,962	43,431
Owners and Operators of U.S. Civilian Nuclear Power Reactors .....	20,404	17,480	14,116	34,400	38,156	39,153	54,804	55,636	53,269
<b>Total Commercial Inventories ....</b>	<b>31,349</b>	<b>24,601</b>	<b>20,561</b>	<b>79,911</b>	<b>79,182</b>	<b>80,584</b>	<b>111,258</b>	<b>103,783</b>	<b>101,145</b>

P = Preliminary data. Final 2001 inventory data reported in the 2002 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;" Schedule B: Uranium Marketing Activities (2001-2002).

## Survey Methodology

### Survey Design

The 19th comprehensive survey of the U.S. uranium industry was conducted in 2003 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 2002. The data reported in this publication were developed from the 2002 survey and predecessor databases.

EIA asked respondents to the “Uranium Industry Annual Survey” to provide data current to the end of 2002 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 2002, 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 2002 or plan such expenditures in 2003; (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 50 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 2002 Form EIA-858 survey, Schedule A, "Uranium Raw Materials Activities," was mailed to 32 firms and Schedule B, "Uranium Marketing Activities," was mailed to 68 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 2002 Uranium Industry Annual Survey**

Response Status	Schedule	
	A	B
Survey Schedules Mailed Out	32	68
Data Provided	30	62
Reported as Not Applicable	2	6

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (2002).

## 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. 2002-22, "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. 2002-22 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

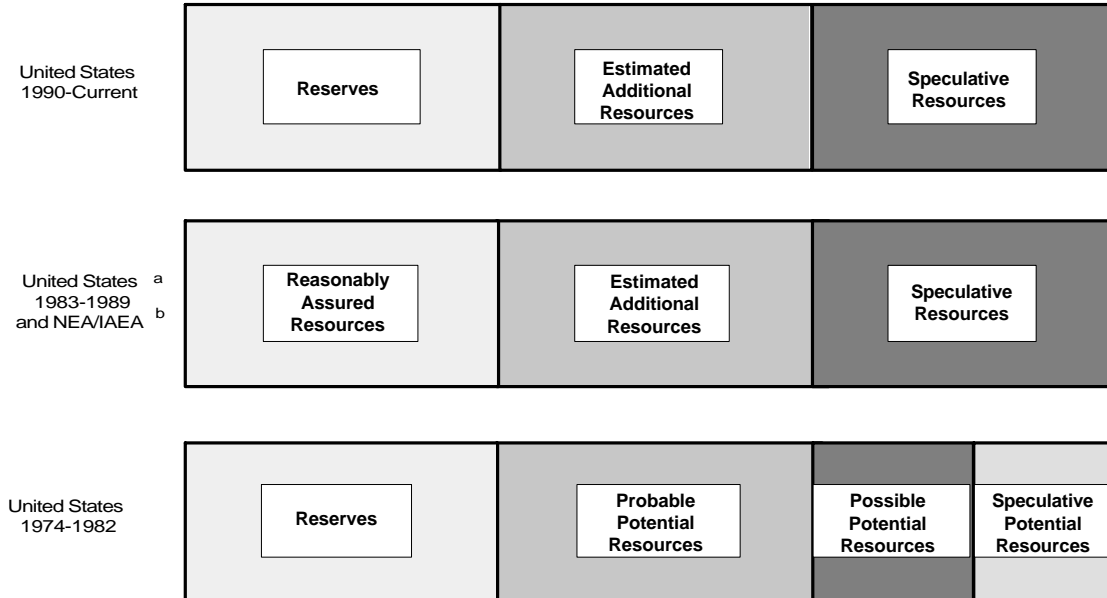
The U.S. uranium reserves reported annually by the EIA for specific maximum forward-cost categories represent the sums of quantities estimated to occur in known deposits on properties where statistical sampling of grade, ore configuration, and depth indicate that the quantities could

be recovered under current regulations at or less than the stated cost using current mining and milling technology. The reserves for 2002 are based on the historical data for about 800 (at the \$100 per pound 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 2002 Form EIA-858. Current mining cost information is not available for all of the uranium reserve properties included in the 2002 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 1993 are shown in Table B2. The 2002 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, 1993-2002**  
(Million Pounds U<sub>3</sub>O<sub>8</sub>)

Year	\$30 per pound	\$50 per pound	\$100 per pound
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
2002 .....	266	896	1,418

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" (1993-2002).

**Table B3. U.S. Forward-Cost Uranium Reserves by State, 2002**

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	0.280	84	102	0.167	341
Wyoming .....	41	0.130	108	238	0.077	367
Arizona, Colorado, Utah .....	7	0.288	41	42	0.138	115
Texas .....	4	0.077	6	18	0.063	23
Other <sup>b</sup> .....	7	0.198	27	24	0.013	50
<b>Total .....</b>	<b>75</b>	<b>0.179</b>	<b>266</b>	<b>425</b>	<b>0.105</b>	<b>896</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," Schedule A: Uranium Raw Material Activities.

## Appendix C

# Respondents to the Uranium Industry Annual Survey

Respondents to the Energy Information Administration's (EIA) 2002 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 2002 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	Geomex Minerals, Inc.	UPH
AmerGen Energy Company	NUC	Georgia Power Co. (Southern Nuclear)	NUC
AmerenUE	NUC	Global Nuclear Fuels	FAB
American Fuel Resources	BRO	Green Mountain Mining Venture	UPH
Anaconda Gold Corporation	UPH	HBS, Inc.	UPH
Arizona Public Service Company	NUC	Homestake Mining Company of California	UPH
Calvert Cliffs Nuclear Power Plant, Inc.	NUC	IES Utilities/Nuclear Management Company	NUC
Carolina Power & Light	NUC	Indiana Michigan Power	NUC
Cobb Resources Corporation	UPH	International Uranium (USA) Corporation	MLG
COGEMA, Inc.	BRO	Malapai Resources Company	MLG
COGEMA Mining, Inc.	MLG	Mestena Uranium, L.L.C.	UPH
ConverDyn	CON	Nebraska Public Power District	NUC
Cotter Corporation	MLG	New York Nuclear Corp. / NYNCO Trading	BRO
Crow Butte Resources, Inc.	MLG	Nine Mile Point Nuclear Station, LLC	NUC
Dawn Mining Company	UPH	NZ Uranium, LLC	UPH
Detroit Edison	NUC	Omaha Public Power District	NUC
Dominion Nuclear Connecticut, Inc.	NUC	Pacific Gas & Electric Company	NUC
Duke Power Company	NUC	Palisades Nuclear Plant/Nuclear Management	NUC
Energy Northwest	NUC	Pathfinder Mines Corporation	UPH
Entergy Gulf States, Inc.	NUC	Petrotomics Company (c/o Texaco, Inc)	UPH
Entergy Nuclear Fuels Company	NUC	Power Resources, Inc.	MLG
Everest Exploration, Inc.	UPH	PPL Susquehanna, LLC	NUC
Exelon Generation Company LLC	NUC	Progress Energy Florida, Inc.	NUC
FirstEnergy Nuclear Operating Company	NUC	PSEG Nuclear LLC	NUC
Florida Power & Light	NUC	Rio Algom Mining LLC	MLG
FPL Energy Seabrook LLC	NUC	Rio Grande Resources/Nuclear Fuels Corp.	UPH
Framatome ANP, Inc.	FAB	RME Partners, L. P.	UPH

**Table C1. Respondents to the 2002 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>
Rochester Gas and Electric Corporation	NUC	United Nuclear Corporation	UPH
RWE NUKEM, Inc.	TRA	Uranium King Corporation	UPH
San Diego Gas & Electric	NUC	Uranium Resources, Inc.	MLG
Section 2 Joint Venture-Continental Materials	UPH	U.S. Department of Energy, EM	GOV
Sheep Mountain Partners	UPH	USEC, Inc.	ENR
Simons Associates	UPH	U.S. Energy Corp. (Plateau Resources, Ltd)	UPH
South Carolina Electric & Gas	NUC	Utah-Idaho Consolidated Uranium	UPH
Southern California Edison Company	NUC	UUS, Inc.	UPH
South Texas Project Nuclear Operating Co.	NUC	Vermont Yankee/Entergy Nuclear Fuels	NUC
Strathmore Minerals Corp.	UPH	Virginia Electric and Power Company	NUC
System Fuels, Inc.	NUC	WEPCO/Nuclear Management Company	NUC
Tennessee Valley Authority	NUC	Western Nuclear, Inc.	UPH
The Uranium Exchange Company	TRA	Westinghouse Electric Company, CNFD	FAB
TXU Generation Company LP	NUC	Wisconsin Public Service/Nuclear Management	NUC
UG U.S.A., Inc.	TRA	Wolf Creek Nuclear Operating Corporation	NUC
Umetco Minerals Company	UPH	Xcel Energy	NUC

<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" (2002).

## 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 2002 (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, 1993-2002**

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)
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
2002 ...	W	3,342	W	W	W	W	W	W	W	W	W

W=Data withheld to avoid disclosure.

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

Sources: Energy Information Administration: **1993-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule A: Uranium Raw Material Activities.

**Table D3. U.S. Forward-Cost Uranium Reserves by Mining Method, 2002**

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 .....	35	0.108	38	106	0.062	66
Other <sup>b</sup> .....	< 1	0.224	< 1	3	0.050	1
<b>Total .....</b>	<b>68</b>	<b>0.151</b>	<b>102</b>	<b>386</b>	<b>0.089</b>	<b>345</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;" Schedule A: Uranium Raw Material Activities.



**Table D4. U.S. Uranium Mine Production and Number of Mines and Sources, 1993-2002**

Mining Method	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Underground (metric tons U).....	0	0	0	W	W	W	W	W	0	0
Openpit (metric tons U).....	0	0	0	0	0	0	0	0	0	0
In Situ Leaching (metric tons U).....	W	942	1,297	1,684	1,571	1,431	1,473	1,152	W	W
Other <sup>a</sup> (metric tons U).....	789	30	60	125	241	408	276	49	W	W
<b>Total Mine Production</b> (metric tons U).....	<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>925</b>
<b>Number of Mines Operated</b>										
Underground .....	0	0	0	1	1	4	3	1	0	0
Openpit.....	0	0	0	0	0	0	0	0	0	0
In Situ Leaching .....	5	5	5	6	7	6	6	4	3	3
Other Sources <sup>b</sup> .....	7	7	7	6	6	5	5	5	4	3
<b>Total Mines and Sources .....</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>	<b>6</b>

<sup>a</sup>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: **1993-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule A: Uranium Raw Material Activities.

**Table D5. U.S. Uranium Concentrate Processing Operations, 1993-2002**

Processing Operations	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Ore Fed to Process<sup>a</sup></b> (thousand metric tons) .....	0	0	151	40	0	0	W	W	W	W
Percent U <sup>b</sup> .....	—	—	0.441	0.424	—	—	W	W	W	W
<b>Contained U (metric tons)</b>										
In Ore .....	0	0	669	171	0	0	W	W	W	W
Other Feed Materials <sup>c</sup> .....	16	30	63	157	350	149	W	W	W	W
<b>Total Mill Feed (metric tons U).....</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>W</b>
<b>In-Process Inventory Change</b> (metric tons U) .....	4	9	60	- 53	20	- 3	41	- 51	W	W
<b>Concentrate Produced at Mills</b> (metric tons U)										
Theoretical <sup>d</sup> .....	12	21	671	381	330	151	444	448	W	W
<b>Actual</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>	<b>W</b>
Recovery as Percent .....	—	—	92.6	86.8	91.2	82.2	78.6	87.4	W	W
Tailings and Unaccountable (metric tons U) .....	0	3	50	50	29	27	95	57	W	W
<b>Other Processing<sup>e</sup></b> (metric tons U) .....	<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>W</b>
<b>Total Uranium Concentrate Production</b> (metric tons U) .....	<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>E 902</b>
<b>Total Concentrate Shipped From Mills and Plants</b> (metric tons U) .....	<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>	<b>1,465</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. E=Estimate.

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

Sources: Energy Information Administration: **1993-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule A: Uranium Raw Material Activities.

**Table D6. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Supplier, Transaction Type, and Delivery Year, 1998-2002**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1998	1999	2000	2001	2002
Received from U.S. Producers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	2,496	1,985	1,369	885	560
Weighted-Average Price .....	35.38	36.21	38.52	34.47	33.87
Received from U.S. Brokers and Traders:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	4,026	3,998	3,498	4,503	5,135
Weighted-Average Price .....	31.07	30.00	29.32	27.15	26.55
Received from other Owners and Operators of U.S. Civilian Nuclear Power Reactors:					
Purchases .....	W	W	0	0	W
Weighted-Average Price .....	W	W	—	—	W
Received from other U.S. Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	W	W	3,383	4,398	W
Weighted-Average Price .....	W	W	27.16	25.94	W
Received from Foreign Suppliers:					
Purchases of U.S.-Origin and Foreign-Origin Uranium .....	8,175	10,296	11,677	11,533	12,378
Weighted-Average Price .....	31.11	29.83	27.70	25.64	26.96
<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>16,441</b>	<b>18,443</b>	<b>19,929</b>	<b>21,319</b>	<b>20,274</b>
Weighted-Average Price .....	<b>31.55</b>	<b>30.24</b>	<b>28.70</b>	<b>26.39</b>	<b>26.93</b>

W=Data withheld to avoid disclosure.

— = Not applicable.

Notes: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators. Totals may not equal sum of components because of independent rounding.  
Sources: Energy Information Administration: **1998-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey,"** Schedule B: Uranium Marketing Activities.

**Table D7. Owners and Operators of U.S. Civilian Nuclear Power Reactors Contracted Uranium by Origin, Transaction Type, and Delivery Year, 1998-2002**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1998	1999	2000	2001	2002
Received of U.S.-Origin Uranium:					
Purchases .....	2,762	4,403	5,100	5,072	2,387
Weighted-Average Price .....	34.76	31.83	29.94	27.30	28.31
Received of Foreign-Origin Uranium:					
Purchases .....	13,679	14,040	14,829	16,247	17,887
Weighted-Average Price .....	30.94	29.83	28.28	26.12	26.75
<b>Total:</b>					
Purchases .....	<b>16,441</b>	<b>18,443</b>	<b>19,929</b>	<b>21,319</b>	<b>20,274</b>
Weighted-Average Price .....	<b>31.55</b>	<b>30.24</b>	<b>28.70</b>	<b>26.39</b>	<b>26.93</b>

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

Sources: Energy Information Administration: **1998-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey,"** Schedule B: Uranium Marketing Activities.

**Table D8. Maximum Anticipated Uranium Market Requirements of Owners and Operators of U.S. Civilian Nuclear Power Reactors, 2003-2012, as of December 31, 2002**  
(Metric Tons U Equivalent)

Year	Maximum Under Purchase Contracts	Unfilled Requirements	Maximum Anticipated Market Requirements	Enrichment Feed Deliveries
2003 .....	19,701	2,000	21,701	21,020
2004 .....	19,378	4,236	23,614	21,880
2005 .....	13,066	7,134	20,201	19,535
2006 .....	8,829	15,771	24,600	24,060
2007 .....	6,726	15,772	22,498	21,446
2008 .....	4,111	17,728	21,839	21,135
2009 .....	2,447	22,406	24,853	22,783
2010 .....	2,749	21,446	24,195	22,541
2011 .....	1,491	19,130	20,621	18,811
2012 .....	1,102	22,478	23,580	22,671
<b>Total .....</b>	<b>79,600</b>	<b>148,101</b>	<b>227,701</b>	<b>215,882</b>

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities (2002).

**Table D9. Owners and Operators of U.S. Civilian Nuclear Power Reactors Deliveries of Uranium Feed by Enrichment Country and Delivery Year, 2000-2002**  
(Metric Tons U Equivalent)

Enrichment Plant Location	Deliveries in 2000			Deliveries in 2001			Deliveries in 2002		
	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total	U.S.- Origin	Foreign- Origin	Total
China .....	0	298	298	0	W	W	0	W	W
France .....	214	1,417	1,632	212	1,841	2,053	485	4,303	4,787
Germany .....	W	W	850	0	611	611	W	W	457
Netherlands .....	W	W	628	0	W	W	0	720	720
Russia .....	W	W	760	W	W	360	0	W	W
United Kingdom.....	151	2,354	2,505	W	W	1,182	182	1,730	1,912
Europe <sup>a</sup> and other .....	W	W	604	93	1,160	1,254	W	W	1,591
<b>Foreign Total .....</b>	<b>479</b>	<b>6,799</b>	<b>7,278</b>	<b>352</b>	<b>5,510</b>	<b>5,861</b>	<b>992</b>	<b>8,871</b>	<b>9,863</b>
United States .....	3,566	7,560	11,126	4,001	8,345	12,346	2,164	9,000	11,164
<b>Total .....</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>	<b>3,155</b>	<b>17,871</b>	<b>21,026</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: **2000-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule B: Uranium Marketing Activities.

**Table D10. Uranium in Fuel Assemblies Loaded into U.S. Civilian Nuclear Power Reactors by Year, 1998-2002**  
(Metric Tons U Equivalent)

Origin of Uranium	1998	1999	2000	2001	2002 <sup>P</sup>
Domestic-Origin Uranium .....	2,842	4,071	4,477	5,085	4,101
Foreign-Origin Uranium.....	11,851	18,557	15,320	15,198	17,923
<b>Total .....</b>	<b>14,693</b>	<b>22,627</b>	<b>19,797</b>	<b>20,283</b>	<b>22,025</b>

P = Preliminary data. Final 2001 fuel assembly data reported in the 2002 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.

Sources: Energy Information Administration: **1998-2000-Uranium Industry Annual 2001** (May 2002). **2001-2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule B: Uranium Marketing Activities.

**Table D11. Foreign Purchases of Uranium by U.S. Suppliers and Owners and Operators of U.S. Civilian Nuclear Power Reactors by Delivery Year, 1998-2002**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1998	1999	2000	2001	2002
<b>U.S. Suppliers:</b>					
Foreign Purchases .....	8,695	8,077	6,687	7,203	8,720
Weighted-Average Price .....	27.29	24.49	21.96	23.35	25.08
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors:</b>					
Foreign Purchases .....	8,117	10,223	10,587	10,752	11,551
Weighted-Average Price .....	31.10	29.76	27.77	25.67	26.95
<b>Total:</b>					
Foreign Purchases .....	<b>16,812</b>	<b>18,300</b>	<b>17,275</b>	<b>17,955</b>	<b>20,271</b>
Weighted-Average Price .....	<b>29.08</b>	<b>27.42</b>	<b>25.58</b>	<b>24.74</b>	<b>26.14</b>

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

Sources: Energy Information Administration: **1998-2001-Uranium Industry Annual 2001** (May 2002). **2002**-Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities.

**Table D12. U.S. Broker and Trader Purchases of Uranium by Origin, Supplier, and Delivery Year, 1998-2002**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries	1998	1999	2000	2001	2002
<b>Received U.S.-Origin Uranium:</b>					
Purchases .....	1,051	1,270	1,140	459	W
Weighted-Average Price .....	35.09	33.40	28.38	26.98	W
<b>Received Foreign-Origin Uranium:</b>					
Purchases .....	8,341	7,185	5,997	6,923	W
Weighted-Average Price .....	28.08	24.41	21.93	23.33	W
<b>Total Received by U.S. Brokers and Traders:</b>					
Purchases .....	<b>9,392</b>	<b>8,455</b>	<b>7,138</b>	<b>7,383</b>	<b>7,653</b>
Weighted-Average Price .....	<b>28.87</b>	<b>25.76</b>	<b>22.96</b>	<b>23.56</b>	<b>25.19</b>
<b>Received from Foreign Suppliers:</b>					
Purchases .....	8,328	7,400	6,079	7,025	7,160
Weighted-Average Price .....	28.01	24.96	22.39	23.05	24.94

W=Data withheld to avoid disclosure.

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

Sources: Energy Information Administration: **1998-2001-Uranium Industry Annual 2001** (May 2002). **2002**-Form EIA-858, "Uranium Industry Annual Survey;" Schedule B: Uranium Marketing Activities.

**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, 1998-2002**  
(Metric Tons U Equivalent; Dollars per Kilogram U Equivalent)

Deliveries to Foreign Suppliers and Utilities	1998	1999	2000	2001	2002
<b>U.S.-Origin Uranium:</b>					
Foreign Sales .....	1,502	1,460	402	594	1,155
Weighted-Average Price .....	40.94	35.36	35.36	30.79	27.47
<b>Foreign-Origin Uranium:</b>					
Foreign Sales .....	4,297	1,814	4,821	3,918	4,764
Weighted-Average Price .....	27.98	28.39	21.04	21.66	25.79
<b>Total Sent:</b>					
<b>Foreign Sales .....</b>	<b>5,798</b>	<b>3,273</b>	<b>5,223</b>	<b>4,512</b>	<b>5,919</b>
<b>Weighted-Average Price .....</b>	<b>31.33</b>	<b>31.11</b>	<b>22.04</b>	<b>22.86</b>	<b>26.11</b>
From U.S. Producers, Owners and Operators of U.S. Civilian Nuclear Power Reactors, and other U.S. Suppliers:					
Foreign Sales .....	1,756	1,447	911	844	1,913
Weighted-Average Price .....	37.41	37.91	30.20	31.06	27.66
From U.S. Brokers and Traders:					
Foreign Sales .....	4,042	1,827	4,312	3,668	4,006
Weighted-Average Price .....	28.70	26.84	20.95	20.97	25.38

Notes: "Other U.S. Suppliers" are U.S. converters, enrichers, and fabricators. Totals may not equal sum of components because of independent rounding.

Sources: Energy Information Administration: **1998-2001-Uranium Industry Annual 2001** (May 2002). **2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule B: Uranium Marketing Activities.

**Table D14. Inventories of Natural and Enriched Uranium as of End of Year, 1998-2002**  
(Metric Tons U Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year				
	1998	1999	2000	2001	2002 <sup>P</sup>
<b>Owners and Operators of U.S. Civilian Nuclear Power Reactors Inventories</b> .....					
Natural Uranium .....	25,294	22,406	21,080	21,400	20,490
Enriched Uranium <sup>a</sup> .....	16,175	17,217	13,829	13,244	12,329
Enriched Uranium <sup>a</sup> .....	9,119	5,188	7,251	8,156	8,161
<b>U.S. Supplier Inventories<sup>b</sup></b> .....					
Natural Uranium .....	27,207	26,482	21,715	18,520	18,415
Enriched Uranium <sup>a</sup> .....	13,474	11,335	4,853	3,536	5,757
Enriched Uranium <sup>a</sup> .....	13,733	15,147	16,862	14,984	12,658
<b>Total Commercial Inventories</b> .....					
	52,501	48,888	42,795	39,920	38,905
<b>DOE-Owned Inventories<sup>c</sup></b> .....					
Natural Uranium .....	9,406	20,407	20,407	20,407	19,920
Enriched Uranium .....	9,406	20,407	20,407	20,407	19,920
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 2001 inventory data reported in the 2002 survey.

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

Sources: Energy Information Administration: **1998-2000-Uranium Industry Annual 2001** (May 2002). **2001-2002-Form EIA-858, "Uranium Industry Annual Survey;"** Schedule B: Uranium Marketing Activities.

# 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.

**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.

**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  $x_f$  into a mass P of product assay  $x_p$  and waste of mass W and assay  $x_w$  is expressed in terms of the number of separative work units needed, given by the expression

$$SWU = WV(x_w) + PV(x_p) - FV(x_f),$$

where  $V(x)$  is the "value function," defined as

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

**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  $U_3O_8$  per ton or 0.05 to 0.20 percent  $U_3O_8$ ).

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

**Uranium property:** A specific 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  $U_3O_8$  by weight. It is used as feedstock for uranium fuel enrichment and fuel pellet fabrication.