Uranium Industry Annual 1992

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Photo Credit

Pathfinder Mines Corporation, page 18.

Cover Photo

Aerial view of a conventional uranium mill. In the United States at the end of 1992, there were no conventional uranium mills remaining in operation for the recovery of uranium from milling of uranium ores, although six mills were being maintained in standby status. Four nonconventional plants were being operated at the end of 1992 for recovery of uranium from in situ leach solutions. In addition, two nonconventional plants were being operated for recovery of uranium as a byproduct of phosphate production.

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Office of Coal, Nuclear, Electric and Alternate Fuels
U.S. Department of Energy
Washington, DC 20585

Preface

The *Uranium Industry Annual* provides current statistical data on the U.S. uranium industry for the Congress, Federal and State agencies, the uranium and electric utility industries, and the public. It utilizes data from the mandatory "Uranium Industry Annual Survey," Form EIA-858 for 1992; historical data collected by the Energy Information Administration (EIA) and by the Grand Junction Projects Office of the Idaho Field Office of the U.S. Department of Energy (DOE); and data gathered by Federal agencies that preceded the DOE. The report was prepared by the Energy Information Administration, the independent agency for data collection and analysis within the U.S. Department of Energy.

Data collected on the "Uranium Industry Annual Survey" (UIAS) provide a comprehensive statistical characterization of the industry's activities for the survey year and include some information about industry plans and commitments for the following year. Where aggregate data are presented in this report, care has been taken to protect the confidentiality of company-specific information while still conveying accurate and complete statistical data. The methodology used in the survey, including data editing and analysis, is described in Appendix A. The history and legal authority, an industry overview, and methodologies used in the estimation of potential uranium resources and uranium reserves are described in Appendix B. A list of respondents to the UIAS is provided in Appendix C. Appendix D consists of the Form EIA-858. Metric versions of selected tables from Chapters 1 and 2 are provided for the convenience of the reader in Appendix E. Standard conversion factors between U.S. customary units of measurement and the International System of Units (SI) are provided in Table E1.

The feature article, "Decommissioning of U.S. Conventional Uranium Production Centers," is included in the *Uranium Industry Annual 1992* and appears before the "Executive Summary." Questions regarding this article should be addressed to the following individuals at the EIA:

Taesin Chung (202/254-5566)
John Moens (202/254-5388)

Data on uranium raw materials activities including exploration activities and expenditures, resources and reserves, mine production of uranium, production of uranium concentrate, and industry employment are presented in Chapter 1.

Data on uranium marketing activities including domestic uranium purchases, commitments by utilities, procurement arrangements, uranium imports under purchase contracts and exports, deliveries to enrichment suppliers, inventories, secondary market activities, utility market requirements, and uranium for sale by domestic suppliers are presented in Chapter 2.

Beginning in survey-year 1984, Form EIA-858, "Uranium Industry Annual Survey," replaced three previous EIA surveys: "Survey of U.S. Uranium Exploration Activity," Form EIA-717; "Survey of United States Uranium Marketing Activity," Form EIA-491; and "U.S. Uranium Industry Financial Survey," Form EIA-854. The *Uranium Industry Annual* (UIA) report series supersedes two earlier reports namely, the *Survey of U.S. Uranium Exploration Activity* and the *Survey of United States Uranium Marketing Activity*, that were based on the previous EIA surveys. The UIA also continues some of the time series of data on the industry and on uranium resources that were presented in the reports *Statistical Data of the Uranium Industry* (GJO-100) and *Uranium Exploration Expenditures and Plans Survey* (GJO-103) that were formerly issued by the DOE's Grand Junction Projects Office.

Questions regarding the contents of this report may be directed to:

Survey Management Division, EI-52
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1000 Independence Avenue, SW
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Questions of a general nature should be directed to Howard L. Walton, Director of the Survey Management Division (202/254-5500); or Noel Balthasar, Chief of the Coal and Uranium Data Systems Branch (202/254-5400).

Questions of a detailed or technical nature should be referred to the following individuals at the EIA:

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Taesin Chung (202/254-5556)
William Szymanski (202/254-5569)

Uranium Marketing Activities
Douglas Bonnar (202/254-5560)

Financial data for the domestic uranium industry reported on Schedule C, "Uranium Industry Financial Status," of the Form EIA-858 are summarized and published in a separate annual report, *Domestic Uranium Mining and Milling Industry: Viability Assessment* (DOE/EIA-0477).

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Decommissioning of U.S. Conventional Uranium Production Centers

by

Taesin Chung
John R. Moens

Introduction

Decommissioning is a general term for procedures involved in permanently closing a nuclear facility and is a time-consuming process that involves significant expense. This article focuses strictly on the decommissioning of commercial operations covered by Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (P.L. 95-604). These facilities serve a commercial market, however, some of them also processed uranium for the Federal Government.[1]

For conventional uranium production centers,[2] decommissioning involves decontaminating and dismantling the mill itself,[3] reclaiming the tailings pile(s),[4] restoring groundwater to acceptable conditions,[5] and long-term monitoring of the site. Radiation levels and the health and safety of workers must be monitored and access to radiation-contaminated areas and equipment must be controlled. In examining these issues, this article: (1) presents a brief history of the U.S. uranium industry, the processing methods used to extract uranium from ores, and the regulations that govern the industry, (2) describes the decommissioning process for conventional uranium production centers and (3) compares aggregated decommissioning cost data for six selected conventional uranium processing mills, based on filings with the U.S. Nuclear Regulatory Commission.

Background

Development of the Uranium Industry

The exploration and mining of radioactive ores in the United States began around the turn of the century, when sources of radium (contained in uranium ore) were being sought by research laboratories in Europe, and for use in luminous paint for watch dials and other instruments. Uranium's importance substantially increased during World War II. In 1943, the Union Mines Development Corporation, assisted by the U.S. Government, operated mills in Colorado to process uranium ore for the Manhattan Project. In the postwar years, uranium continued to be essential to the national defense. The Atomic Energy Act of 1946 (P.L. 83-703) created the Atomic Energy Commission (AEC), which launched a uranium procurement program, encouraging new exploration, primarily in the Colorado Plateau region that includes parts of Colorado, Arizona, New Mexico, and Utah. Additional uranium deposits were discovered in these States as well as in South Dakota, Texas, Washington, and Wyoming. With the discovery of these significant deposits (primarily, uraninite and coffinite), expansive mining and milling facilities were constructed, and new and improved ore-processing methods were developed.

[1]Facilities designated as "Title I" facilities were operated for the Department of Energy (DOE) solely to supply the uranium requirements of the Federal Government. The DOE is in the process of decommissioning these facilities with the objective of cleaning up "the current waste inventory within the DOE nuclear complex by the year 2019." More detail on this subject can be found in U.S. Department of Energy, *Integrated Data Base for 1992: U.S. Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, October 1992, DOE/RW-0006, Rev. 8, Washington, DC.

[2]See Box on next page for a definition of the conventional mining and milling process.

[3]Mill—A conventional uranium recovery facility that uses a process of crushing, grinding, leaching, extracting, and drying to treat ores brought from open pit or underground mines.

[4]Mill tailings—waste material remaining after extraction of uranium from ores. Consists of slurries of sands and clay-like materials called "slimes."

[5]Groundwater—Water of atmospheric origin which saturates rock openings beneath the water table.

Between the mid-1940's and the mid-1960's, uranium was used almost exclusively for military purposes, and only the Federal Government could own significant quantities of uranium in the United States. As military requirements declined during the 1960's, the Government gradually completed its uranium purchase program, which ended in 1970. At the same time, a major new source of demand emerged—commercial nuclear power plants. The commercial use of uranium for electricity generation was further encouraged in 1964 by the passage of the Private Ownership of Special Nuclear Materials Act, which ended the Federal Government's monopsony position in the domestic uranium market.

The AEC laid the foundation for the work of the uranium industry. It performed research; provided technical assistance to industry in exploring, mining, and milling uranium; encouraged property development and uranium marketing; and secured sufficient uranium stockpiles to meet defense requirements well into the future. During the AEC's tenure, the uranium industry significantly improved its techniques for recovering and processing radioactive ores.

Regulatory Development

Initially, the Government imposed few regulations on any mining activity including that of radioactive ores. There were neither specific Government guidelines nor directives for siting processing plants, discharging wastes, or handling tailings. The Atomic Energy Act of 1946 gave the AEC regulatory authority over radioactive materials. However, the AEC interpreted its authority as beginning *after* ores were removed from mines—essentially, when the ores were received at ore processing mills. In addition, the AEC's regulatory influence over mills was hampered by the absence of a clear definition of the role of State agencies. This

Uranium Milling and Generated Wastes

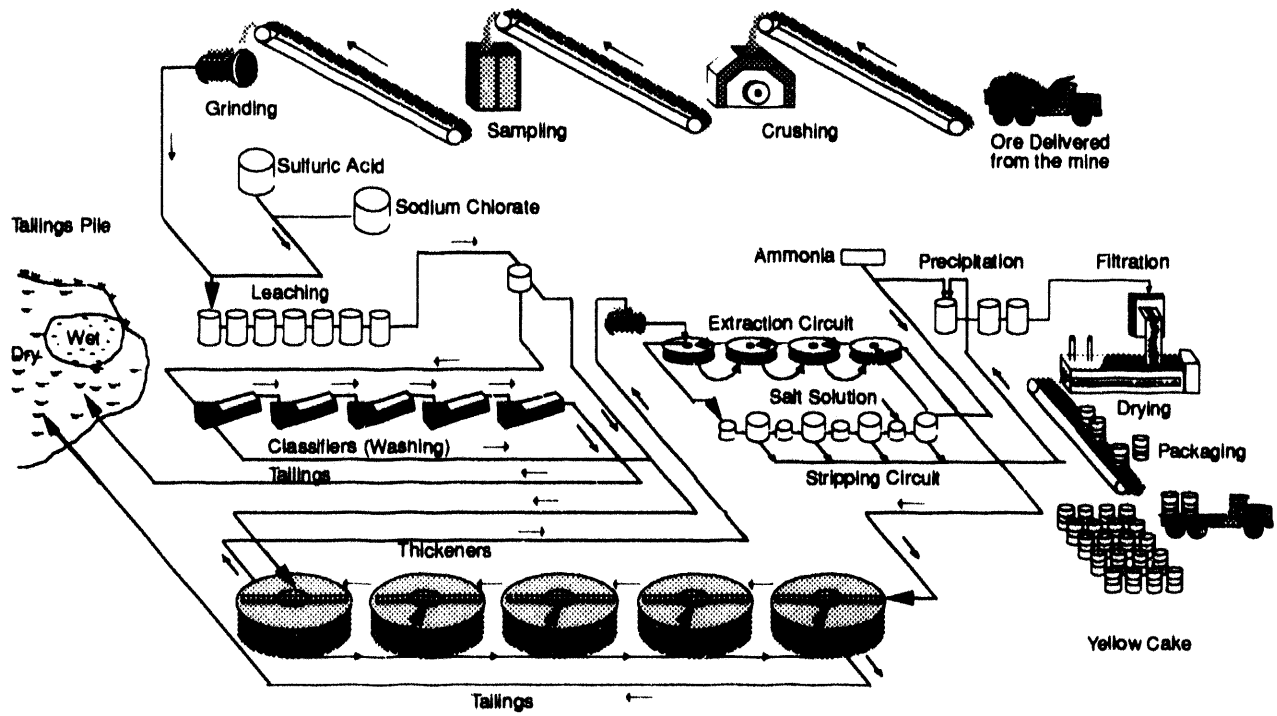
The first uranium operations in the United States relied on conventional methods to recover radioactive ore (Figure FE1), and for many years this was the only option available. (*In situ* leach mining and associated decommissioning and reclamation of *in situ* leach wellfields are not discussed in this paper). All conventional methods rely on traditional mining to extract ore. To recover the uranium from the ore, either an acid or carbonate leaching method can be used. In the early days, acid leaching was the dominant ore processing method. Various techniques were employed to separate the minerals from the gangue—worthless rock or undesired minerals associated with the uranium ore—and to recover the uranium. Later, for environmental reasons, the carbonate leaching process became more common. However, while it is more environmentally benign than acid leaching, carbonate leaching is generally less efficient in dissolving the uranium.

All uranium processing operations produce some form of waste. The amount of waste generated in a uranium milling operation depends on the nominal capacity of the mill, the number of years of operation, the types of ore being processed, and the process used. During processing, the liquid and solid wastes from the processed ore are sent to the tailings pile. Since only a few pounds of uranium are obtained from a ton of ore, almost all of the material, including a high percentage of radium, ends up as tailings.

The wastes generated in the milling process include the following:

- **Solid wastes** consisting mainly of mill tailings from the extraction process, together with contaminated scrap
- **Liquid wastes** consisting mainly of acidic or neutralized liquors from acid leaching plants or, in the case of alkaline leaching plants, the water used to transport the tailings, plus small volumes of other liquid wastes such as floor washings and laboratory wastes
- **Seepage** from waste retention systems
- **Decant solution** from waste retention systems
- **Contaminated run-off** from the plant area
- **Airborne dusts** from conveyor transfer points, tipples, crushing, reagent preparation and product drying and calcining
- **Airborne mists and fumes** from reagent preparation and leaching operations.

Figure FE1. Schematic of a Typical Conventional Uranium Mill



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

ambiguity minimized Federal influence on site selection, operation, design, construction, and decommissioning of mills. During the 1960's and early 1970's discharges of uranium mill tailings into rivers, and wind erosion of exposed tailings piles increased public pressure for additional control measures and cleanup activities.

In 1975, the AEC was divided into two separate agencies—the Energy Research and Development Administration (which later was incorporated into the U.S. Department of Energy) and the Nuclear Regulatory Commission (NRC). Primary responsibility for regulating uranium processing and decommissioning activities was transferred from the AEC to the NRC, which exercises authority over the licensing process for uranium production facilities and provides further direction through rulemaking procedures, *Federal Register* notices, guideline documents, and workshops. Three States—Colorado, Texas, and Washington (so-called agreement States)—elected to operate their own programs for regulating uranium production facilities. These "agreement States" have adopted regulations that conform to those of the NRC, and although their regulatory programs are relatively free of Federal control, they are subject to review by the NRC.

Like the AEC before it, the NRC did not interpret its authority as extending to uranium mines. The enforcement of most mining regulations is carried out by the individual States. For example, State laws in Wyoming have been effective in encouraging phased open pit operations and associated reclamation activities. For open pit mines, the principal environmental concerns involve the excavations and waste piles. Such mines may have to be backfilled, or the pit walls may have to be reshaped to eliminate steep highwalls, and waste piles may have to be recontoured to a more natural shape for revegetation. Other than a mandatory requirement to close shafts and mine openings, underground

uranium mines generally have few reclamation requirements.

Current Regulations of Uranium Recovery Facilities

While the NRC has responsibilities for regulations, the Environmental Protection Agency (EPA) has overall responsibility for establishing environmental standards and guidelines, as defined in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA is the basis for present-day control of uranium mill sites. It stipulates that the EPA set environmental standards and guidelines and that each NRC license contains provisions regarding decontamination, decommissioning, and reclamation of the licensed facility. Applicable EPA standards are contained in the Code of Federal Regulations, 40 CFR Part 192, "Health and Environmental Protection Standards for Uranium and Uranium Mill Tailings." However, issuing an operating license and enforcing the regulations are NRC responsibilities.[6]

As part of the licensing process, each applicant must submit to the NRC a detailed study called the final Generic Environmental Impact Statement (GEIS). This study reviews all aspects of the construction of the uranium production facility and provides various approaches to reclaiming the site and its uranium tailings when the facility is permanently closed. The GEIS serves as the basis for the NRC decision on granting a license, under the Code of Federal Regulations, 10 CFR Part 51, Title X—"Remedial Action and Uranium Revitalization."

A license issued by the NRC to an operator of a uranium production facility sets forth both the conditions for operation and the actions that the licensee must take for decommissioning. A licensee must present a plan for site reclamation to the NRC for approval. The NRC and the licensee must agree on the estimated costs for the work to be done, assuming that a third party might be required to do the work. If the NRC approves the plan and the cost estimate, the licensee must then post a surety bond to assure that funds will be available to reclaim the site if the licensee is unable to complete the task.[7] The cost estimate and surety bond must also include the funds necessary for the long-term surveillance and monitoring of the decommissioned site to protect public health and safety.

After satisfactory completion of decommissioning by the licensee, title to the site and the uranium tailings passes to the DOE, which is responsible for long-term monitoring and care of the site. Of the 26 licensed conventional uranium processing mills in the United States, none are operational, six are on standby, two have been reclaimed, and 18 are in varying stages of dismantling (Table FE1). The Department of Energy has reported that the Nation's 26 conventional processing mills had a total original capacity of 56,850 tons of ore per day (Table FE2). To date, these mills have produced more than 200 million tons of tailings.

The Decommissioning Process

The effectiveness of much of the key legislation affecting decommissioning passed in the late 1970's was frequently tested in the following decade as domestic uranium production fell (from 44 million pounds of U_3O_8 in 1980 to less than 6 million pounds in 1992), resulting in the permanent closing of a number of uranium-producing facilities and returning the land to other uses. During this period, the uranium industry and the Government acquired experience in decommissioning production sites, becoming better able to anticipate and avoid many potential problems.

Work on several phases of the decommissioning process, each of which is described in the following sections, can be done simultaneously. For example, reclamation work can begin while the mill is still operating, and the tailings pile can be handled in a phased program of use, stabilization, and reclamation.

Mill Decontamination and Dismantling

The mill decontamination[8] and dismantling activities consist of the following steps:

1. Cleanup and decontamination of equipment and buildings, using spraying, steam cleaning, or other methods, as needed. Also involved in this operation is the disposal of cleanup fluids in evaporation ponds.

2. Removal of equipment from the buildings during the cleanup process. Equipment is segregated into the following categories: a) that which is potentially salable for unrestricted use following radiation checks and necessary decontamination,

[6]The specific criteria are set forth in detail in Appendix A of UMTRCA.

[7]The Government authorizes reimbursement of up to $5.50 per dry short ton of tailings under Title X of the Energy Policy Act of 1992 for reclamation costs incurred by qualified licensees when producing uranium for Government use.

[8]Decontamination—Those activities employed to reduce radiation levels to acceptable levels or remove contamination in or on structures, equipment, and materials.

Table FE1. Current Status of Conventional Uranium Production Centers (as of January 1, 1993)

Name	Owner	State	Surety Bond[a] (Thousand Dollars)	Status	
Ambrosia Lake	Rio Algom	NM	18,250	Standby	Currently recovering uranium from mine waters. NRC has approved decommissioning plans. (NRC Docket Number 40-8905).
Bear Creek	Union Pacific	WY	11,296	Dismantled	Work is in progress on groundwater restoration, but evaporation ponds remain. (NRC Docket Number 40-8452).
Bluewater	ARCO	NM	37,240	Dismantled	The site is topsoiled and revegetated. Main tailings pile slopes were established and covered. Jackpile and Paguate mines are being reclaimed by Laguna Indian Tribe under an agreement with ARCO. (NRC Docket Number 40-8902).
Canon City	Cotter Corp.	CO	10,500	Standby	Work continues on groundwater problems. (Colorado License No. RML 369-01S).
Church Rock	United Nuclear	NM	9,401	Dismantled	Tailings work is proceeding. (NRC Docket Number 40-8907).
Edgemont	Tennessee Valley Authority	SD	0	Reclaimed	Tailings were moved to a new location a few miles southeast on a partially-excavated site with an impervious shale base. The tailings were covered, vegetation established, and the site fenced off. The original mill and tailings sites have been released for general use. TVA has elected to retain title to the new tailings pile and is negotiating with the NRC regarding additional erosion prevention steps required to meet the current NRC regulations. TVA reports that an estimated $33 million has been spent on decommissioning the Edgemont site. The NRC license is still active. (NRC Docket Number 40-1341).
Falls City	Continental Oil	TX	6,811	Dismantled	Tailings reclamation is almost completed. (Texas License Number TX-LO1634).
Ford	Dawn Mining	WA	1,000	Standby	Although mill is shut down, permission was requested to operate part of the mill to process water from open pit mines. (Washington License Number WN-I043-1).
Gas Hills	American Nuclear	WY	2,967	Dismantled	Work is in progress on tailings pile reclamation and groundwater cleanup. The company is now controlled by NUKEM. (NRC Docket Number 40-4492).
Gas Hills	Umetco	WY	10,877	Dismantled	Tailings piles are in various stages of reclamation. Groundwater cleanup is underway. Reverse osmosis plant is in use. (NRC Docket Number 40-0299).
Grants[b]	Homestake	NM	20,000	Dismantling	Mill is closed and is being dismantled. (NRC Docket Number 40-8903).
Highland	Exxon	WY	4,820	Dismantled	Tailings have been reshaped, covered, and revegetated. Fencing is underway. Groundwater cleanup continues with pumping to evaporation ponds. (NRC Docket Number 40-8102).
L-Bar	BP America	NM	2,069	Dismantled	Tailings reclamation is nearly complete. Work is underway on groundwater restoration. (NRC Docket Number 40-8904).

See footnotes at end of table.

Table FE1. Current Status of Conventional Uranium Production Centers (as of January 1, 1993) (Continued)

Name	Owner	State	Surety Bond[a] (Thousand Dollars)	Status	
Lisbon[b]	Rio Algom	UT	3,467	Dismantled	Plant is closed. Company is negotiating with NRC on final decommissioning plan. (NRC Docket Number 40-8084).
Lucky Mc[b]	Pathfinder Mines	WY	9,778	Dismantling	Now in the decommissioning phase. Mill is being dismantled. (NRC Docket Number 40-2259).
Moab[b]	Atlas Corp.	UT	6,500	Dismantling	Mill is closed and is being dismantled. (NRC Docket Number 40-3453).
Panna Maria	Chevron Oil	TX	7,145	Dismantling	Mill is closed and is being dismantled. Plant was sold to General Atomics Corp. Title is still with Chevron. (Texas License Number TX-LO2402).
Ray Point	Exxon	TX	802	Reclaimed	Mill has been decommissioned, tailings have been covered and soil revegetated. Title is still with Exxon. (Texas License Number TX-LO1431).
Sherwood	Western Nuclear	WA	6,000	Dismantled	Tailings have dried. They are being consolidated. (Washington License Numbers WN-I0133-1, WN-I0133-2).
Shirley Basin[b]	Pathfinder Mines	WY	5,756	Dismantling	Mill was shut down in 1992 and is being dismantled. Tailings will be held open, in part, to accommodate *in situ* leaching project wastes. (NRC Docket Number 40-6622).
Shirley Basin	Petrotomics	WY	5,031	Dismantled	Mill has been dismantled. Tailings and groundwater reclamation are proceeding. (NRC Docket Number 40-6659).
Shootering	Plateau Resources	UT	2,296	Standby	Mill is reportedly being offered for sale. (NRC Docket Number 40-8698).
Split Rock	Western Nuclear	WY	14,000	Dismantled	Company is proceeding to reclaim tailings and restore groundwater. (NRC Docket Number 40-1162).
Sweetwater	Kennecott	WY	4,557	Standby	Plant has been sold by Minerals Exploration to the Green Mountain Mining Venture with Kennecott Corp., the operator and licensee of record. Kennecott is a subsidiary of RTZ Corp. (NRC Docket Number 40-8584).
Uravan	Umetco	CO	30,569	Dismantling	Plant remains, except for some equipment. The tailings pile(s) have been reshaped and covered. Waste from the town site is being added to the tailings. New evaporation ponds are in operation, and the older evaporation ponds have been reclaimed. (Colorado License No. 660-2).
White Mesa	Umetco/ Energy Fuels	UT	5,473	Standby	Tailings reclamation has been concurrent with operation. (NRC Docket Number 40-8681).
Total			**236,605**		

[a]Surety Bond can be a portion of licensee's asset in lieu of cash amount.

[b]The Nuclear Regulatory Commission classifies this operation as "Possession Only." Owners of mills in this category have announced that they do not plan to reopen in the future.

Source: Company filings with U.S. Nuclear Regulatory Commission or with State authority.

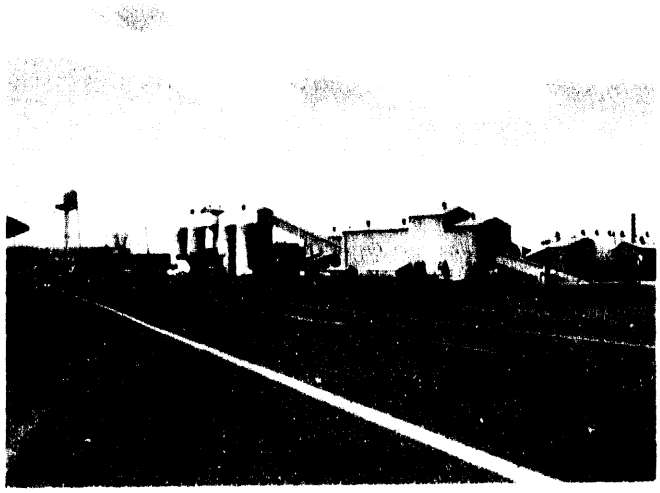
Table FE2. Status of Uranium Mills and Mill Tailings (as of July 1, 1992)

Name	Capacity (tons of ore per day)	Mill Status		Tailings			
		Year Started	Year Closed	Quantity (thousand short tons)	Area (acres)	Average Short tons per Acre	Average Thickness[a] (feet)
Ambrosia Lake	7,000	1958	1985	33,180	328	101,159	53
Bear Creek	2,000	1977	1986	4,740	150	31,600	17
Bluewater	6,000	1953	1982	23,920	341	70,147	37
Canon City	1,200	1958	1987	2,315	165	14,030	7
Church Rock	3,000	1958	1982	3,527	100	35,270	19
Edgemont	500	1956	1974	1,984	123	16,130	9
Falls City	3,400	1972	1982	11,574	250	46,296	24
Ford	450	1957	1982	3,086	133	23,203	12
Gas Hills/American Nuclear	950	1959	1981	5,842	117	49,932	26
Gas Hills/Umetco	1,300	1960	1984	8,047	146	55,116	29
Grants	3,400	1958	1990	22,377	215	104,079	55
Highland	3,200	1972	1984	11,354	290	39,152	21
L-Bar	1,600	1976	1981	2,094	115	18,209	10
Lisbon	750	1972	1988	3,858	35	110,229	58
Lucky Mc	2,800	1958	1987	11,685	248	47,117	25
Moab	1,400	1956	1984	10,582	128	82,672	44
Panna Maria	2,500	1979	1992	6,393	250	25,572	14
Ray Point	1,000	1971	1973	441	45	9,800	5
Sherwood	2,000	1978	1984	2,866	42	68,238	36
Shirley Basin/Pathfinder	1,800	1971	1989	8,047	263	30,597	16
Shirley Basin/Petrotomics	1,500	1962	1985	6,945	140	49,607	26
Shootering	1,000	1982	1982	0	[b]70	0	0
Split Rock	1,700	1958	1981	7,716	167	46,204	24
Sweetwater	3,000	1981	1983	2,315	300	7,717	4
Uravan	1,400	1948	1984	10,472	85	123,200	65
White Mesa	2,000	1980	1990	3,527	333	10,592	6
Totals and Averages	**56,850**			**[c]208,887**	**[b]4,509**	**46,327**	**24**

[a]Calculated based on acreage, quantity and tonnage factor of 23 cubic feet per ton of tailings.
[b]Acreage for Shootering not included in the total since the mill did not produce any tailings.
[c]The total includes tailings resulting from production of uranium for the Government.
Sources: International Atomic Energy Agency, *1988 Nuclear Fuel Cycle Information System*, STI/PUB/794. Estimated for Edgemont, Falls City and Ray Point. U.S. Department of Energy, *Summary History of Domestic Uranium Procurement Under Atomic Energy Commission Contracts*, GJBX-220(82). U.S. Department of Energy, Grand Junction Office, *Uranium Industry Seminar*, GJO-109(77), p. 183; GJO-108(80), p. 127. U.S. Nuclear Regulatory Commission, Uranium Recovery Field Office, and Colorado Department of Public Health. U.S. Department of Energy, *Commingled Uranium Tailings Study*, DOE/DP-0011. U.S. Nuclear Regulatory Commission, *Directory and Profile of Licensed Uranium Recovery Facilities*, NUREG/CR-2869, Rev. 1. U.S. Nuclear Regulatory Commission, uranium company filings.

b) that which is possibly contaminated but potentially salable to other uranium operations, and c) that which is disposable. Equipment which is salvageable is likely to come from the crushing and grinding sections, where ore is handled before it is contaminated by acid solutions. The sales of salvaged equipment are unlikely to be significant, considering the limited potential market, the costs involved for seller and buyer, and the potential liabilities.

3. Dismantling of buildings and foundation structures. Cutting, crushing and flattening of equipment, pipes, tanks, and structural material for ease of handling.



Homestake's Grants Mill (now being dismantled) is located in Grants, New Mexico. The mill was closed in 1990 and had a rated capacity of 3,400 short tons of uranium ore per day.

4. Burying debris, usually in the tailings pile, some distance from the edge of the pile. The debris is placed in the pile in layers, with dirt compacted in and around it. Since a tailings pile must have dried and compacted sufficiently to support heavy equipment, such piles might not be accessible for disposal of mill debris for some years. Disposal at other locations, such as in other tailings piles or specially constructed pits, may be possible.

5. Cleanup of the mill site. Contaminated debris and soil are removed, as are roads and parking lots.

6. Ripping, regrading, resoiling, liming, fertilizing, and reseeding as necessary to establish vegetation. To enhance its long-term survival, the types of vegetation selected should be indigenous to the area.

Tailings Piles Reclamation

Most wastes from the mining, milling, decontamination, and reclamation processes are finally deposited in the tailings pile,[9] the primary concern of environmental efforts (Figure FE2). Groundwater contamination comes mostly from the tailings pile. Depending on the siting and design of the pile, the efforts to clean up groundwater to acceptable levels may be extensive at some sites.

Mill tailings from leaching and decantation[10] processes consist of slurries of sands and clay-like particles called "slimes." The tailings slurries are pumped to tailings piles for disposal. Generally, there are a number of tailings piles at each site, each pile with different characteristics. The steps involved in cleaning up the tailings piles are as follows:

1. The edges of the piles are reshaped to minimize erosion hazards from surface water runoff.

2. The slopes and edges of the piles are covered with radon barrier material and rock or other cover (usually a clay or silty material). Where erosion may be a consideration, broken rock called "rip rap" is the preferred material for cover.

3. Drainage in the vicinity is redirected away from the piles. Consideration must be given to the maximum possible magnitude of flood water over the design life of the tailings pile, which is at least 200 years.

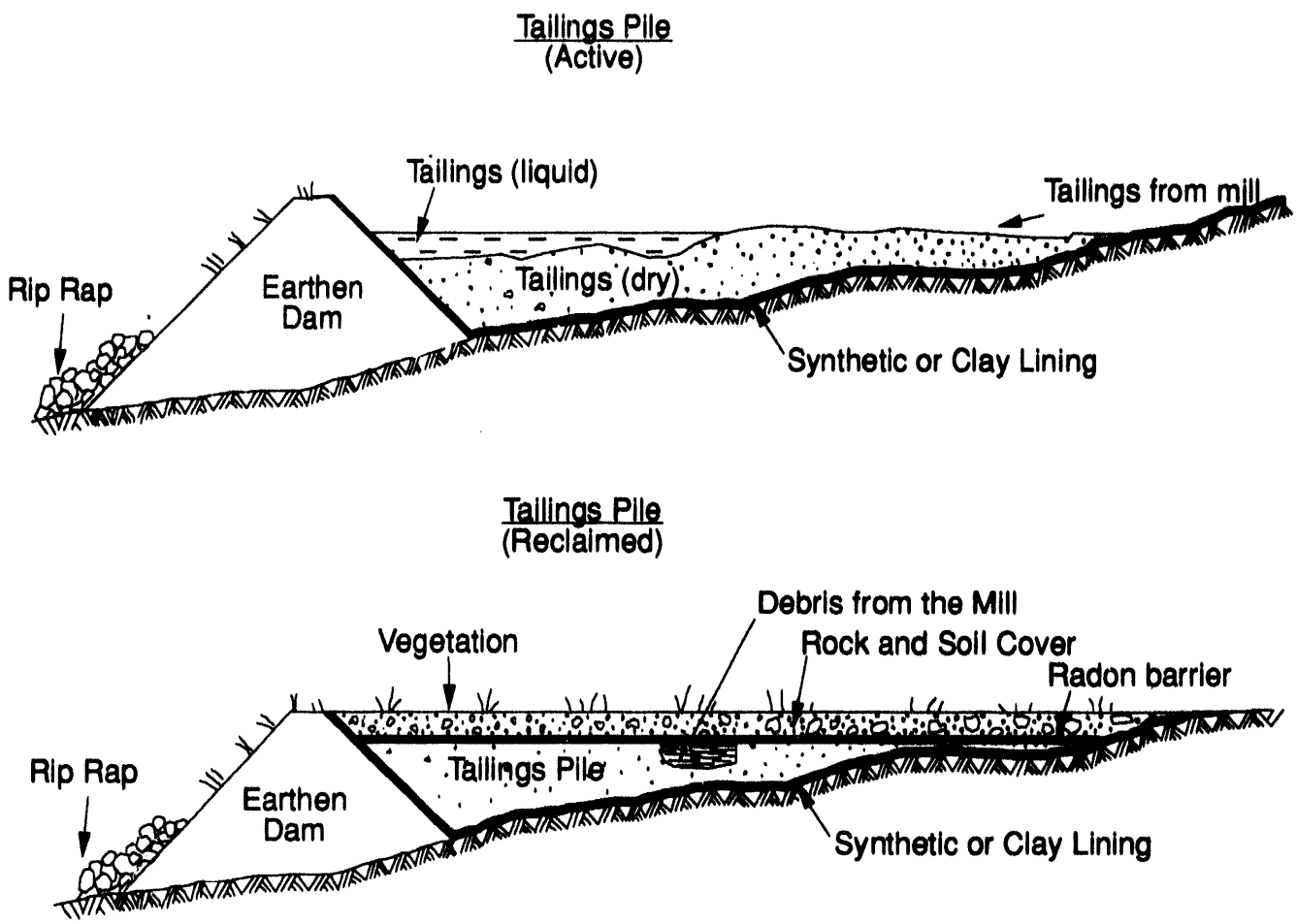
4. The piles are allowed to settle and dehydrate. This may take years if the pile is slow in releasing moisture. Generally, pools of liquid on the tailings piles receive additional water from rainfall. The slimy, clay-like nature of the fine materials from the milling process and the lack of capillary action inhibits moisture release and movement to the drying surface. Piles placed on porous material without sealing materials will drain through the bottom. Piles with synthetic or clay liners at the base will depend either on drainage systems built into the pile or on evaporation. To hasten drying, additional moisture should be kept off the pile. Settlement of tailings must be monitored by establishing survey monuments on the pile and checking their movement, both vertically and laterally.

5. The entire pile is covered with a radon barrier. The material for this cover is usually the same as that used to cover the edges and slopes of the piles, and to verify its suitability, it must be tested

[9]As of July 1, 1992, there were more than 200 million tons of tailings, covering more than 4,500 acres, at the 26 conventional mill sites. The thickness of these tailings piles averaged 24 feet (Table FE2).

[10]Decantation—Process of separating sediments from liquid by settling solids below and pouring off liquids above.

Figure FE2. Reclaiming a Typical Tailings Pile



Source: Energy Information Administration.

for such characteristics as acidity and radioactivity associated with disposal of heavy metal contaminants. The thickness of the cover (from 6 inches to more than several feet) required to meet standards varies with the nature of the tailings pile and with the material available for cover. Computer models estimate the thicknesses required for the various materials available to meet NRC standards for radiation and radon emanation. This barrier also serves to keep additional moisture off the pile, thus avoiding subsequent drainage into groundwater.

6. The final pile cover is a protection against erosion and should be deferred until the pile settlement is almost complete. The erosion cover may include various types of rocks and earth material, depending on what is available near the site. The erosion cover may be of soil if revegetation is planned, or of rock if revegetation is not feasible. The site must be monitored for erosion of the soil and growth of the vegetation.

7. The restricted part of the site is enclosed with a fence.

8. A portion of the area of the tailings pile may be needed for final disposal of wastes at the site, particularly those wastes that may continue to accumulate from groundwater cleanup.

9. The site is monitored to ensure that all aspects of the design and construction programs have worked as expected, that all standards have been met, and that no unexpected changes have occurred at the site. When the work is completed and approved by the NRC, title to the site and the responsibility for long-term surveillance, monitoring, and maintenance of the site are turned over to the DOE.

Groundwater Restoration

The general approach to controlling groundwater problems during the operating life of the mill is to restrict the generation of additional contaminated groundwater, to prevent the movement of such water from the site, and to collect it (as necessary) for treating and recycling.

The process comprises the following steps:

1. Wells and piping systems are established in and around the site area to collect the groundwater and to monitor its quality.

2. Cutoff ditches and drains to bedrock may be placed where drainage from the site occurs, such as at the base of the tailings pile.

3. Input and collection wells may be built to prevent groundwater from moving through geological formations and off the site.

4. Limiting the amount of surface water entering the site may be necessary to reduce groundwater flows.

5. Interception of groundwater entering the site by use of wells or underground openings may be used to reduce potential contamination.

6. Lined evaporation ponds may be constructed for disposal of collected contaminated groundwater. New ponds may be needed to minimize additional contamination. Because the solid wastes from the ponds will be disposed of in the tailings pile or at some other final disposal site, a final disposal location must be kept available until the last phases of the project.

7. Groundwater must be collected and monitored, and, if necessary, treated until all standards are met.

Analysis of Decommissioning Cost Data for Selected Mills

Decommissioning costs for the six conventional production centers with sufficiently complete data were collected to conduct the following analysis (Table FE3). These six production centers are located in New Mexico and Wyoming (Figure FE3). Data were obtained from the licensees' filings with the NRC. Detailed cost elements were allocated to each of the costs categories (Table FE3 and Figure FE4), for analysis and clarity, then totalled and adjusted to 1991 dollars. Note that these costs are largely estimates that are subject to change. The cost data, however, provide an indication of the levels that can be expected. To simplify the analysis, costs are aggregated into the two following basic categories: (1) *direct costs*, which include mill decommissioning and site reclamation, reclamation of tailings piles, and groundwater restoration and (2) *indirect costs*, which include contingency, overhead, and profit and long-term surveillance and control of the reclaimed areas.

The estimated cost data include a mandatory 15-percent contingency fee and a 10-percent allowance for overhead and profit to approximate the decommissioning costs that would be incurred if the reclamation work were carried out by a third party. The fee and allowances are used in determining the surety bond necessary for decommissioning. In practice, the use (to various degrees) of licensee company staff for reclamation work may hold down actual costs. The goal of the NRC in obtaining and reviewing costs is solely to determine an adequate surety bond. Thus, if the estimate is sufficiently high, the accuracy of the various estimated components, or costs of activities completed in the past, are of less concern.

For each of the six conventional operations analyzed, mill dismantling costs accounted for less than 12 percent of the total decommissioning costs. At Bear Creek, mill dismantling costs accounted for about 5 percent of total decommissioning costs—the smallest percentage of any of the projects. Sweetwater has the highest percentage for dismantling costs (11.5 percent), because its relatively short operational life (from 1980 through 1983) limited the other costs. However, when costs are compared in dollars, the Sweetwater plant's costs are the lowest.

For five of the six conventional mills studied, tailings reclamation costs represented the largest factor in decommissioning costs. For three of the mills, these

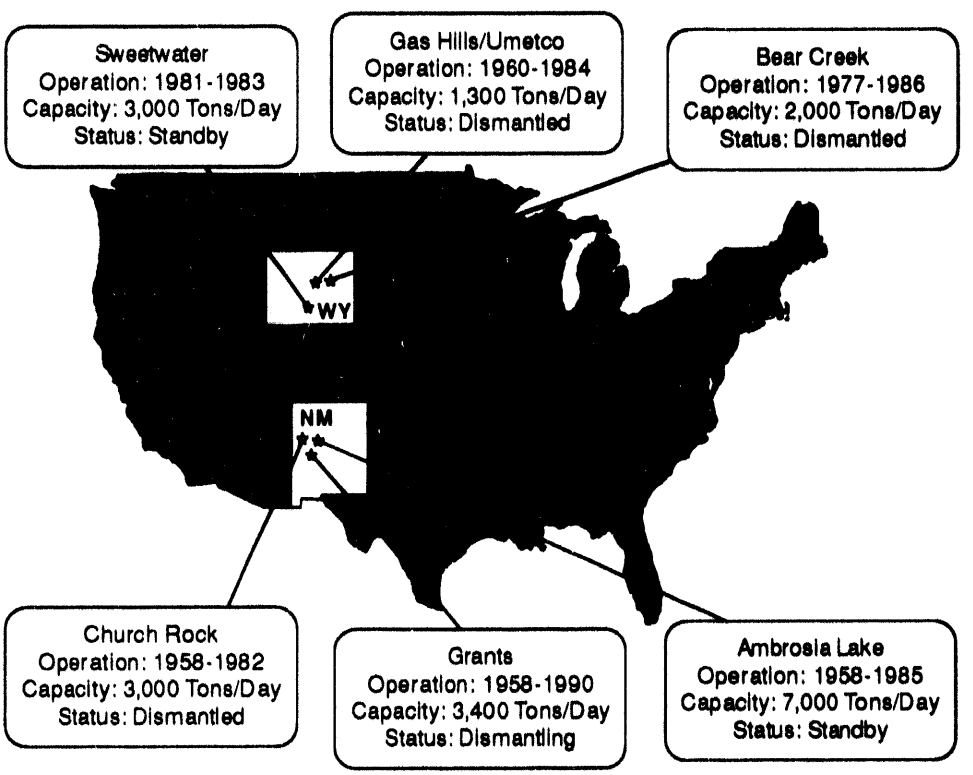
Table FE3. Decommissioning Costs for Selected Conventional Production Centers

(1991 Dollars)

	Ambrosia Lake	Bear Creek	Church Rock	Gas Hills/ Umetco	Grants	Sweetwater	Total
Tailings							
(thousand tons)	33,180	4,740	3,527	8,047	22,377	2,315	74,186
(acres)	328	150	100	146	215	300	1,239
Decommissioning Costs							
Direct Costs							
Mill Dismantlement Costs (thousand dollars)	1,391	610	689	968	1,607	564	5,829
Tailings Reclamation Costs (thousand dollars)	12,129	6,437	3,472	8,258	6,405	2,697	39,398
Dollars per Ton of Tailings	*0.37*	*1.36*	*0.98*	*1.03*	*0.29*	*1.17*	*[a]0.53*
Dollars per Acre of Tailings (thousand dollars)	*37*	*43*	*35*	*57*	*30*	*9*	*[a]32*
Groundwater Restoration Costs (thousand dollars)	1,149	2,486	2,118	3,629	9,688	267	19,337
Total Direct Costs (thousand dollars)	14,669	9,533	6,279	12,855	17,700	3,528	64,564
Other (Indirect) Costs[b] (thousand dollars)	4,170	2,886	2,073	3,717	4,928	1,385	19,159
Total Decommissioning Costs (thousand dollars)	**18,839**	**12,419**	**8,352**	**16,572**	**22,628**	**4,913**	**83,723**
Dollars per Ton of Tailings	*0.57*	*2.62*	*2.37*	*2.06*	*1.01*	*2.12*	*[a]1.13*
Dollars per Acre of Tailings (thousand dollars)	*57*	*83*	*84*	*114*	*105*	*16*	*[a]68*

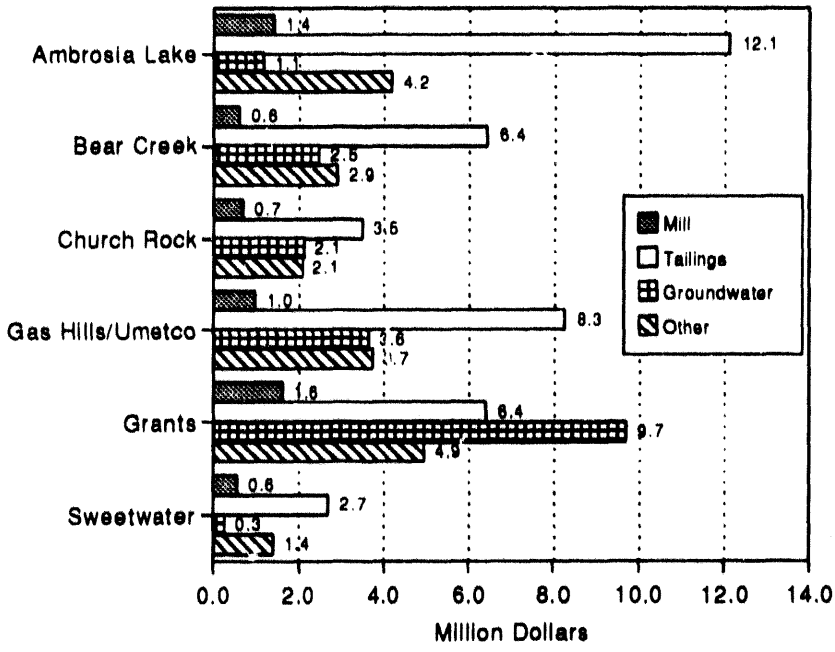
[a]Weighted average.
[b]Includes contingency/overhead and long-term care.
Source: Company filings with the U.S. Nuclear Regulatory Commission.

Figure FE3. Locations and Status of the Six Conventional Mills Included in the Cost Analysis



Notes: Capacities given in tons of uranium ore per day. Status shown as of July 1, 1992.
Source: Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels.

Figure FE4. Components of Decommissioning Costs for Selected Conventional Production Centers



Source: Filings with the U.S. Nuclear Regulatory Commission.

costs represented more than half of the total decommissioning costs: Ambrosia Lake, 64 percent, Sweetwater, 55 percent and Bear Creek 52 percent. Ambrosia Lake was the largest of the six operations analyzed and generated the most mill tailings. Other factors besides tonnages, however, can influence the costs per ton of tailings, as demonstrated by comparing the Bear Creek operation with the Grants mill. Although the Grants plant accounted for nearly five times as much tonnage of mill tailings as the Bear Creek plant, its costs for tailings reclamation were less because of other favorable factors that influence reclamation costs, such as topography, geographic location, subsurface lithologic conditions, and tailings pile design. The quantity of tailings also usually increases commensurate with the length of time the mill operates, and the costs tend to increase accordingly. The Sweetwater plant operated only 3 years before closing, and its tailings reclamation costs were the lowest (Table FE3).

Groundwater restoration costs are normally less than tailings reclamation costs at a conventional mill, but they can be substantial. At the Grants mill, groundwater restoration costs accounted for 43 percent of the total decommissioning costs. This was the only conventional mill (of the six studied) that had higher costs for groundwater restoration than for tailings reclamation because Grants mill tailings encountered a higher level of groundwater contamination in contrast to the other mill tailings, due to problems with seepage by water runoff. As a result, although the Grants plant expenditures for tailings reclamation were about half those of the Ambrosia Lake plant, total decommissioning costs were larger at the Grants plant than at any of the others.

Decommissioning costs of uranium mills vary substantially by site, and caution should be used when calculating or interpreting "average" costs. A simple average of costs is meaningless, and even a weighted average should not be confused with "typical" or "common" costs. For example, groundwater reclamation costs range from $300,000 to $9.7 million (Table FE3, Figure FE4). The range is even broader for total direct decommissioning costs—from $3.5 million to $17.7 million. Recently built mill sites incorporate better design features (such as liners to the tailings ponds), which reduce decommissioning costs. The highest decommissioning costs are for mills that were built earliest and had the longest period of operation, accumulating more tailings than at the newer mills and operating with fewer environmental controls.

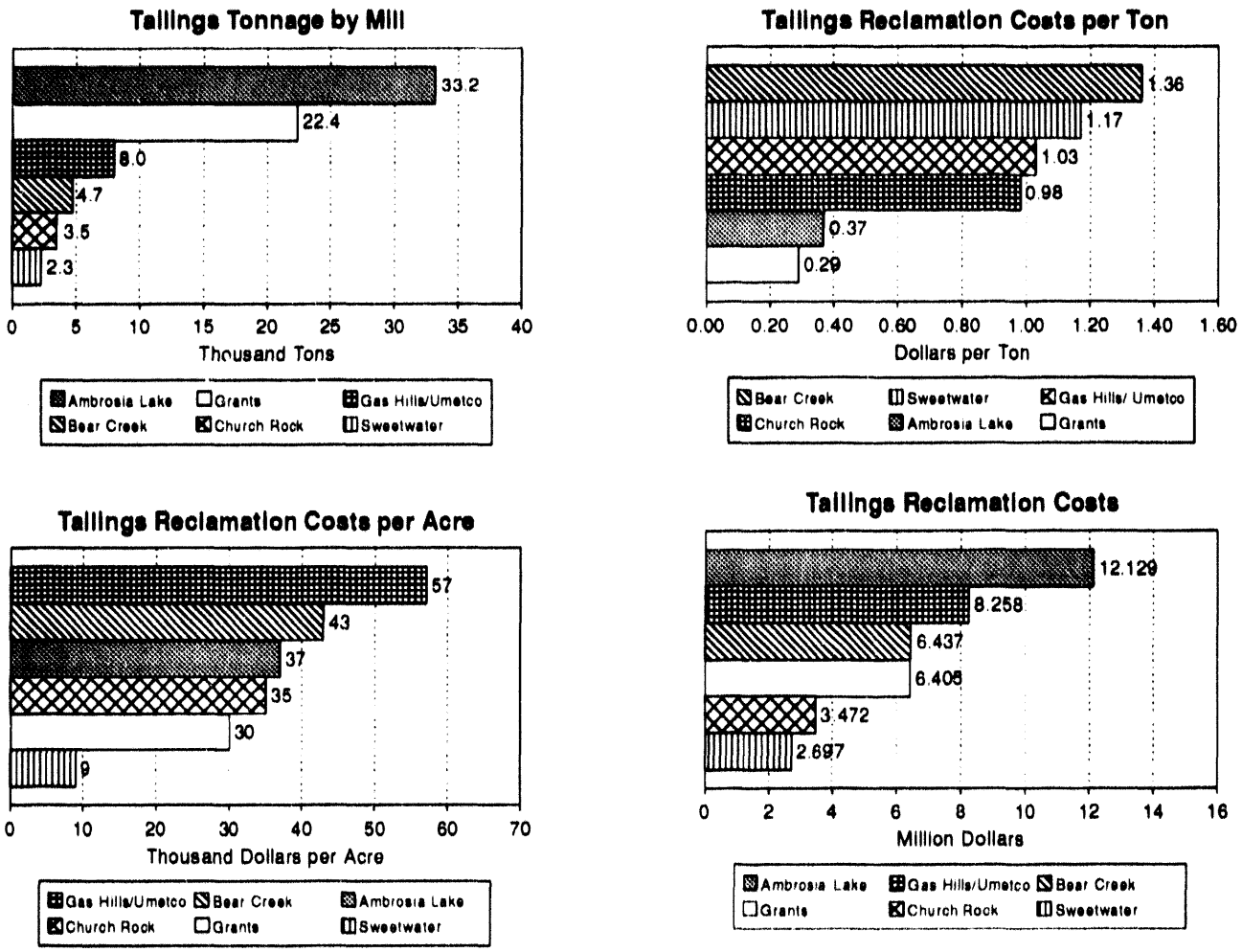
Average tailings reclamation costs were $0.53 per ton of tailings (Table FE3). The costs averaged $32,000 per acre of tailings, with a range of $9,000 to $57,000 per acre. The wide range reflects differences in the design and configuration of the tailings piles and the reclamation measures required. Of the six mills analyzed, the Sweetwater site had the smallest amount of tailings and the lowest direct costs for decommissioning (Table FE3 and Figure FE5). Generally, direct costs for decommissioning tend to be higher for plants with more tailings, although a comparison of the Grants and Ambrosia Lake plants illustrates that this is not the only factor determining direct costs. The total costs of the reclamation projects, including contingencies and allowances, averaged $1.13 per ton of tailings and ranged from $0.57 to $2.62 per ton.

Impact of Decommissioning Costs on Uranium Price

From the previous discussion it can be seen that decommissioning conventional uranium production centers can be costly. To put these costs into perspective it is useful to examine the relationship between the costs of decommissioning the production facilities examined in this article and the price of uranium.

The total cost of decommissioning and the total amount of tailings, which are available, can be used in conjunction with estimated uranium production to estimate the average cost of decommissioning per pound of uranium produced.

Figure FE5. Decommissioning Costs for Selected Mills by Tailings Amount and Acreage



Source: Filings with the U.S. Nuclear Regulatory Commission.

To do this, uranium production is first estimated assuming that 1) the amount of existing tailings at the facilities equals the amount of ore processed, 2) mill recovery was 95 percent of the uranium contained in the mill feed[11] and 3) the ore grade at all sites averaged 0.15 percent U_3O_8. (This percentage corresponds to the average ore grade from 1970 to 1983, when most mills were in operation.) This estimate of uranium production is then divided into the total decommissioning cost for each facility to obtain the average cost of decommissioning per pound of uranium. Note that these costs are based on the assumptions detailed above and may not reflect the actual quantity of uranium produced or decommissioning costs per pound. These estimates merely provide some perspective on the possible outlook for existing mills with characteristics similar to the operations considered here and what might happen to similar future operations.

Based on these assumptions, the average total decommissioning cost per pound of U_3O_8 is $0.39, of which $0.18 is for tailings reclamation (Table FE4). Of the $0.39, direct costs are estimated at $0.30 per pound U_3O_8, ranging from $0.16 to $0.71 per pound of U_3O_8. By comparison, the average price of uranium delivered by domestic producers in 1992 to domestic utilities was at an historic low of $13.45 per pound U_3O_8. The average decommissioning costs then represent 2.9 percent (ranging from 1.5 percent to 6.9 percent) of the average price of U_3O_8. Thus, if these costs are representative of the costs of a new plant, they would have a small impact on the overall price of uranium, particularly if the price of uranium rises above its current historic low.

Summary

Other costs for such a rejuvenation would likely be far higher than the costs associated with the decommissioning phase alone. With the current regulatory system and standards for decommissioning, the costs can be factored into the planning of future operations and amortized over the life of the mill, and thus should not hamper future development of production facilities.

The time for application and approval of decommissioning plans also can be a concern for potential new operations. Long approval processes and licensing and permitting delays can be a concern in planning new projects. However, the process of plant design and environmental studies would encompass many of the considerations that would relate to decommissioning. Thus, it would not be expected that the development and approval of decommissioning plans would add significant time to the permitting process.

Decommissioning entails considerable costs for the industry. The amount of surety bonds in effect, which covers costs for third parties to do the decommissioning for the 26 existing conventional mills, is $237 million. With the site owner doing the work, however, actual costs would be lower. Thus, the impact of decommissioning costs on future uranium prices should be less influential than other costs (such as acquisition, exploration, development, and operating costs). The current generation of uranium mills is being phased out. Future operations would expect a lower rate of decommissioning costs through improved tailings pile design and groundwater restoration technology and practice. The decommissioning costs are normally amortized over the life of the operation and added into projected sales prices that would support developing a new plant. Therefore, decommissioning requirements would have some influence on prices, but they would not have a significant impact on future U.S. uranium production.

Table FE4. Production, Revenue and Costs for Selected Conventional Production Centers

	Ambrosia Lake	Bear Creek	Church Rock	Gas Hills/ Umetoo	Grants	Sweetwater	Total
Production (million pounds U_3O_8)	94.1	13.4	10.3	26.2	62.7	6.8	213.5
Decommissioning Costs							
Tailings Reclamation Costs (dollars per pound U_3O_8)	0.13	0.48	0.34	0.32	0.10	0.40	[a]0.18
Direct Costs (dollars per pound U_3O_8)	0.16	0.71	0.61	0.49	0.28	0.52	[a]0.30
Total Decommissioning Costs[b] (dollars per pound U_3O_8)	0.20	0.93	0.81	0.63	0.36	0.72	[a]0.39

[a]Weighted average.
[b]Includes contingency/overhead and long-term care.
Source: Company filings with the U.S. Nuclear Regulatory Commission.

[11]Mill feed—Uranium ore supplied to a crusher or grinding mill in an ore dressing process.

Executive Summary

A statistical profile of the U.S. uranium industry as of December 31, 1992, is presented in the *Uranium Industry Annual 1992*. Noteworthy facts and events relating to the status of the domestic industry during 1992 are provided under Highlights below. Selected data on uranium materials and uranium marketing activities are briefly described and are summarized in Table ES1 in U.S. customary units of measurement and in International System of Units (SI).

Highlights

- U.S. uranium concentrate production in 1992 totaled 5.6 million pounds U_3O_8, a drop of 29 percent from the 1991 level. This is the lowest level of U.S. production since 1955.

- Six nonconventional uranium concentrate production facilities were operating at the end of 1992, consisting of 4 *in situ* leaching and 2 byproduct recovery plants. Production from nonconventional facilities in 1992 accounted for 76 percent of total concentrate production.

- During 1992, no uranium ore from underground mining operations was shipped for processing, marking the first year in which no ore from underground mines was shipped for processing since the recording of ore shipments was initiated in 1948 by the U.S. Atomic Energy Commission.

- Employment in the raw materials sector of the industry declined by one-third during 1992, falling to the lowest level since before 1967.

- The U.S. Department of Commerce signed suspension agreements with the Republics of Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, the Ukraine, and Uzbekistan, members of the Commonwealth of Independent States, restricting their uranium imports into the United States. The agreements specify quota limits on imports of uranium that are tied to a market price of uranium in the United States. This market price is determined semiannually by the U.S. Department of Commerce.

- U.S. purchase-contract imports of uranium in 1992 totaled 23.3 million pounds U_3O_8, only slightly below the record high level in 1990. Imports under other types of transactions are not included. Uranium import prices in 1992 dropped 27 percent from the 1991 level to a record low level of $11.34 per pound U_3O_8. The greater portion of 1992 import deliveries were made under contracts signed prior to 1992 for which the quantity-weighted average price was about $8.00 per pound.

- Uranium inventories held by U.S. utilities continued to decline in 1992 reaching 91.6 million pounds U_3O_8 at the end of the year. This represents a drop of 7 percent from the level of stocks at the end of 1991, and it was 43 percent below the record high level of stocks held by utilities at the end of 1984 (160.2 million pounds U_3O_8).

Uranium Raw Materials Activities

Exploration and Development. Total surface drilling in the United States in 1992, consisting of exploration and development drilling, was 1.1 million feet in 1,768 holes. This is the lowest amount of total surface drilling footage recorded for the U.S. industry since 1950. Exploration drilling accounted for 53 percent of the total footage. Development drilling accounted for 47 percent, nearly the same as in 1991. The amount of land held by uranium companies declined to 0.8 million acres at the end of 1992 from 1.1 million acres at the end of 1991.

Total exploration and development expenditures in 1992 were $14.5 million, a 19-percent decrease from 1991. Foreign companies contributed $8.0 million (55 percent) of these expenditures, compared with $3.4 million (19 percent) in 1991. The increase in these contributions reflected increased participation by a few foreign firms in U.S. exploration efforts during 1992, compared with 1991.

Table ES1. Uranium Industry Summary Statistics for the United States, 1981-1992

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Uranium Raw Materials Activities												
Exploration and Development												
Surface Drilling (million feet)	14.2	5.4	3.2	2.6	1.8	2.1	2.0	3.0	2.2	1.7	1.8	1.1
(million meters)	4.3	1.6	1.0	0.8	0.5	0.6	0.6	0.9	0.7	0.5	0.6	0.3
Land Held for Exploration at End of Year												
(million acres)	9.6	5.2	4.6	3.4	2.9	2.6	1.9	1.7	1.5	1.2	1.1	0.8
(thousand square kilometers)	38.9	20.8	18.7	13.9	11.7	10.7	7.9	6.9	6.2	4.9	4.3	3.2
Expenditures[a] (million dollars	144.8	73.8	36.9	26.5	20.1	22.1	19.7	20.1	14.8	17.1	17.8	14.5
Reserves at End of Year (million pound U_3O_8, $US30 per pound U_3O_8)	410	360	360	359	345	322	304	289	277	265	304	295
(thousand metric tons U, $US80 per kilogram U)	158	138	138	138	133	124	117	111	107	102	117	114
Mine Production of Uranium												
(million pounds U_3O_8)	36.6	23.6	23.5	10.0	8.6	8.3	6.0	9.5	9.7	5.9	5.2	1.0
(thousand metric tons U)	14.1	9.1	9.0	3.8	3.3	3.2	2.3	3.7	3.7	2.3	2.0	0.4
Uranium Concentrate Production												
(million pounds U_3O_8)	36.5	26.9	21.2	14.9	11.3	13.5	13.0	13.1	13.8	8.9	8.0	5.6
(thousand metric tons U)	14.1	10.3	8.1	5.7	4.4	5.2	5.0	5.0	5.3	3.4	3.1	2.2
Uranium Concentrate Shipments												
(million pounds U_3O_8)	35.1	26.5	19.8	15.5	11.8	10.8	11.6	12.8	14.8	13.0	8.4	6.9
(thousand metric tons U)	13.5	10.2	7.6	6.0	4.5	4.1	4.4	4.9	5.7	4.9	3.2	2.6
Employment (person-years expended)	13,676	8,967	5,615	3,597	2,446	2,120	2,002	2,141	1,583	1,335	1,016	682
Uranium Marketing Activities												
Deliveries from Domestic Suppliers to Utilities[b]												
(million pounds U_3O_8)	[c]32.6	27.1	24.2	22.5	21.7	18.9	20.8	17.6	18.4	20.5	26.8	23.4
(thousand metric tons U)	[c]12.5	10.4	9.3	8.7	8.3	7.3	8.0	6.8	7.1	7.9	10.3	9.0
Average Price of Delivered Uranium[a,d]												
(dollars per pound U_3O_8)	[c]34.65	38.37	38.21	32.65	31.43	30.01	27.37	R26.15	19.56	15.70	13.66	13.45
(dollars per kilogram U)	[c]90.09	99.76	99.35	84.89	81.72	78.03	71.16	R67.99	50.86	40.82	35.52	34.96
Purchase Contract Imports of Uranium[b,e]												
(million pounds U_3O_8)	6.6	17.1	8.2	12.5	11.7	13.5	15.1	15.8	13.1	23.7	16.3	23.3
(thousand metric tons U)	2.5	6.6	3.2	4.8	4.5	5.2	5.8	6.1	5.0	9.1	6.3	9.0
Average Price of Purchase Contract Imports[a]												
(dollars per pound U_3O_8)	32.90	[f]27.23	26.16	21.86	20.08	20.07	19.14	19.03	16.75	12.55	15.55	11.34
(dollars per kilogram U)	85.54	[f]70.80	68.02	56.84	52.21	52.18	49.76	49.48	43.55	32.63	40.43	29.48
Exports of Uranium[b,e]												
(million pounds U_3O_8)	4.4	6.2	3.3	2.2	5.3	1.6	1.0	3.3	2.1	2.0	3.5	2.8
(thousand metric tons U)	1.7	2.4	1.3	0.8	2.0	0.6	0.4	1.3	0.8	0.8	1.3	1.1
Commercial Inventories at End of Year[b,e]												
(million pounds U_3O_8)	159.2	174.8	191.8	185.2	176.9	171.1	163.2	144.8	138.1	129.1	R118.7	117.2
(thousand metric tons U)	61.2	67.2	73.8	71.2	68.0	65.8	62.8	55.7	53.1	49.6	R45.7	45.1

[a]Prices shown are quantity-weighted averages in nominal U.S. dollars.

[b]Uranium quantities are the aggregate U_3O_8 or U equivalents of values reported on the Form EA-858.

[c]Includes delivery commitments to domestic utilities and agents.

[d]Based on deliveries from domestic suppliers to domestic utilities. Imports and interutility transactions are not included.

[e]Includes domestic utility, supplier, and trader/broker purchases (sales) reported as imports (exports) of uranium materials into (from) the United States. Uranium materials reported on the form as imports (exports) under loan, exchange, and other transactions are excluded. Loan, exchange and other import (export) data are shown on Table 30.

[f]Computation of quantity-weighted-average price excludes the quantity associated with a large exchange transaction that occurred in 1982.

R = Revised data.

Sources: U.S. Department of Energy, Grand Junction Projects Office, *Uranium Exploration Expenditures and Plans* (1981-1982) and *Statistical Data of the Uranium Industry* (January 1983); Assistant Secretary for Nuclear Energy, Office of Uranium Enrichment and Assessment, U.S. Department of Energy, *Survey of Uranium Marketing Activity* (1980-1982); Energy Information Administration, *Survey of U.S. Exploration Activity 1983* (July 1984); *Survey of Uranium Marketing Activity* (1983-1984); *Uranium Industry Annual 1991* (October 1992); and Form EIA-858, "Uranium Industry Annual Survey" (1992). Specific references for each category of data and year are provided in various detailed tables included in the main body of this report.

Reserves. Uranium reserves recoverable at a cost of $30 per pound U_3O_8 as of the end of 1992 were 295 million pounds U_3O_8, a decrease of three percent compared with 1991. Approximately 73 percent of the $30 reserves were located in deposits in New Mexico, Texas, and Wyoming. The decrease reflects the reevaluations of reserves for selected uranium properties based on recovery costs, depletion, and the availability of milling facilities. The $50 per pound U_3O_8 reserves as of the end of 1992 decreased to 959 million pounds U_3O_8, a two percent decline compared with 1991.

Mine Production of Uranium. In 1992, total production of uranium from mines was 1.0 million pounds U_3O_8, a decline of 81 percent from the 1991 level. The 1992 total includes underground, openpit, and *in situ* leach mining operations, but it excludes uranium recovered as a byproduct from the mining of phosphate.

Uranium Concentrate Production. Uranium concentrate production in 1992 was just over 5.6 million pounds U_3O_8. Of this amount, 1.4 million pounds (24 percent) were produced by conventional milling of ore from openpit mines, and 4.3 million pounds (76 percent) were produced by processing uranium-bearing solutions from byproduct-commodity operations, *in situ* leaching, and other sources such as reclamation activities. Texas and Wyoming accounted for all of the 1992 concentrate production from ore processing at conventional mills. Florida, Louisiana, Nebraska, Texas, Wyoming, and New Mexico accounted for most of the nonconventional sources of concentrate production.

Employment. In the raw materials sector of the domestic uranium industry, total employment reported for 1992 was 682 person-years, about 33 percent less than the 1,016 person-years reported by the industry for 1991.

Uranium Marketing Activities

Domestic Purchase Commitments by Utilities. In 1992, U.S. electric utilities signed 53 uranium purchase contracts with domestic suppliers[1] for 23.3 million pounds of uranium (U_3O_8 equivalent). Domestic suppliers delivered a total of 23.4 million pounds to domestic utilities in 1992,[2] 12.3 million pounds more than the deliveries anticipated by utilities at the end of 1991. Low spot-market prices for uranium during 1992 appear to be a contributing factor to this increase. At the end of 1992, market commitments for delivery in 1993 and beyond from domestic suppliers totaled 77.5 million pounds of uranium, representing an increase of 12.6 million pounds from the level reported in 1991.

Uranium Prices and Procurement Arrangements. The quantity-weighted average price of uranium deliveries by domestic suppliers to utilities in 1992 was $13.45 per pound U_3O_8 equivalent, a decrease of 2 percent compared with 1991. Prices ranged from about $5 to about $50 per pound. The quantity-weighted average price of 40 new short-term contracts signed in 1992 by utilities with domestic suppliers was $7.97 per pound U_3O_8 equivalent.

Foreign Purchases and Sales.[3] Purchase-contract imports of uranium by all domestic companies totaled 23.3 million pounds in 1992, compared with 16.3 million in 1991. The quantity-weighted average price of uranium imported under purchase contracts in 1992 was $11.34 per pound, a decrease of 27 percent from the price of these imports in 1991. Export sales of uranium decreased to 2.8 million pounds in 1992 from 3.5 million pounds in 1991.

Commercial Inventories. Inventories of natural and enriched uranium held by U.S. companies at the end of 1992 were 117.2 million pounds U_3O_8 equivalent, a decline of 1 percent from the total reported for 1991. The 1992 total consisted of 91.6 million pounds held by utilities and 25.6 million pounds held by suppliers.

Antidumping Suspension Agreements. The U.S. Department of Commerce upheld an antidumping petition filed in November 1991 by a group of domestic U.S. uranium mining and milling companies and the Oil, Chemical and Atomic Workers Union against some of the former Soviet Republics. The International Trade Commission subsequently began an investigation, initiated at the direction of the Senate Finance Committee, of the impact on the U.S. uranium industry of uranium imports from nonmarket economy countries.

The U.S. Department of Commerce (DOC) signed suspension agreements with the Commonwealth of Independent States (C.I.S.) Republics of Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, Ukraine,

[1]In this report, "domestic suppliers" are domestic companies that sell uranium, including uranium producers and agents but excluding electric utility companies.

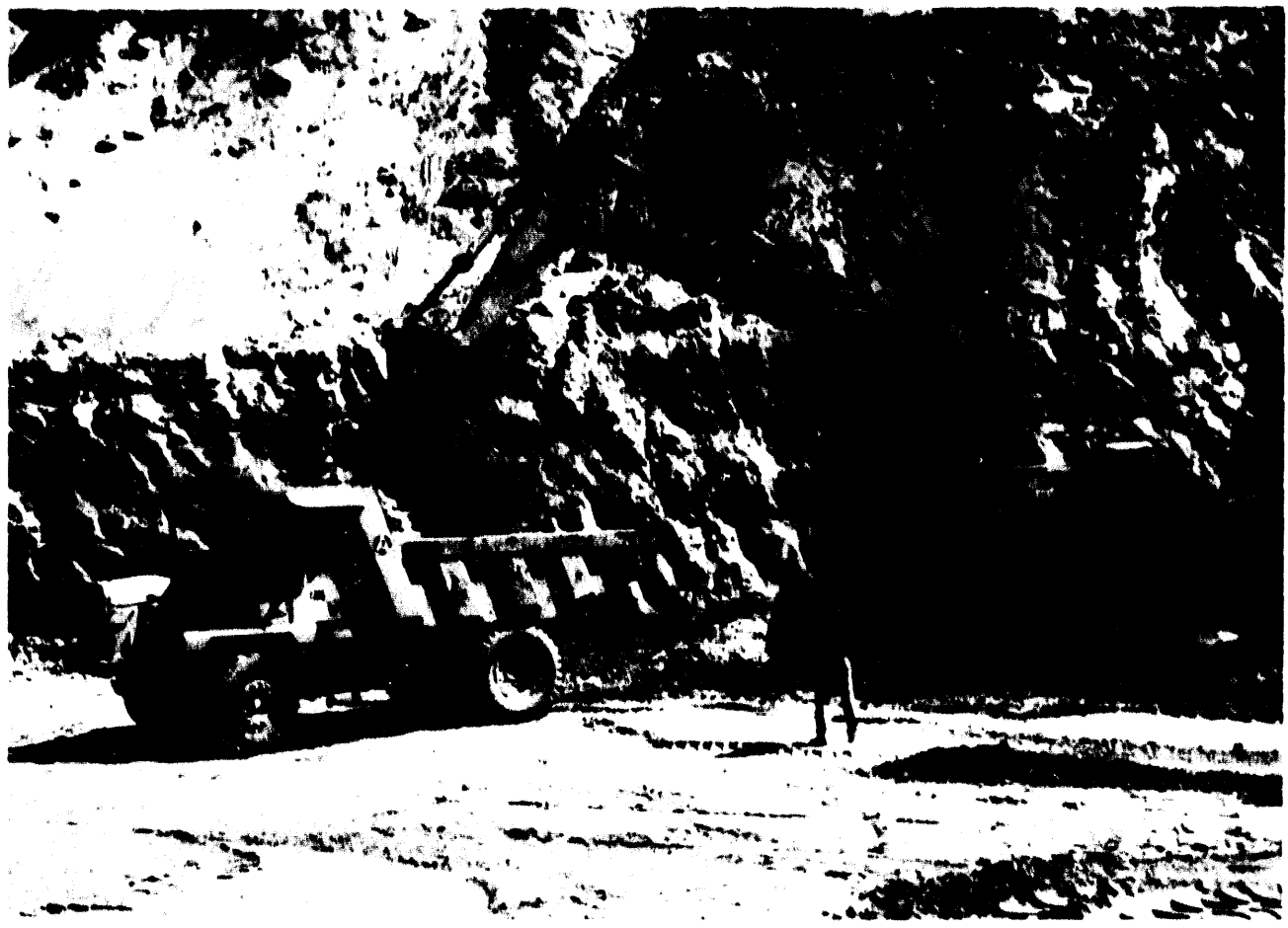
[2]If electric utilities are included as suppliers, there was a total of 23.6 million pounds of uranium delivered to utilities in 1992.

[3]Includes domestic utility, suppliers, and trader/broker purchases (sales) reported on Form EIA-858 as imports (exports) of uranium materials into (from) the United States. Uranium materials reported as imports and exports under loan, exchange, and "other" transactions are excluded.

and Uzbekistan in October 1992 to resolve the anti-dumping petition and restrict the volume of direct or indirect imports of C.I.S. uranium. Uranium import quota levels are based on the market price of uranium in terms of U.S. dollars per pound U_3O_8 equivalent to be determined semiannually by the DOC using price information based on the weighted average of spot market and long-term contracts. For DOC-determined market prices below $13.00 per pound U_3O_8 equivalent, all direct or indirect imports of uranium from the C.I.S. Republics are prohibited. At market prices between $13.00 and $21.00 per pound, import quota levels rise proportionately. For market prices above $21.00 per pound U_3O_8 equivalent, unlimited importation will apply, except that no more than 5.5 million pounds U_3O_8 equivalent annually may be imported from the Russian Federation.

Limited quantities of uranium are allowed from the C.I.S. Republics under long-term contracts made by U.S. utilities before March 5, 1992. The suspension agreement allows the Russian Federation to sell highly enriched uranium (HEU) to the new U.S. Enrichment Corporation (USEC) beginning in 1993.

On October 30, 1992, the Department of Commerce determined that the market price for uranium was $7.95 per pound U_3O_8 equivalent. Deliveries of imported uranium from the C.I.S. Republics were prohibited for the period October 1, 1992, through March 31, 1993. The International Trade Commission suspended its anti-dumping investigation on December 11, 1992.



Loading uranium ore at an openpit mine. Mined ore is hauled to a surface location for eventual milling to recover the uranium for use as nuclear fuel.

1. Uranium Raw Materials Activities

Introduction

The development of a uranium-producing industry in the United States began in the late 1940s, following World War II. In the years from 1947 through 1970, the domestic industry was fostered through the Government's uranium raw materials and procurement programs administered by the Atomic Energy Commission (AEC).

A large quantity of information about uranium as a producible commodity has been compiled by the DOE and its predecessor agencies since the AEC was established in 1946. Information from this data base has been used where appropriate in the presentation of time-series data that show trends in the industry's raw materials sector. The activities that comprise the uranium raw materials sector are summarized below.

Estimates of potential (or undiscovered) uranium resources for various localities, some of which may lack production histories, are prepared by the U.S. Geological Survey (USGS), U.S. Department of the Interior, under a memorandum of understanding between the USGS and the Energy Information Administration (EIA). The estimating methodology is described in Appendix B. These estimates of potential resources are reported in the international classifications of Estimated Additional Resources and Speculative Resources.

Estimates of minable uranium reserves at specific forward costs are made by the EIA through annual analysis of current and historical information on known uranium deposits. This information includes gamma ray drill hole logs, mining and geologic factors, mine production, and mining and processing practice and costs. Reserves reported in this publication are equivalent to the Reasonably Assured Resources category reported in international publications. Estimates of uranium in both the reserves and potential resources categories are made for selected forward-cost categories that are independent of the market price of uranium.

In the United States, exploration for new uranium deposits is conducted solely by the private sector. The decision to conduct exploration on a particular property is based on information from many sources, including industry studies and Government reports. Exploration involves the identification of prospective areas with geologically favorable characteristics; development of data on surface and subsurface conditions using mapping, sampling, drilling, and logging; and thorough analysis and reporting of all data developed. If results are favorable, followup drilling is conducted. The aim of these efforts is to develop uranium reserves.

All information developed in a detailed exploration program contributes to determining the feasibility of mining a discovered uranium deposit. The important parameters include accurate data about the deposit's depth and configuration, the distribution of uranium mineralization in the deposit, costs and the determination of cutoff grades, and the metallurgical characteristics of the deposit. If the ore is sufficiently rich in uranium to be recovered profitably, a mining operation might be established at the deposit site.

Conventional mining includes openpit and underground methods. Openpit methods are used to produce ore from deposits located near the surface or at shallow depths. Underground mining methods are used for deposits that are deeper and that usually contain ore of a higher grade. Ore mined by conventional methods is hauled to mills for processing or to buying stations or stockpiles for future processing.

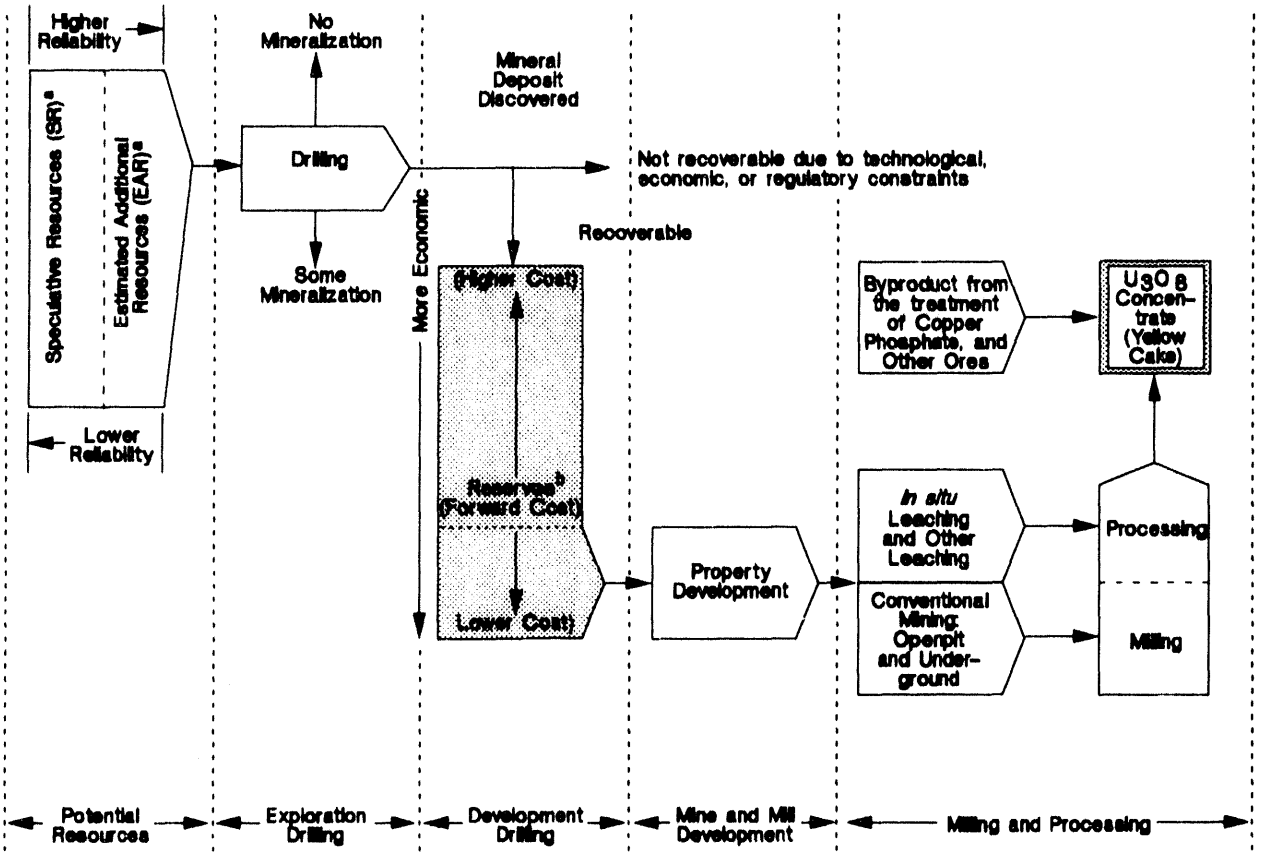
Milling of conventionally mined ore begins with crushing and grinding to the particle size required for nearly complete chemical extraction of the contained uranium. The prepared ore is then leached in a dilute slurry with acid or alkaline reagents to extract the uranium. After leaching is completed, uranium is concentrated from the slurry by solution-extraction techniques. The uranium is recovered from solution by chemical precipitation as uranium concentrate, which is then dried and packaged for shipment.

Uranium can also be "mined" using *in situ* leaching methods, which involve leaching uranium from the ore "in place" without removing the ore from the ground. A leaching solution is circulated through the in-place ore, the uranium-bearing leaching solution is then pumped to the surface, and the uranium is recovered. Leaching solutions commonly employed in solution mining consist of water containing small quantities of

oxygen and carbon dioxide or sodium bicarbonate. Uranium is also recovered as a byproduct from the processing of uraniferous phosphate ore. Uranium also has been recovered in the United States as a byproduct of copper and beryllium production, although not in recent years.

A diagram of the major stages in the production of uranium concentrate in the domestic industry is shown in Figure 1. Delineation of exploration targets, exploration and development drilling, evaluation of discovered mineral deposits to determine reserves quantities, and mine and mill development are the major early stages. Mining and milling of uranium ore or processing of uraniferous solutions (including *in situ* leaching) to recover uranium concentrate complete the uranium concentrate production process.

Figure 1. Stages in Production of Uranium Concentrate



[a]Estimates of domestic potential resources as Estimated Additional Resources (EAR) and Speculative Resources (SR) are prepared by the U.S. Geological Survey (USGS) of the U.S. Department of the Interior under a memorandum of understanding between the USGS and the Energy Information Administration.

[b]Estimates of domestic reserves are made by the staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration.

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

Exploration Activities

Land Holdings and Acquisitions for Uranium Exploration

At the end of 1992, 32 companies involved in domestic uranium exploration held about 0.8 million acres, 25 percent less than the 1.1 million acres held by 37 companies at the end of 1991 (Table 1). The amount of land held for exploration as of the end of 1992 represents approximately 4 percent of the 19 million acres held at the end of 1978.

The amount of land acquired during 1992 was 0.09 million acres, compared with 0.03 million acres acquired in 1991 (Table 1). The annual amount of land acquired since 1982 has ranged between 0.48 million acres in 1984 and 0.03 million acres in 1989 and 1991. The peak year for land acquisition was 1978, when 6.39 million acres were acquired for exploration.

Types of land held and land acquired include fee land, mineral fee, leases, patented and unpatented claims, and options to purchase mineral fee land. The totals shown in Table 1 do not include land held for production of uranium from commercial deposits.

Table 1. Land Held and Acquired for Uranium Exploration, 1966-1992

Year(s)	Land Held for Exploration at End of Year			Land Acquired for Exploration During the Year				
	Number of Companies with Holdings	Million Acres Held	Percent Change from Prior Year in Acres Held	Number of Companies That Acquired Land	Million Acres Acquired[a]	Percent Change from Prior Year in Acres Acquired	Cost (million dollars)[b]	Average Cost (dollars per acre)
1966-1973	--	6.9	--	--	23.41	--	75.07	--
1974	69	9.0	--	55	3.32	--	12.61	3.80
1975	71	11.8	31.1	54	3.48	4.8	16.70	4.80
1976	96	15.0	27.1	81	4.75	36.5	13.89	2.92
1977	128	17.9	19.3	111	6.00	26.3	28.22	4.70
1978	157	19.0	6.1	116	6.39	6.5	30.73	4.81
1979	149	17.2	-9.5	108	4.21	-34.1	44.53	10.58
1980	127	14.9	-13.4	82	3.07	-27.1	35.06	11.42
1981	99	9.6	-35.6	57	2.31	-24.8	11.41	4.94
1982	85	5.2	-45.8	20	0.83	-64.1	11.30	13.61
1983	84	4.6	-11.5	21	0.46	-44.6	3.03	6.59
1984	62	3.4	-26.1	20	0.48	4.3	1.56	3.26
1985	52	2.9	-14.7	9	0.13	-72.9	0.89	6.74
1986	56	2.6	-8.5	16	0.22	68.1	1.33	6.00
1987	49	1.9	-26.5	16	[c]0.09	-60.0	0.79	8.96
1988	54	1.7	-12.6	14	[c]0.09	4.9	1.67	18.12
1989	53	1.5	-10.1	13	0.03	-69.3	0.39	13.87
1990	45	1.2	-20.9	7	0.04	25.2	0.40	10.21
1991	37	1.1	-12.6	7	0.03	-15.7	0.25	5.34
1992	32	0.8	-25.4	5	0.09	166.5	1.36	[d]8.02

[a]Does not include approximately 0.61 million acres acquired in the period 1966-1973 for which no cost data were reported.

[b]Includes costs for land acquisitions and rentals in nominal dollars.

[c]Land acquired in 1987 was 0.088 million acres and in 1988 was 0.092 million acres.

[d]Average cost does not include land acquired for which a cost was not reported and land acquired under arrangements covering reserves and/or incompletely delineated uranium deposits.

-- = Not applicable.

Note: Average cost per acre shown here may not equal quotients obtained with independently rounded numerator and denominator.

Sources: **1966-1970**—U.S. Department of Energy, Grand Junction Projects Office, Press Release No. 582 (August 12, 1971). **1971-1980**—U.S. Department of Energy, Grand Junction Projects Office, *Uranium Exploration Expenditures and Plans Survey* (1972-1981). **1981-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Land Acquisition Costs

The total cost of land acquired during 1992, about $1.36 million, was over five times the reported total cost of land acquired in 1991 (Table 1). Since 1982, annual expenditures for land acquisition have ranged between $0.25 million (1991) and $3.03 million (1983). Annual expenditures for land acquisition peaked in 1979 when $44.5 million was spent to acquire 4.2 million acres. Expenditures for land acquired for exploration in 1992 ranged from less than $1.00 to about $40 per acre; the average cost was $8.02 per acre compared with $5.34 per acre in 1991. Note that this average cost does not include the costs for land acquired under arrangements covering purchases of reserves and/or partially delineated uranium deposits. From 1976 through 1991, the annual average cost (in nominal dollars) per acre of acquired land ranged from $2.92 (in 1976) to $18.12 (in 1988). Five companies reported data for land acquisitions in 1992, compared with 7 in 1991.

Surface Drilling

Total surface drilling in the United States in 1992 including exploration and development drilling, was 1.06 million feet in 1,768 holes (Table 2). This total footage was 42 percent less than the 1.84 million feet reported by the industry for 1991. During 1992, 16 companies conducted uranium surface drilling programs, 8 fewer than in 1991. In 1992, development drilling was conducted by 9 companies and exploration drilling was conducted by 14 companies. The peak year for U.S. surface drilling was 1978 when total surface drilling was 48 million feet, consisting of nearly 29 million feet for exploration and 19 million feet for development (Table 3). The total annual surface drilling since 1976 and drilling planned for 1993 are shown in Figure 2.

Costs incurred for surface drilling activities include those for ground surveys, road construction and site preparation, drilling, downhole geophysical surveys,

Table 2. Surface Drilling Activities, 1966-1992

Year(s)	Number of Companies That Drilled	Number of Holes Drilled	Percent Change from Prior Year in Holes	Drilling Footage (million feet)	Percent Change from Prior Year in Feet	Cost (million Dollars)[a]	Percent Change from Prior Year in Cost	Average Cost (dollars per foot)	Percent Change from Prior Year in Average Cost
1966-1973	--	351,114	--	117.53	--	164.87	--	1.29	--
1974	62	39,700	--	21.56	--	44.76	--	2.08	--
1975	66	55,886	40.8	25.42	17.9	73.81	64.9	2.90	39.4
1976	97	67,640	21.0	34.80	36.9	108.97	47.6	3.13	7.9
1977	125	93,452	38.2	45.58	31.0	155.03	42.3	3.40	8.6
1978	152	104,353	11.7	48.10	5.5	169.68	9.4	3.53	3.8
1979	154	90,648	-13.1	41.08	-14.6	162.98	-3.9	3.97	12.5
1980	127	59,795	-34.0	28.19	-31.4	125.70	-22.9	4.46	12.3
1981	96	26,424	-55.8	14.22	-49.6	67.90	-46.0	4.77	7.0
1982	89	9,967	-62.3	5.35	-62.4	27.85	-59.0	5.20	9.0
1983	60	7,298	-26.8	3.17	-40.8	14.42	-48.2	4.55	-12.5
1984	43	5,521	-24.3	2.55	-19.6	11.85	-17.8	4.65	2.3
1985	30	3,649	-33.9	1.76	-30.9	5.53	-53.3	3.14	-32.4
1986	35	3,831	5.0	2.07	17.6	7.74	39.9	3.74	19.0
1987	29	3,814	-0.4	1.96	-5.2	6.96	-10.1	3.55	-5.1
1988	32	5,205	36.5	3.01	53.5	9.70	39.3	3.22	-9.3
1989	27	3,840	-26.2	2.22	-26.2	8.94	-7.8	4.03	25.0
1990	26	3,415	-11.1	1.68	-24.5	9.15	2.3	5.45	35.4
1991	24	3,197	-6.4	1.84	9.7	10.95	19.6	5.94	9.0
1992	16	1,768	-44.7	1.06	-42.2	2.43	-77.8	2.28	-61.6

[a]Includes costs for exploration and development drilling in nominal dollars.

-- = Not applicable.

Notes: Percent change may not equal quotients obtained with independently rounded numerator and denominator. Average cost per foot shown here may not equal quotients with independently rounded numerator and denominator.

Sources: **1966-1970**—U.S. Energy Research and Development Administration, Grand Junction Projects Office, Press Release No. 582 (August 12, 1971). **1971-1980**—U.S. Department of Energy, Grand Junction Projects Office, *Uranium Exploration Expenditures in 1980 and Plans for 1981-1982* (May 1981). **1981-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991*, (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 3. Exploration and Development Drilling Activities, 1966-1992

Year(s)	Exploration Drilling[a]				Development Drilling[b]			
	Number of Holes Drilled[c]	Million Feet[c]	Cost (million dollars)[c d]	Average Cost (dollars per foot)[c]	Number of Holes Drilled[c]	Million Feet[c]	Cost (million dollars)[c d]	Average Cost (dollars per foot)[c]
1966-1973	226,721	89.78	124.52	--	124,393	27.75	26.66	--
1974	27,400	14.72	34.95	2.37	12,300	6.84	9.81	1.43
1975	34,285	15.69	51.92	3.31	21,601	9.73	21.89	2.25
1976	40,409	20.36	70.70	3.47	27,231	14.44	38.30	2.65
1977	62,597	27.96	99.40	3.56	30,855	17.62	55.60	3.16
1978	75,068	28.95	113.30	3.91	29,285	19.15	56.40	2.95
1979	60,457	28.07	119.60	4.26	30,191	13.01	43.40	3.34
1980	39,607	19.60	94.80	4.84	20,188	8.59	30.90	3.60
1981	17,751	10.87	56.43	5.19	8,673	3.35	11.47	3.42
1982	6,965	4.23	20.94	4.96	3,002	1.13	6.90	[e]6.13
1983	4,287	2.09	10.60	5.07	3,011	1.08	3.81	3.55
1984	4,798	2.26	10.53	4.66	723	0.29	1.32	4.60
1985	2,877	1.42	5.14	3.63	772	0.34	0.39	1.15
1986	1,985	1.10	6.40	5.83	1,846	0.97	1.35	1.38
1987	1,820	1.11	5.90	5.34	1,994	0.86	1.06	1.24
1988	2,029	1.28	6.44	5.03	3,176	1.73	3.26	1.88
1989	2,087	1.43	5.82	4.09	1,753	0.80	3.12	3.92
1990	1,507	0.87	3.21	3.68	1,908	0.81	5.95	7.37
1991	1,624	0.97	2.83	2.91	1,573	0.87	8.11	9.33
1992	935	0.56	1.27	2.25	833	0.50	1.16	2.31

[a]Includes assessment drilling and drilling in search of new ore deposits or extensions of known deposits and drilling at the location of a discovery up to the time the company decides sufficient ore reserves are present to justify commercial exploitation.

[b]Includes all drilling of an ore deposit to determine more precisely size, grade, and configuration subsequent to the time that commercial exploitation is deemed feasible.

[c]Number of holes for 1981 and prior years and data for drilling footage total cost, and average cost for 1982 and prior years as reported in *Statistical Data of the Uranium Industry*, GJO-100(83) (January 1, 1983). Costs shown are in nominal dollars.

[d]Does not include the costs for 2.074 million feet of exploration drilling and 0.53 million feet of development drilling for 1966-1971 for which drilling costs were reported as "other exploration expenditures." Does not include costs for 9.966 million feet of exploration and development drilling reported together at a cost of $13.7 million, 1966-1972.

[e]This high value is attributable primarily to the large percentage of the total expenditures for development drilling in 1982 contributed by one company.

-- = Not applicable

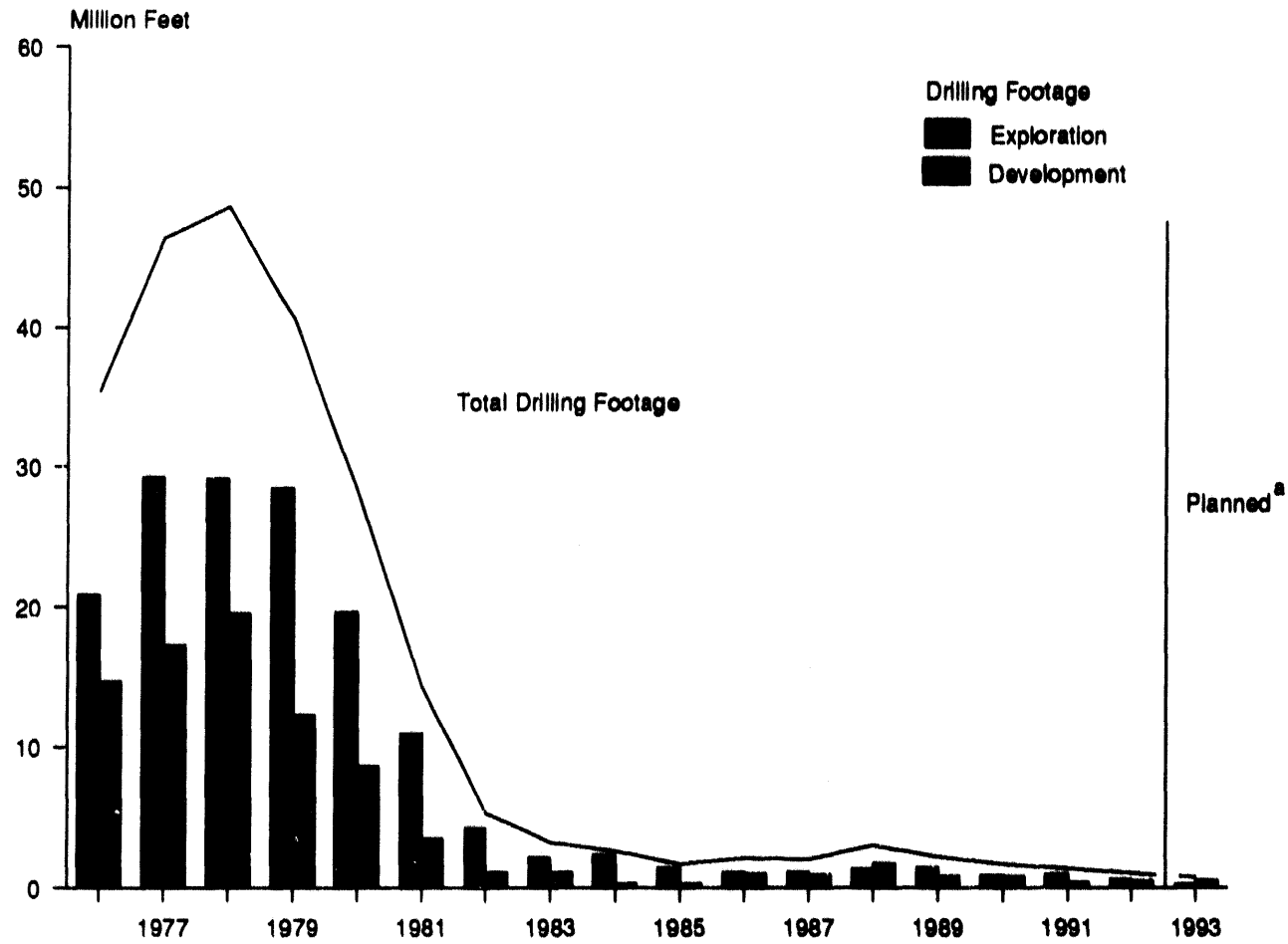
Note: Average cost per foot shown here may not equal quotients obtained with independently rounded numerator and denominator.

Sources: **1966-1970**—U.S. Department of Energy, Grand Junction Projects Office, Press Release No. 582 (August 12, 1971). **1971-1980**—U.S. Department of Energy, Grand Junction Projects Office, *Uranium Exploration Expenditures in 1980 and Plans for 1981-1982* (May 1981). **1981-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

sample collection and analysis, and geological and other technical support. In 1992, the costs for surface drilling ranged from about $1.00 to nearly $35.00 per foot drilled. The average cost of surface drilling was $2.28 per foot, a decrease of 62 percent from the average cost per foot drilled in 1991 (Table 2). The relatively low average cost per foot of drilling in 1992 was because nearly two-thirds of the total footage reported was completed at a cost of less than $1.75 per foot.

Surface drilling for uranium consists of both exploration and development drilling (Table 3). Exploration drilling is done in search of new ore deposits or extensions of known deposits. The 0.56 million feet of exploration drilling during 1992 was 42 percent less than the footage reported for 1991. The number of exploration holes drilled in 1992 decreased to 935 holes. The average cost per foot of exploration drilling in 1992 decreased to $2.25, a 23 percent decline from 1991. Exploration drilling reported on Form EIA-858

Figure 2. Exploration and Development Drilling Footage, 1976-1993



[a]Planned as of the end of 1992.

Sources: **1976-1980**—U.S. Department of Energy, Grand Junction Projects Office, *Uranium Exploration Expenditures in 1980 and Plans for 1981-1982* (May 1981). **1981-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992-1993**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

includes assessment drilling completed to meet requirements for holding land under certain lease agreements.

Development drilling is done to define the size, shape, and grade of known deposits and to provide data needed for mine planning (Table 3). In 1992, 0.50 million feet of development drilling was completed in 833 holes. Development drilling was reported by 9 companies for 1992, compared with 14 in 1991. During the period 1984 through 1992, annual development drilling has been less than 1 million feet each year, except in 1988. The average cost per foot of development drilling in 1992 decreased to $2.31.

For both the exploration and development drilling categories in 1992, the decrease in the average cost per foot drilled compared with 1991 resulted from the dominance of each category in 1992 by a few companies that reported large, low cost drilling programs. For individual drilling programs in 1992, the reported average cost-per-foot drilled ranged from about $1.00 to near $25.00 for exploration drilling and from about $1.00 to near $35.00 for development drilling. Ranking the 14 exploration drilling programs reported for 1992 by total footage drilled showed that: 7 companies drilled less than 10,000 feet; 5 drilled 10,001 to 100,000 feet; and 2 drilled more than 100,001 feet. A like ranking of the 9 development drilling programs reported for 1992 showed that: 2 companies drilled less than 10,000 feet; 5 drilled 10,001 to 100,000 feet; and 2 drilled more than 100,001 feet.

Surface Drilling Footage by State

Surface drilling was conducted in Arizona, Colorado, Nebraska, New Mexico, Texas, Utah, and Wyoming in 1992. Compared with 1991, total surface drilling footage in 1992 decreased in all States except Arizona. Wyoming accounted for about 67 percent of the total surface drilling footage reported in 1992 (Table 4). Exploration drilling footages increased in Colorado and Texas but decreased in Arizona, Nebraska, New Mexico, Utah, and Wyoming. Development drilling in 1992 increased in Arizona and Nebraska but decreased in Colorado, New Mexico, Texas, Utah, and Wyoming (Figure 3). Drilling data for Arizona, Colorado, Nebraska, New Mexico, Texas, and Utah are combined in Table 4 and Figure 3 into the "Other States" category to avoid disclosure of company-specific data.

Total Domestic Exploration Expenditures

The total expenditures for uranium exploration shown in Table 5 include all expenditures for land acquired and held, exploration drilling costs, development drilling costs, and other exploration expenditures. Total exploration expenditures in 1992 were $14.51 million, approximately 19 percent less than the total expenditures in 1991. The 1992 total consisted of $1.36 million for land acquisition, $2.43 million for surface drilling, ad $10.72 million for other exploration activities.[1]

For 1992, 21 companies incurred costs for exploration activities in the *other exploration expenditures* category. This expenditures category increased by 61 percent compared with the 1991 level. Costs for land acquisition, drilling, or work in foreign countries are not included in other exploration expenditures. Expenditures by U.S. companies for exploration in foreign countries were reported as zero during 1992, and like expenditures planned for 1993 were also reported as zero on the 1992 survey.

Foreign Participation in Domestic Exploration

Expenditures from foreign sources in U.S. exploration activities during 1992 were $8.0 million, a 56-percent increase above the total of $3.5 million from foreign sources in 1991 (Table 6)."Foreign" means majority-owned by non-U.S. entities. Foreign participation in 1992 accounted for about 55 percent of the total exploration expenditures for the domestic industry; in 1991 foreign participation accounted for 19 percent and in 1987 it accounted for 60 percent. Six companies reported participation in 1992 from foreign sources, the same number as in 1991. The dollar amounts from foreign sources are included in the exploration expenditures reported in Tables 1, 2, 3, 5, and 7.

Planned and Actual U.S. Exploration and Development Activities, 1980 Through 1992

Of the 88 companies that responded on Schedule A of Form EIA-858 for 1992, 16 reported actual exploration and development drilling activities for the year. In comparison, 14 companies reported planned exploration and development drilling programs for 1992 on the 1991 survey.

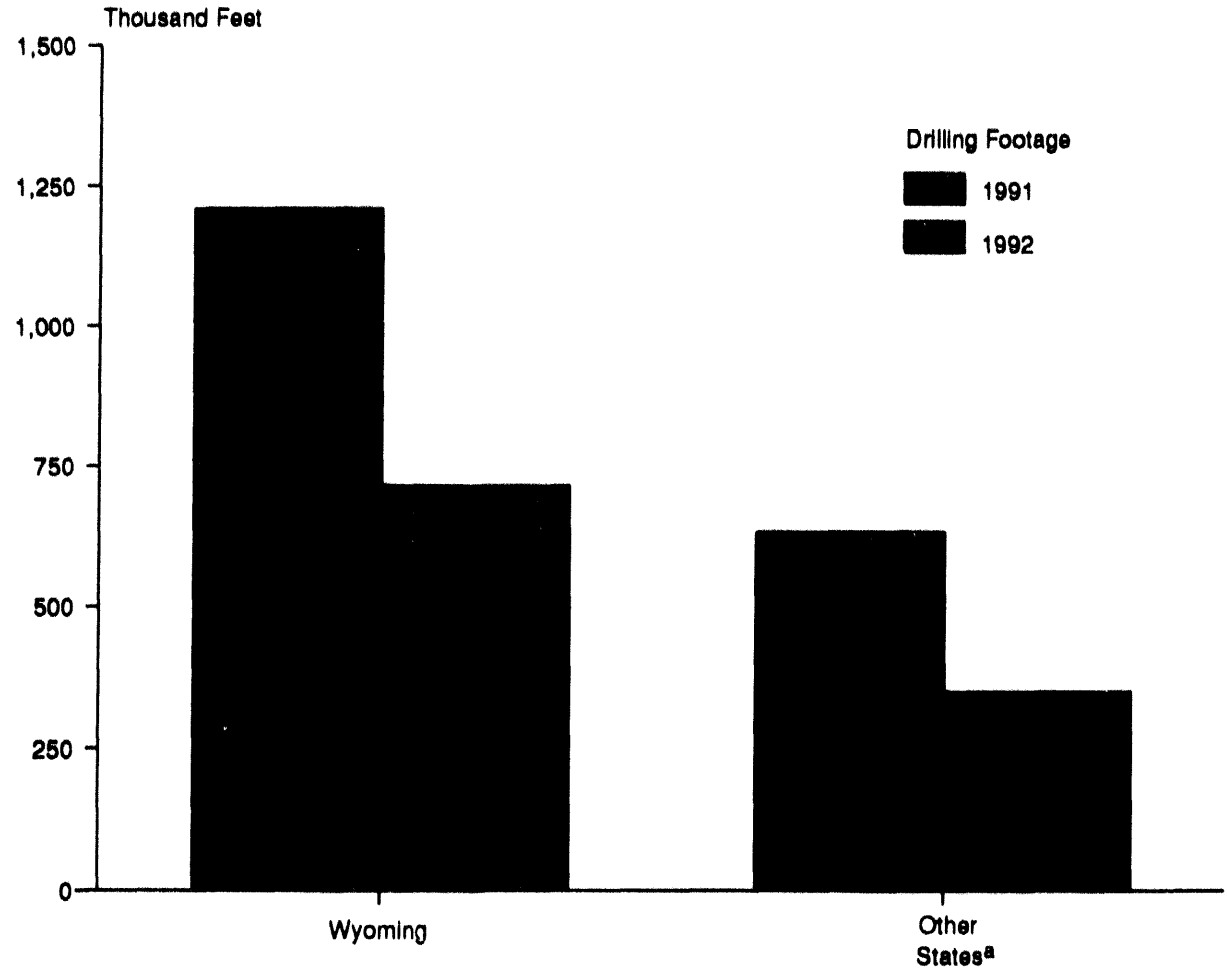
Table 4. Surface Drilling by State, 1992

State	Exploration Drilling		Development Drilling		Total Surface Drilling		Total Surface Drilling as a Percent of U.S. Total	
	Number of Holes	Thousand Feet	Number of Holes	Thousand Feet	Number of Holes	Thousand Feet	Number of Holes	Drilling Footage
Wyoming	588	367	495	347	1,083	714	61.3	67.1
Other States[a]	347	195	338	155	685	350	38.7	32.9
Total	**935**	**562**	**833**	**502**	**1,768**	**1,064**	**100.0**	**100.0**

[a]Includes Arizona, Colorado, Nebraska, New Mexico, Texas, and Utah.
Notes: Totals may not equal sum of components because of independent rounding. Percentages were calculated using unrounded data.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992)

[1]The category "other exploration expenditures" includes costs for geologic and geophysical investigations and research costs incurred by field personnel during exploration, assessment work other than drilling, and overhead and administrative charges specifically associated with supervising and supporting exploration activities.

Figure 3. Total Surface Drilling Footage by State, 1991-1992



[a]Other States: **1991**—Arizona, Colorado, Nebraska, New Mexico, Texas, and Utah.
1992—Arizona, Colorado, Nebraska, New Mexico, Texas, and Utah.
Sources: **1991**: Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

The actual total surface drilling reported for 1992, 1.1 million feet, was 21 percent less than the projected (planned for 1992) amount reported on the 1991 survey. Statistics for actual and planned exploration activities for 1980 through 1992 and planned activities for 1993 are shown in Table 7. Total surface drilling footage planned for 1993 is projected to be 28 percent less than the actual amount of drilling reported for 1992, and drilling expenditures planned for 1993 are projected to be 11 percent above the actual 1992 level. The total actual drilling expenditures for 1992 were 64 percent less than like expenditures reported as planned for 1992 on the prior year's survey.

Uranium Resources and Reserves

Potential Uranium Resources

Estimates of potential (undiscovered) uranium resources for the classes of Estimated Additional Resources (EAR) and Speculative Resources (SR) at forward-cost categories of $30-, $50-, and $100-per-pound U_3O_8 are reported by the EIA. Within each forward-cost category, the estimates of resources at each cost level are cumulative and include all lower cost resources within that category. Because of limited

Table 5. Exploration and Development Expenditures, 1966-1992

Year(s)	Surface Drilling		Land Acquisition		Other Exploration Expenditures		Total Expenditures		
	Number of Companies	Million Dollars[a]	Number of Companies	Million Dollars[a]	Number of Companies	Million Dollars[a]	Number of Companies	Million Dollars[a]	Percent Change from Prior Year
1966-1973	--	164.87	--	75.07	--	94.43	--	334.37	--
1974	62	44.76	55	12.61	NA	21.71	83	79.08	--
1975	66	73.81	54	16.70	NA	31.52	86	122.03	54.3
1976	97	108.97	81	13.89	NA	47.79	108	170.65	39.8
1977	125	155.03	111	28.22	NA	74.83	146	258.08	51.2
1978	152	169.68	116	30.73	NA	113.85	174	314.26	21.8
1979	154	162.98	108	44.53	NA	108.40	164	315.91	0.5
1980	127	125.70	82	35.06	NA	106.20	147	266.96	-15.5
1981	96	67.90	57	11.41	NA	65.45	107	144.76	-45.8
1982	69	27.85	20	11.30	64	34.47	85	73.61	-49.2
1983	60	14.42	21	3.03	66	19.41	77	36.86	-49.9
1984	42	11.85	20	1.56	32	13.07	53	26.48	-28.2
1985	30	5.53	9	0.89	34	13.67	40	20.10	-24.1
1986	35	7.74	16	1.33	34	12.99	50	22.06	9.8
1987	29	6.96	16	0.79	34	11.92	42	19.67	-10.8
1988	32	9.70	14	1.67	31	8.73	44	20.10	2.2
1989	27	8.94	13	0.39	24	5.43	39	14.77	-26.5
1990	26	9.15	7	0.40	31	7.58	40	17.12	15.9
1991	24	10.95	7	0.25	19	6.65	30	17.84	4.2
1992	16	2.43	5	1.36	21	10.72	28	14.51	-18.7

[a]Includes costs for exploration and development in nominal dollars.
[b]Companies reporting land acquisitions and rentals.
[c]Includes costs for land acquisitions and rentals in nominal dollars.
[d]Companies reporting other exploration expenditures.
[e]Includes costs, in nominal dollars, for geologic and geophysical investigations and research costs incurred by field personnel during exploration, and overhead and administrative charges specifically associated with supervising and supporting exploration activities.
-- = Not applicable
NA = Not available
Notes: Totals may not equal sum of components because of independent rounding.
Sources: **1966-1974**—U.S. Energy Research and Development Administration, Grand Junction Projects Office, *Uranium Exploration Expenditures in 1974 and Plans for 1975-1976* (April 1975). **1975-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

direct-sample data, the estimation of potential uranium resources is not precise, and the reliability of the estimates is subject to some uncertainty. Assistance provided by the U.S. Geological Survey (USGS) to the EIA in support of the estimation of potential resources and the methodology used are described in Appendix B.

For 1992, the mean values of EAR for the $30-, $50-, and $100-per-pound U_3O_8 forward-cost categories remained relatively unchanged from the 1991 EAR values (Table 8). Estimates of potential resources in the SR class decreased for 1992: the decrease was 4 percent at the $30-per-pound forward-cost category, 3 percent at the $50-per-pound, and 1 percent at the $100-per-pound forward-cost category (See Table B4). An explanation of the potential uranium resources estimates for 1992 and historical estimates is provided in Appendix B.

Estimates of Uranium Reserves for 1992

Uranium reserves consist of the estimated quantities of uranium (as U_3O_8) occurring in known deposits of such grade, quantity, configuration of mineralized rock, and depth, that, based on mining analyses and engineering calculations, portions of the mineralized deposits can be recovered at specified costs under current regulations using state-of-the art mining and processing. The specified costs, which comprise the forward-cost categories, are not the same as market prices. The EIA category of "uranium reserves" is equivalent to the internationally reported category of Reasonably Assured Resources (RAR).

Using historical data, industry information, and the reserves data and estimating parameters for individual

Table 6. Foreign Participation in Domestic Exploration, 1976-1992

Year	Number of Companies Reporting	Expenditures by Foreign Companies	
		Million Dollars[a, b]	Percent of Total U.S. Expenditures
1976	15	13.2	8
1977	17	21.7	8
1978	31	39.3	13
1979	28	34.1	11
1980	28	37.6	14
1981	25	24.6	17
1982	14	14.6	20
1983	9	4.8	13
1984	9	6.6	25
1985	6	5.6	28
1986	8	12.0	55
1987	11	11.9	60
1988	11	8.9	44
1989	7	6.1	42
1990	9	2.5	15
1991	6	3.5	19
1992	6	8.0	55

[a]Expenditures shown are in nominal dollars. Includes expenditures for land acquired and held, surface drilling, and "other exploration expenditures." Includes costs, in nominal dollars, for geologic and geophysical investigations and research costs incurred by field personnel during exploration, and overhead and administrative charges specifically associated with supervising and supporting exploration activities.

Sources: **1976-1980**—U.S. Department of Energy, Grand Junction Projects Office, Uranium Exploration Expenditures and Plans Survey (1976-1980). **1981-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

properties reported on the 1992 Form EIA-858, the EIA staff prepared the national estimates of uranium reserves presented in this section. Reserves totals are presented for selected forward-cost categories that cover a broad range of costs for both short-term and long-term planning for the supply and procurement of uranium as well as for planning the development of energy programs by Government and industry. Costs used in deriving the 1992 reserves estimates include capital and operating costs associated with mining, transporting, and processing of the uranium ores. Uranium recovery factors normally encountered in actual mining and milling operations were used in the estimations.

Estimates of uranium reserves for 1991 and 1992 are shown in Table 9. The estimate of reserves as of the end of 1992 at the $30-per-pound category was 295 million pounds of U_3O_8 located in 246 properties. Reserves in the $30-per-pound category decreased by about 3 percent in 1992. The estimate of 959 million pounds U_3O_8 for $50-per-pound category represents a decrease of 2 percent from the corresponding 1991 estimates. The $100-per-pound reserves estimate for 1992 decreased to 1,523 million pounds U_3O_8, or 1 percent below the corresponding estimate at the end of 1991. Most of the decrease in reserves was the result of the reevaluation of selected uranium property reserves based on new data and on costs, depletion, and availability of milling facilities within reasonable haulage distance. Changes in 1992 reserves from the estimates for 1991 are shown in Table 10. Estimates of reserves by State are shown in Table 11 and Figure 4. Three States, New Mexico, Texas, and Wyoming, contain about 73 percent of $30-per-pound U_3O_8 reserves.

Based on the reserve data reported on Form EIA-858 and on evaluation of EIA-held historical uranium-properties data, an assessment was made of the distribution of reserves most likely to be extracted by underground, openpit, *in situ* leaching, or other methods of mining. This distribution by expected

Table 7. Actual and Planned Exploration and Development Activities, 1980-1993

Year	Exploration Drilling		Development Drilling		Total Surface Drilling (million feet)	Total Expenditures[a] (million dollars)
	Thousand Holes	Million Feet	Thousand Holes	Million Feet		
1980						
Planned[b]	NA	27.9	NA	11.5	39.4	277
Actual	39.6	19.6	20.2	8.6	28.2	267
1981						
Planned[b]	NA	15.2	NA	5.2	20.4	175
Actual	17.8	10.9	8.7	3.4	14.2	145
1982						
Planned[b]	NA	6.4	NA	2.5	8.9	74
Actual	7.0	4.2	3.0	1.1	5.4	74
1983						
Planned[b]	3.4	2.2	3.3	1.2	3.4	40
Actual	4.3	2.1	3.0	1.1	3.2	37
1984						
Planned[b]	4.6	2.6	1.6	0.9	3.5	33
Actual	4.8	2.3	0.7	0.3	2.5	26
1985						
Planned[b]	3.3	1.8	0.5	0.1	1.9	21
Actual	2.9	1.4	0.8	0.3	1.8	20
1986						
Planned[b]	2.2	1.5	0.8	0.4	1.9	19
Actual	2.0	1.1	1.8	1.0	2.1	22
1987						
Planned[b]	1.7	1.1	1.4	0.7	1.8	18
Actual	1.8	1.1	2.0	0.9	2.0	20
1988						
Planned[b]	2.3	1.5	2.5	1.2	2.7	20
Actual	2.0	1.3	3.2	1.7	3.0	20
1989						
Planned[b]	1.6	1.0	2.6	1.4	2.4	15
Actual	2.1	1.4	1.8	0.8	2.2	15
1990						
Planned[b]	0.8	0.6	1.3	0.8	1.3	8
Actual	1.5	0.9	1.9	0.8	1.7	17
1991						
Planned[b]	1.6	1.0	0.9	0.4	1.4	9
Actual	1.6	1.0	1.6	0.9	1.8	11
1992						
Planned[b]	1.1	0.7	1.1	0.7	1.4	7
Actual	0.9	0.6	0.8	0.5	1.1	2
1993						
Planned[b]	0.3	0.2	0.6	0.5	0.8	3

[a]For 1980-1990, Planned and Actual includes total expenditures for surface drilling, land, and all other exploration activities. For 1991-1993, Planned and Actual include total expenditures for surface drilling only. Expenditures shown are in nominal dollars.

[b]Activity for the year indicated, planned at the end of the previous year.

NA = Not available.

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

Sources: **1980-1982 Planned**—U.S. Department of Energy, Grand Junction Projects Office, Uranium Exploration Expenditures and Plans Survey (1980-1983). **1980-1983 Actual, 1984 Planned**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1981 Planned**—Energy Information Administration, *1982 Survey of U.S. Uranium Exploration Activity* (August 1983). **1984-1991 Actual, 1992 Planned**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992 Actual, 1993 Planned**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 8. Estimated Additional Resources (EAR) and Speculative Resources (SR) at the End of the Year, 1991-1992
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]					
	$30 per pound		$50 per pound		$100 per pound	
	EAR	SR	EAR	SR	EAR	SR
1991	2,200	1,400	3,400	2,300	4,900	3,600
1992	2,200	1,300	3,400	2,300	4,900	3,500

[a]Values shown are the mean values for the distribution of estimates for each forward-cost category, rounded to the nearest 100 million pounds U_3O_8. 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: **1991-1992**—Estimates based on uranium resources data developed under the DOE National Uranium Resources Evaluation (NURE) program, 1974-1983, and updated annually since with new data on uranium resources developed by the U.S. Geological Survey (USGS). The 1992 estimates are from the internal report "Report on 1992 EAR and SR for Various Cost Categories," (USGS, June 15, 1993). The USGS resource estimation methodology is described in the U.S. Geological Survey Circular 994, *Uranium Resource Assessment by the Geological Survey: Methodology and Plan to Update the National Resource Ban* (1987).

Table 9. U.S. Uranium Reserves at the End of the Year, 1991-1992
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]		
	$30 per pound	$50 per pound	$100 per pound
1991	304	975	1,542
1992	295	959	1,523

[a]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. Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in these reserves estimates.

Sources: **1991-1992**—Estimated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Projects Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1991-1992).

mining methods is presented in Table 12 and Figure 5. Conventional underground mining continues to be the dominant method, accounting for about one-half of the total reserves in each cost category. In the $30-per-pound cost category, *in situ* leaching is the second largest mining method, and in the $50 and $100 categories openpit mining is the second largest method.

Mine Production of Uranium

Production from underground, openpit, and *in situ* leach mines during 1992 totaled 1.0 million pounds U_3O_8, a decline of 81 percent below the 5.2 million pounds produced during 1991 (Table 13). The decline in 1992 production was due in part to closings during the year of the last openpit mines in Texas and Wyoming. Production from *in situ* leach mines and from other production sources also declined in 1992 compared with like production in 1991.

The greater share of domestic mine production in 1992 came from old, established mining districts in the Colorado Plateau and in Texas and Wyoming (Table 14). Nebraska also was a major State in mine production of uranium in 1992. Figure 6 shows historical mine production of uranium for the years 1968 through 1992. Table 15 shows the number of mining sources operating each year from 1982 through 1992.

The quantities of uranium ore produced from openpit and underground mines and received at mills from producing mines and stockpiles for 1948 through 1992 are shown in Table 16. There were no shipments of uranium ore from underground mines to uranium mills during 1992, marking 1992 as the first year that such shipments were not made since 1948, when ore shipments were first recorded by the Atomic Energy Commission. The quantities for 1992 are withheld from Table 16 to prevent disclosure of company specific

Table 10. Changes in Reserves During 1992
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]		
	$30 per pound	$50 per pound	$100 per pound
Reserves at the End of 1991	304	975	1,542
Reevaluations of Reserves in 1992			
Additions	0	0	1
Subtractions	(6)	(12)	(15)
Depletion (Production and Erosion) in 1992	(3)	(4)	(5)
Reserves at the End of 1992[a]	295	959	1,523

[a]Does not include uranium reserves from byproducts recovery facilities. 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.

Note: Totals may not equal sum of components because of independent rounding. No reserves evaluations for new uranium properties are included in the estimates of U.S. reserves made during 1992.

Sources: Estimates by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration (EIA), based on U.S. Department of Energy, Grand Junction Projects Office data files and Form EIA-858, "Uranium Industry Annual Survey" (1992). See Appendix B for a description of the methodology used by the EIA for estimating uranium reserves.

Table 11. Distribution of Reserves by State at the End of 1992

Year	Forward-Cost Category in Nominal Dollars								
	$30 per pound			$50 per pound			$100 per pound		
	Million Tons Ore	Grade (Percent U_3O_8)	Million Pounds U_3O_8	Million Tons Ore	Grade (Percent U_3O_8)	Million Pounds U_3O_8	Million Tons Ore	Grade (Percent U_3O_8)	Million Pounds U_3O_8
New Mexico	15	0.277	84	112	0.157	350	301	0.098	588
Wyoming	45	0.129	117	250	0.079	394	628	0.050	626
Arizona, Colorado, Utah	8	0.304	47	46	0.135	123	96	0.088	169
Texas	7	0.103	15	25	0.070	35	66	0.042	55
Other States[a]	8	0.196	32	26	0.111	57	58	0.071	83
Total[b]	**84**	**0.176**	**295**	**457**	**0.105**	**959**	**1,449**	**0.066**	**1,523**

[a]Includes California, Idaho, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington.

[b]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.

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

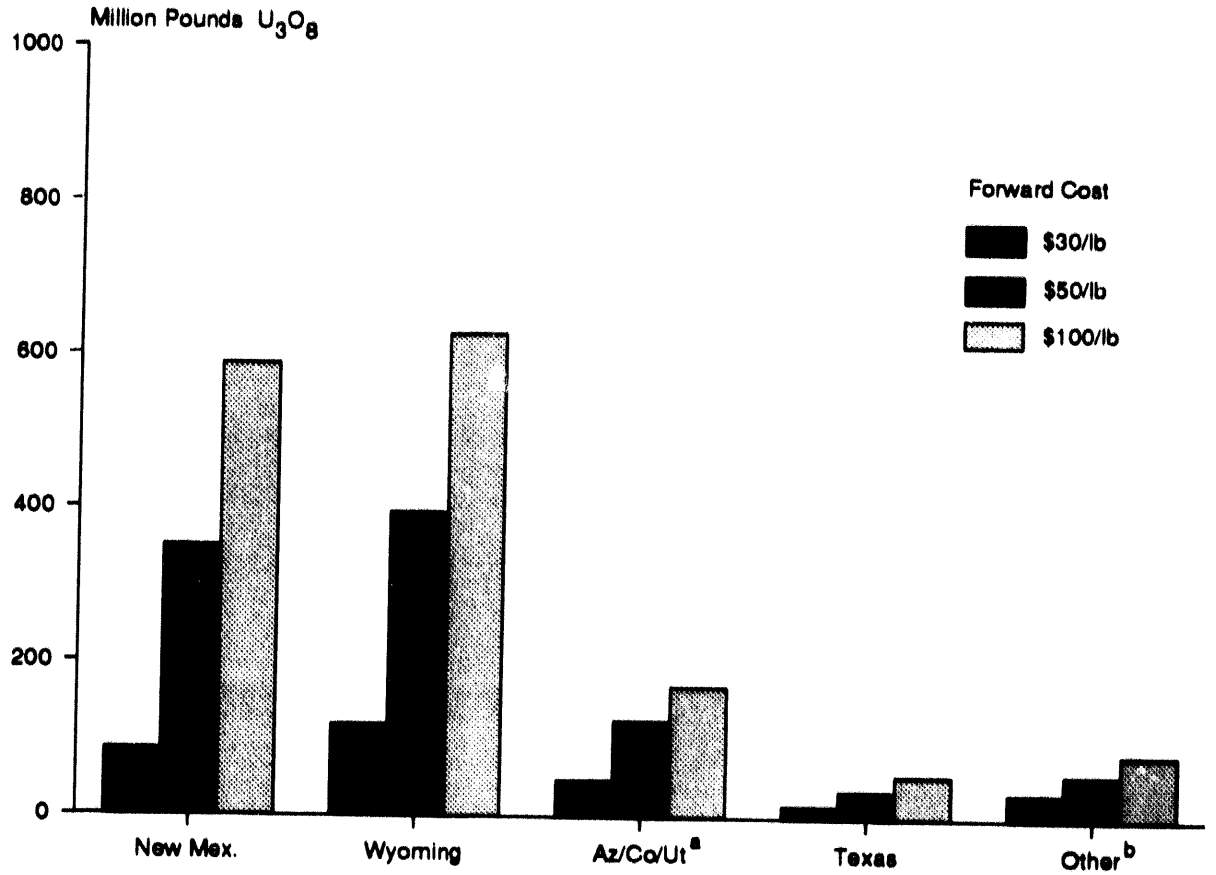
Sources: Estimates by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992). See Appendix B for a description of the methodology.

information. The table does not include data for *in situ* leach production or miscellaneous production from mine water, heap-leach solution, byproduct recovery, *in situ* leach well field restoration, or from low grade ore on old mine dumps.

Production of Uranium Concentrate

Total U.S. uranium concentrate (U_3O_8) production in 1992 declined by 29 percent from the 1991 level, primarily because of closures of production facilities in Texas and Wyoming. Wyoming produced the largest share of uranium concentrate in 1992 (Table 17). Florida and Louisiana (included in "Others" in Table 17) and Texas were also significant States in production of uranium concentrate in 1992. Compared with 1991 concentrate production, however, production in 1992 decreased in Texas by 56 percent and in Wyoming by 22 percent.

Figure 4. Reserves by State at the End of 1992



[a]Arizona, Colorado, and Utah.

[b]Includes California, Idaho, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington.

Note: Reserves values in forward-cost categories are cumulative; that is, the quantity at each level of forward cost includes all resources at the lower costs in that category.

Sources: Estimates by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 12. Distribution of Reserves by Mining Method at the End of 1992

Year	Forward-Cost Category in Nominal Dollars								
	$30 per pound			$50 per pound			$100 per pound		
	Million Tons Ore	Grade (Percent U_3O_8)	Million Pounds U_3O_8	Million Tons Ore	Grade (Percent U_3O_8)	Million Pounds U_3O_8	Million Tons Ore	Grade (Percent U_3O_8)	Million Pounds U_3O_8
Underground	27	0.276	150	148	0.162	479	405	0.098	793
Openpit	11	0.140	29	165	0.080	263	437	0.048	417
In Situ Leaching	46	0.126	115	129	0.078	201	283	0.052	293
Other[a]	<1	0.264	<1	15	0.050	15	23	0.044	20
Total[b]	84	0.176	295	457	0.105	959	1,149	0.066	1,523

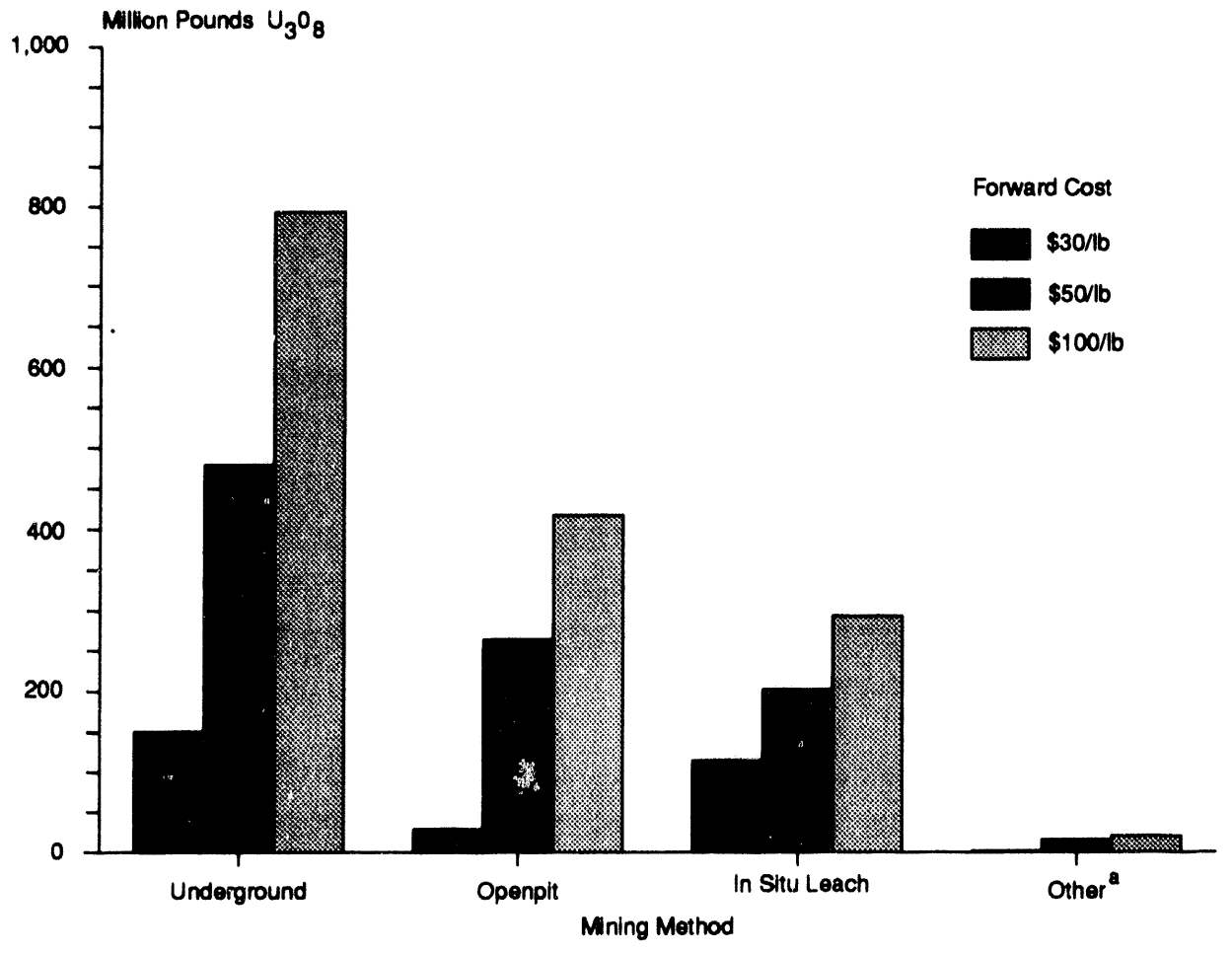
[a]Includes heap leach, mine water, and low grade stockpiles.

[b]Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in the resources shown 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.

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

Sources: Estimates by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992). See Appendix B for a description of the methodology.

Figure 5. Reserves by Mining Method at the End of 1992



[a]Includes heap leach, mine water, and low-grade stockpiles.

Note: Reserves values in forward-cost categories are cumulative; that is, the quantity at each level of forward cost includes all resources at the lower costs in that category.

Sources: Estimates by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on industry conferences, U.S. Department of Energy, Grand Junction Projects Office data files, and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Concentrate production in Texas and Wyoming in 1992 was from both conventional milling and *in situ* leaching operations. In New Mexico, production was from processing of mine water, and in Nebraska it was from *in situ* leaching. In Florida and Louisiana, uranium was recovered as a byproduct of phosphoric acid production.

Statistics on total U.S. uranium processing operations for uranium concentrate production from 1981 through 1992 are shown in Table 18. Between 1987 and 1992, production has ranged between 13.8 million pounds (1989) and 5.6 million pounds (1992).

Uranium concentrate production from conventional mills in 1992 was 1.4 million pounds U_3O_8—about 1.2 million pounds below the 1991 level (Table 18). Production from "Other Concentrate" sources (that is, not from mined ore) was 4.3 million pounds, about 1.1 million pounds less than in 1991, but the "Other" sources accounted for 76 percent of total production in 1992. In the period 1981 through 1992, the "Other" category has ranged between 6.5 (1981) and 4.2 (1990) million pounds U_3O_8. Since 1987, production from "other" sources has accounted for a steadily increasing share of total domestic production, as the number of operating conventional mills has steadily declined. The "Other"

Table 13. Mine Production of Uranium by Mining Method, 1978-1992

Mining Method	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Underground Mines															
Million Pounds U_3O_8	18.4	12.6	19.2	17.0	12.6	(a)	4.9	4.5	6.4	4.9	5.4	5.3	W	W	W
Percent of Total . . .	45.5	30.4	43.2	46.4	53.4	--	49.0	52.3	77.8	81.7	56.8	54.4	W	W	W
Openpit Mines															
Million Pounds U_3O_8	19.2	18.8	20.8	14.0	7.6	(a)	2.9	2.0	W	W	W	W	1.9	2.5	W
Percent of Total . . .	47.5	45.4	46.8	38.3	32.2	--	29.0	23.3	W	W	W	W	32.0	48.8	W
Other Methods[b]															
Million Pounds U_3O_8	2.8	10.0	4.4	5.6	3.4	4.9	2.2	2.1	1.8	1.1	4.1	4.4	4.0	2.7	1.0
Percent of Total . . .	6.9	24.2	9.9	15.3	14.4	20.9	22.0	24.4	22.2	18.3	43.2	45.6	68.0	51.2	100.0
Total Production															
Million Pounds U_3O_8	40.4	41.4	44.4	36.6	23.6	23.5	10.0	8.6	8.3	6.0	9.5	9.7	5.9	5.2	1.0
Percent Change from Prior Year	21.0	2.5	7.2	-17.6	-35.6	-0.4	-57.4	-14.0	-3.5	-27.7	58.3	2.1	-39.2	-11.8	-80.7

[a]For 1983, openpit plus underground mine production was 18.6 million pounds U_3O_8, or 79.1 percent.

[b]For 1978-1984, the "Other" category includes production from *in situ* leach, heap leach, mine water, and low-grade stockpiles. For 1985 the "Other" includes production from *in situ* leach, mine water, and water-treatment plant solutions. For 1986 through 1989, the "Other" includes production from openpit, *in situ* leach, heap leach, mine water, and water-treatment plant solutions. For 1990 and 1991, the "Other" includes production from underground, *in situ* leach, heap leach (1990), mine water, water treatment plant solutions (1990), and restoration. For 1992, the"Other" includes production from underground, openpit, and *in situ* leach mines and uranium bearing water from mine workings, tailings ponds, and restoration.

-- = Not applicable.

W = Withheld to avoid disclosure of company-specific data. The data are included in the total for "Other."

Notes: Totals may not equal sum of components because of independent rounding. Percentages were calculated using unrounded data.

Sources: **1978-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1983**—Estimated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1990**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

sources for 1992 include *in situ* leaching, byproduct, mine water, and tailings water. Annual uranium concentrate production for 1955 through 1992 is shown in Figure 7.

Uranium is also recovered in the United States as a byproduct of phosphoric acid production. Florida phosphate rock is the raw material used at plants in Florida and Louisiana to produce phosphoric acid. The byproduct uranium recovery industry began in the United States in 1977, and the annual share of domestic uranium concentrate derived from wet-process phosphoric acid production has been significant. Byproduct uranium concentrate production is not shown separately in Table 18 to avoid disclosure of proprietary data.

Shipments of U_3O_8 concentrate from domestic production facilities decreased to 6.9 million pounds in 1992 from 8.4 million pounds in 1991 (Table 18). Concentrate shipments reported in 1992 by producers, however, were approximately 1.2 million pounds above the total domestic U_3O_8 production for the year. This resulted in an overall decrease in concentrate inventories held at production facilities at the end of 1992. Annual shipments of concentrate from processing plants in 1989 through 1992 exceeded annual concentrate production for the same time period.

Uranium Processing Operations

At the end of 1992, U.S. conventional milling facilities consisted of six inactive mills with a combined rated capacity of 14,640 tons per day (Tables 19 and 20). None of the six mills were processing are at the end of 1992, although the mills were recovering uranium from mine water and/or tailings-pond water. The status of conventional mills at the end of each year from 1987 through 1992 is shown in Table 20. Using a 350-day operating year, the average daily mill feed during 1992 was 730 tons per day, which represented about 5 percent of the total available milling capacity at the 6 mills. At the end of 1992, two phosphate byproduct and four *in situ* leaching plants were in operation (Table 21).

The locations of conventional mills and non-conventional plants active or inactive as of the end of 1992 are shown in Figure 8.

Table 14. Mine Production of Uranium by State, 1968-1992
(Million Pounds U_3O_8)

Year	Colorado	New Mexico	Texas	Utah	Wyoming	Others[a]	Total
1968	2.9	12.9	1.2	1.8	6.3	0.6	25.7
1969	3.0	12.4	(b)	1.2	7.1	1.4	25.2
1970	3.1	12.1	(b)	1.7	6.8	2.4	26.1
1971	2.6	10.9	(b)	1.7	7.3	3.6	26.2
1972	2.0	11.4	(b)	1.6	9.1	3.5	27.7
1973	2.0	10.0	(b)	2.1	10.7	2.7	27.6
1974	(b)	10.8	(b)	(b)	8.0	6.4	25.2
1975	(b)	11.0	(b)	(b)	7.4	6.2	24.6
1976	(b)	13.0	(b)	(b)	8.8	6.2	28.0
1977	(b)	15.2	(b)	(b)	10.4	7.8	33.4
1978	(b)	18.8	(b)	(b)	11.0	10.6	40.4
1979	(b)	16.4	(b)	(b)	11.2	13.8	41.4
1980	(b)	16.4	7.0	(b)	12.8	8.2	44.4
1981	(b)	13.2	6.4	(b)	8.8	8.2	36.6
1982	(b)	7.6	4.4	(b)	5.4	6.2	23.6
1983	(b)	5.9	3.9	(b)	7.4	6.3	23.5
1984	W	3.0	2.7	W	1.9	2.4	10.0
1985	W	1.3	2.1	W	1.6	3.5	8.6
1986	W	1.6	1.5	W	W	5.2	8.3
1987	W	2.0	0.9	W	W	3.1	6.0
1988	W	W	2.2	W	2.0	5.3	9.5
1989	W	W	2.9	W	1.4	5.4	9.7
1990	W	W	2.0	W	1.3	2.5	5.9
1991	W	W	2.6	W	1.9	0.7	5.2
1992	W	W	0.3	W	0.2	0.5	1.0

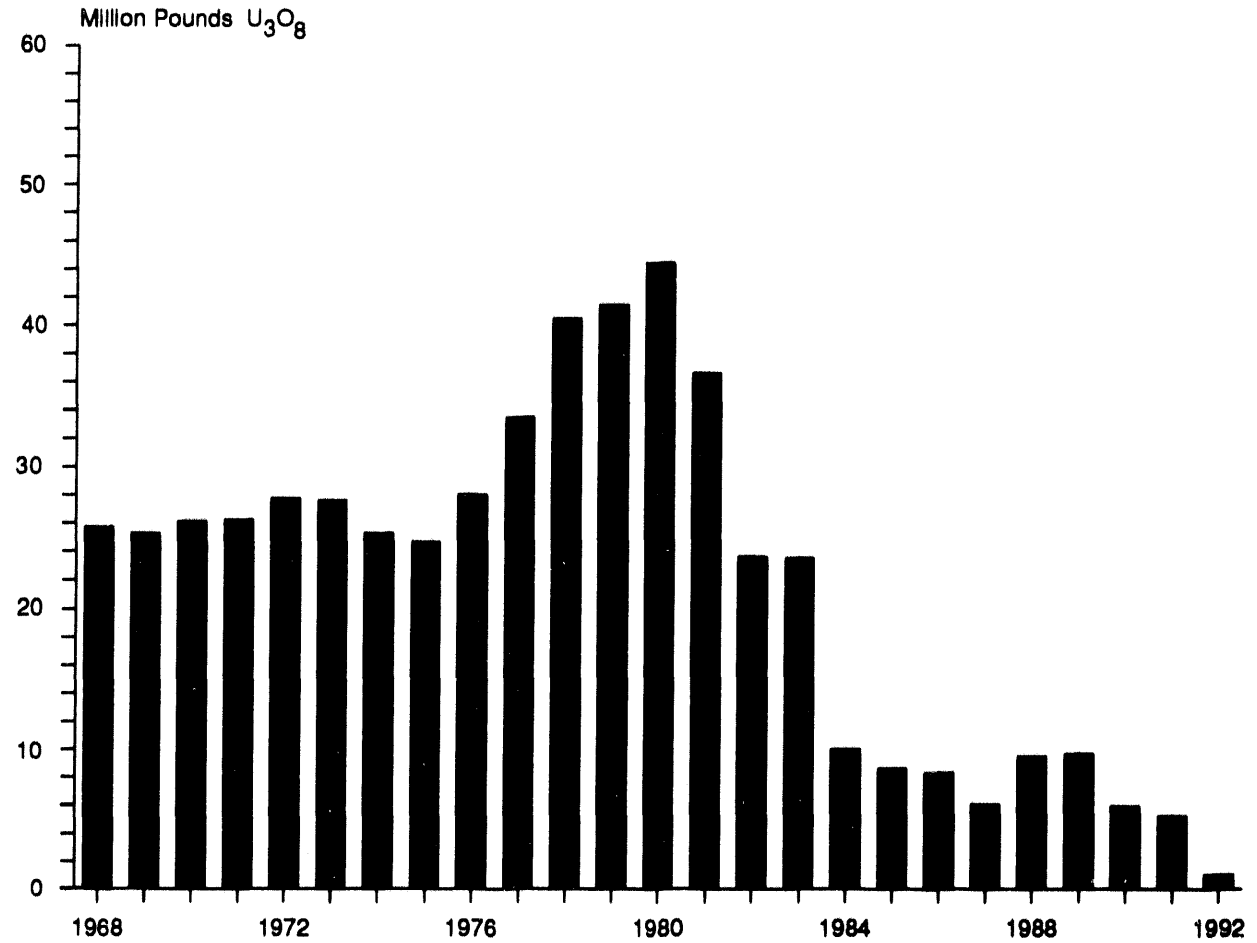
[a]Includes, for various years, Alaska, Arizona, Colorado, New Mexico, Nebraska, North Dakota, South Dakota, Texas, Utah, Washington, and Wyoming.
[b]Included in the "Others" category.
W = Withheld to avoid disclosure of company-specific data. The data are included in the total for "Others."
Notes: Totals may not equal sum of components because of independent rounding. Percentages were calculated using unrounded data.
Sources: **1968-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (1969-1983). **1983**—Estimated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Employment in the Uranium Raw Materials Industry

Employment in the U.S. uranium raw materials industry in 1992 was reported as 682 person-years expended, a decrease of 33 percent from the 1991 total (Table 22 and Figure 9). The employment level for exploration declined by 2 percent, for mining by 47 percent, for milling by 32 percent, and for processing by 22 percent. Except for 1988, employment in the raw materials sector has declined each year since 1979 when the industry employment was reported as 21,521 person years. The 1992 employment level in the raw materials sector is the lowest since before 1967.

Wyoming and Texas accounted for about 50 percent of the total employment in the industry for 1992 (Table 23, Figure 10). Colorado, Florida, Louisiana, Nebraska, and Utah also accounted for significant levels of employment in raw-materials-sector activities.

Figure 6. Total Mine Production, 1968-1992



Sources: **1968-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (1969-1983). **1983**—Estimated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 15. Number of Uranium Mining Sources Operating During the Year, 1982-1992

Item	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Underground	139	94	19	13	13	19	17	19	27	6	4
Openpit	24	16	8	6	4	2	4	2	2	2	1
In Situ Leaching	18	10	14	10	12	15	11	9	7	6	4
Others (Heap Leach, Mine Water Mill Tailings, Well Field Restoration and Low-Grade Stockpiles	10	7	1	5	2	1	0	2	3	1	8
Total	**191**	**127**	**42**	**34**	**31**	**37**	**32**	**32**	**39**	**15**	**17**

Note: Table does not include byproduct sources.

Sources: **1982-1983**—U.S. Department of Energy, Grand Junction Projects Office, *Production Data File*. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**-Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 16. Uranium Ore Produced from Mines and Received at Mills, 1948-1992

Year	Openpit Mines		Underground Mines		Total Receipts		
	Thousand Tons of Ore	Million Pounds U_3O_8	Thousand Tons of Ore	Million Pounds U_3O_8	Thousand Tons of Ore	Million Pounds U_3O_8	Percent Change from Prior Year
1948	(a)	(b)	38	0.2	38	0.2	--
1949	1	(b)	172	1.0	173	1.0	400.0
1950	23	0.2	228	1.4	251	1.6	60.0
1951	28	0.4	319	1.8	347	2.2	37.5
1952	65	0.6	370	2.0	435	2.6	18.2
1953	179	1.2	555	3.4	734	4.6	76.9
1954	266	1.8	840	5.2	1,106	7.0	52.2
1955	374	1.6	1,150	7.2	1,524	8.8	25.7
1956	1,247	6.4	1,758	10.4	3,005	16.8	90.9
1957	1,613	6.8	2,082	12.8	3,695	19.6	16.7
1958	2,358	10.8	2,820	17.2	5,178	28.0	42.9
1959	2,206	8.8	4,792	26.0	6,935	34.8	24.3
1960	2,393	10.6	5,577	27.0	7,970	37.6	8.0
1961	2,482	10.6	5,559	26.4	8,041	37.0	-1.6
1962	1,782	8.6	5,271	25.6	7,053	34.2	-7.6
1963	1,879	8.8	4,069	20.6	5,948	29.4	-14.0
1964	1,537	6.8	3,760	21.0	5,297	27.8	-5.4
1965	1,243	6.0	3,133	14.8	4,376	20.8	-25.2
1966	1,333	6.2	2,996	13.6	4,329	19.8	-4.8
1967	1,593	6.4	3,697	15.0	5,272	21.4	8.1
1968	2,366	9.2	4,082	16.0	6,448	25.2	17.8
1969	2,173	10.4	3,731	14.2	5,904	24.6	-2.4
1970	2,801	11.8	3,523	13.8	6,324	25.6	4.1
1971	3,284	14.0	2,995	11.8	6,279	25.8	0.8
1972	3,887	16.2	2,531	11.2	6,418	27.4	6.2
1973	4,544	17.2	1,993	10.0	6,537	27.2	-0.7
1974	4,216	14.6	2,811	10.2	7,027	24.8	-8.8
1975	4,247	13.4	2,810	10.6	7,057	24.0	-3.2
1976	4,673	13.6	3,935	13.4	8,608	27.0	12.5
1977	5,578	15.2	4,747	16.6	10,325	31.8	17.8
1978	8,237	19.2	6,105	18.4	14,342	37.6	18.2
1979	9,655	18.8	5,356	12.6	15,011	31.4	-16.5
1980	10,394	20.8	6,351	19.2	16,745	40.0	27.4
1981	8,436	14.0	5,229	17.2	13,665	31.2	-22.0
1982	5,504	7.8	2,809	12.4	8,313	20.2	-35.3
1983	(c)	(c)	(c)	(c)	7,400	18.6	-7.9
1984	1,968	2.9	1,027	4.9	2,995	7.7	-58.6
1985	936	2.0	570	4.3	1,506	6.3	-18.2
1986	139	0.2	661	6.4	801	6.7	5.7
1987	W	W	W	W	642	4.9	-26.9
1988	W	W	W	W	1,260	7.7	57.1
1989	W	W	W	W	1,022	7.1	-7.8
1990	W	W	W	W	722	4.2	-40.8
1991	W	W	W	W	639	2.5	-40.5
1992	W	W	0	0	W	W	--

[a]Value is less than 1,000 tons.
[b]Value is less than 0.2 million pounds.
[c]For 1983, only total mine production data were reported.
W = Withheld to avoid disclosure of individual company data. The data are included in the Total Receipts for 1948 through 1991.
-- = Not applicable.

Note: Mined ore does not include production from mine water, *in situ* leach, heap leach solutions, byproducts, or miscellaneous low-grade ore from old mine dumps.

Sources: **1948-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1983**—Calculated by staff of the Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 17. Uranium Concentrate Production by State, 1947-1992

(Million Pounds U_3O_8)

Year(s)	State						Total	Cumulative Total
	Colorado	New Mexico	Texas	Utah	Wyoming	Others[a]		
1947-1965	59.304	108.602	(b)	57.848	36.898	16.760	279.412	279.412
1966	2.846	10.152	(b)	(c)	4.496	3.684	21.178	300.590
1967	2.680	11.866	(b)	(c)	5.334	2.626	22.506	323.096
1968	3.228	12.384	(b)	(c)	5.746	3.378	24.736	347.832
1969	3.356	11.886	(b)	(c)	6.126	1.850	23.218	371.050
1970	(c)	11.542	(b)	(c)	7.308	6.960	25.810	396.860
1971	(c)	10.610	(b)	(c)	6.974	6.962	25.546	421.406
1972	(c)	10.928	(b)	(c)	8.432	6.440	25.800	447.206
1973	(c)	9.268	(b)	(c)	10.318	6.884	26.470	473.676
1974	(c)	9.902	(b)	(c)	7.534	5.620	23.056	496.732
1975	(c)	10.382	(c)	(c)	6.894	5.924	23.200	519.932
1976	(c)	12.118	(c)	(c)	8.092	5.284	25.494	545.426
1977	(c)	13.558	(c)	(c)	9.980	6.340	29.878	575.304
1978	(c)	17.078	(c)	(c)	10.658	9.236	36.972	612.276
1979	(c)	14.846	5.302	(c)	10.904	6.420	37.472	649.748
1980	(c)	15.502	6.816	(c)	12.072	9.314	43.704	693.452
1981	(c)	12.412	6.282	(c)	8.170	11.070	38.474	731.926
1982	(c)	7.812	4.262	(c)	5.042	9.752	26.868	758.794
1983	W	5.660	3.200	W	5.260	7.038	21.158	779.952
1984	W	2.916	2.620	W	3.120	6.226	[d]14.882	794.834
1985	W	1.387	2.167	W	2.427	5.333	[d]11.314	806.148
1986	W	0.751	2.586	W	0.633	9.536	[d]13.506	819.654
1987	W	0.700	2.716	W	0.567	9.008	[d]12.991	832.645
1988	W	W	2.805	W	2.007	8.318	13.130	845.775
1989	0	W	2.939	W	1.607	9.291	13.837	859.612
1990	0	W	1.832	W	1.368	5.685	8.885	868.497
1991	0	W	2.343	0	2.035	3.574	7.952	876.449
1992	0	W	1.032	0	1.589	3.024	5.645	882.094

[a]Includes, for various years, Arizona, Colorado, Florida, Louisiana, Nebraska, New Mexico, South Dakota, Texas, Utah, and Washington.
[b]Data were not collected.
[c]Included in the "Others" category.
[d]Total does not include uranium concentrate production from pilot projects or other research project sources.
W = Withheld to avoid disclosure of individual company data. The data are included in the total for "Others."

Sources: **1947-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1983**—Estimated by staff of the Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 18. Uranium Processing Operations, 1981-1992

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Ore Fed to Process[a]												
Thousand Tons of Ore	14,546	8,751	5,925	4,316	1,795	1,308	1,441	1,214	1,235	722	639	256
Percent U_3O_8 (weighted average grade)	0.115	0.119	0.128	0.112	0.161	0.336	0.264	0.288	0.323	0.293	0.198	0.229
Million Pounds U_3O_8	33.384	20.761	15.180	9.631	5.785	8.783	8.191	6.998	7.977	4.227	2.529	1.171
Other Mill Feed[b]												
(million pounds U_3O_8)	0.678	0.654	0.573	0.536	0.750	0.260	0.474	0.507	0.429	0.485	0.179	0.181
Total Mill Feed												
(million pounds U_3O_8)	34.062	21.416	15.752	10.168	6.535	9.043	8.664	7.505	8.406	4.712	2.708	1.353
Change in-Process Inventory												
(million pounds U_3O_8)	0.007	-0.287	-0.280	0.048	0.206	-0.064	-0.210	0.136	-0.234	-0.244	-0.122	-0.025
Production (million pounds U_3O_8)												
Theoretical Production at 100-Percent Recovery	34.055	21.702	16.032	10.119	6.329	9.107	8.874	7.369	8.640	4.956	2.830	1.377
Conventional Concentrate Production	31.996	20.893	15.519	9.626	6.084	8.853	8.536	7.034	8.175	4.649	2.608	1.359
U_3O_8 Tailings Less Unaccountables	2.059	0.809	0.514	0.493	0.245	0.254	0.338	0.335	0.465	0.309	0.222	0.018
Recovery From Mill Feed (percent)	94.0	96.3	96.8	95.1	96.1	97.2	96.2	95.5	94.6	93.8	92.2	98.7
Other Concentrate Production[c]	6.477	5.975	5.639	5.256	5.230	4.653	4.455	6.096	5.062	4.237	5.344	4.286
Total Concentrate Production	38.474	26.868	21.158	[d]14.882	[d]11.314	[d]13.506	[d]12.991	13.130	13.637	8.885	7.952	5.645
Concentrate Shipments (million pounds U_3O_8)	35.148	26.480	19.755	15.485	11.760	10.641	11.558	12.791	14.808	12.957	8.437	6.853

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

[b]Includes uranium recovered from low-grade ore, mine water, tailings water, and heap leaching, except as footnoted below.

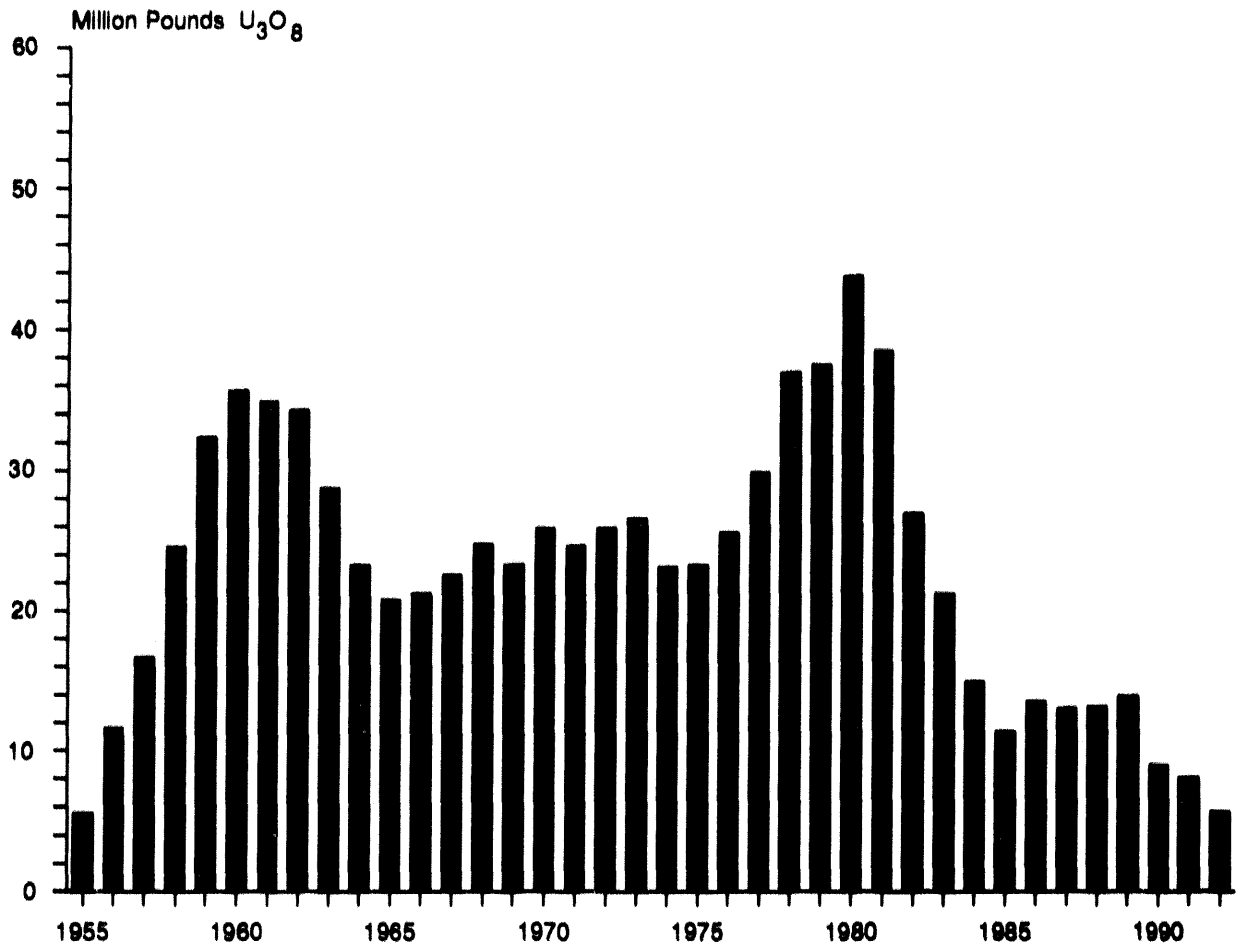
[c]U_3O_8 concentrate production from *in situ* leaching and as a byproduct of other processing. The totals for 1986, and following years include U_3O_8 recovered from reclamation and mine water at some mills that did not report processing of uranium ore for that year.

[d]Total does not include uranium concentrate production from pilot projects or other research project sources.

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

Sources: **1980-1983**—Calculated by staff of the Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 7. Production of Uranium Concentrate, 1955-1992



Source: **1955-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1983**—Estimated by staff of the Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 19. Operating Status of Conventional Uranium Mills at the End of the Year, 1987-1992

Mill Owner	Location	1992 Milling Capacity[a] (short tons of ore per day)	Operating Status at the End of the Year[b]					
			1987	1988	1989	1990	1991	1992
American Nuclear	Gas Hills, WY	(950)	I	D	D	D	D	D
Atlas Minerals	Moab, UT	(1,400)	I	D	D	D	D	D
Cotter	Canon City, CO	1,200	[c]I	I	I	I	I	I
Dawn Mining	Ford, WA	450	I	I	I	I	I	I
Homestake Mining	Grants, NM	(3,400)	O	O	O	I	D	D
Green Mountain Mining Venture	Red Desert, WY	3,000	I	I	I	I	I	I
Pathfinder Mines	Gas Hills, WY	(2,800)	O	I	I	I	P	D
Pathfinder Mines	Shirley Basin, WY	(1,800)	O	[c]I	[c]I	O	O	D
Plateau Resources	Ticaboo, UT	1,000	I	I	I	I	I	I
Rio Algom Mining	Grants, NM	7,000	I	I	I	I	I	I
Rio Algom Mining	La Sal, UT	(750)	O	[c]I	I	I	I	P
Rio Grande Resources	Panna Maria, TX	([d]3,000)	O	O	O	O	O	D
Umetco Minerals/ Energy Fuels Nuclear	Blanding, UT	2,000	O	O	O	[c]I	I	I
Umetco Minerals	Natrona, WY	(1,300)	I	I	I	I	D	D
Umetco Minerals	Uravan, CO	(1,400)	I	I	I	I	P	P
Western Nuclear	Jeffrey City, WY	(1,700)	I	D	D	D	D	D
Western Nuclear	Wellpinit, WA	(2,000)	I	I	I	I	P	P

[a]Milling capacity based on historical data and data reported on Form EIA-858 for 1992. Parentheses indicate mills that have been decommissioned or that were permanently closed as of the end of 1992.

[b]O, Operating throughout the year; I, Inactive at the end of the year; P, Permanently closed as of the end of 1992; D, Decommissioning: Restoration begun or completed.

[c]Inactive at the end of the year but produced during one or more months of the period.

[d]Capacity for years 1987-1990 was reported as 2,500 tons per day.

Sources: **1987-1988**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1991**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1991). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 20. Status of Conventional Uranium Mills at the End of the Year, 1987-1992

Item	1987	1988	1989	1990	1991	1992
Number of Mills						
Operating	6	3	3	2	2	0
Not Operating	11	11	11	12	7	6
Total	17	14	14	14	9	6
Milling Capacity (tons of ore per day)						
Operating	13,250	7,900	7,900	4,300	4,800	0
Not Operating	21,400	22,700	22,700	26,300	15,400	14,650
Total	34,650	30,600	30,600	30,600	20,200	14,650
Average Daily Mill Feed (tons of ore per day)[a]	4,120	3,470	3,530	2,060	R1,830	730
Operating Level As Percent of Total Milling Capacity[b]	12	11	12	7	10	5

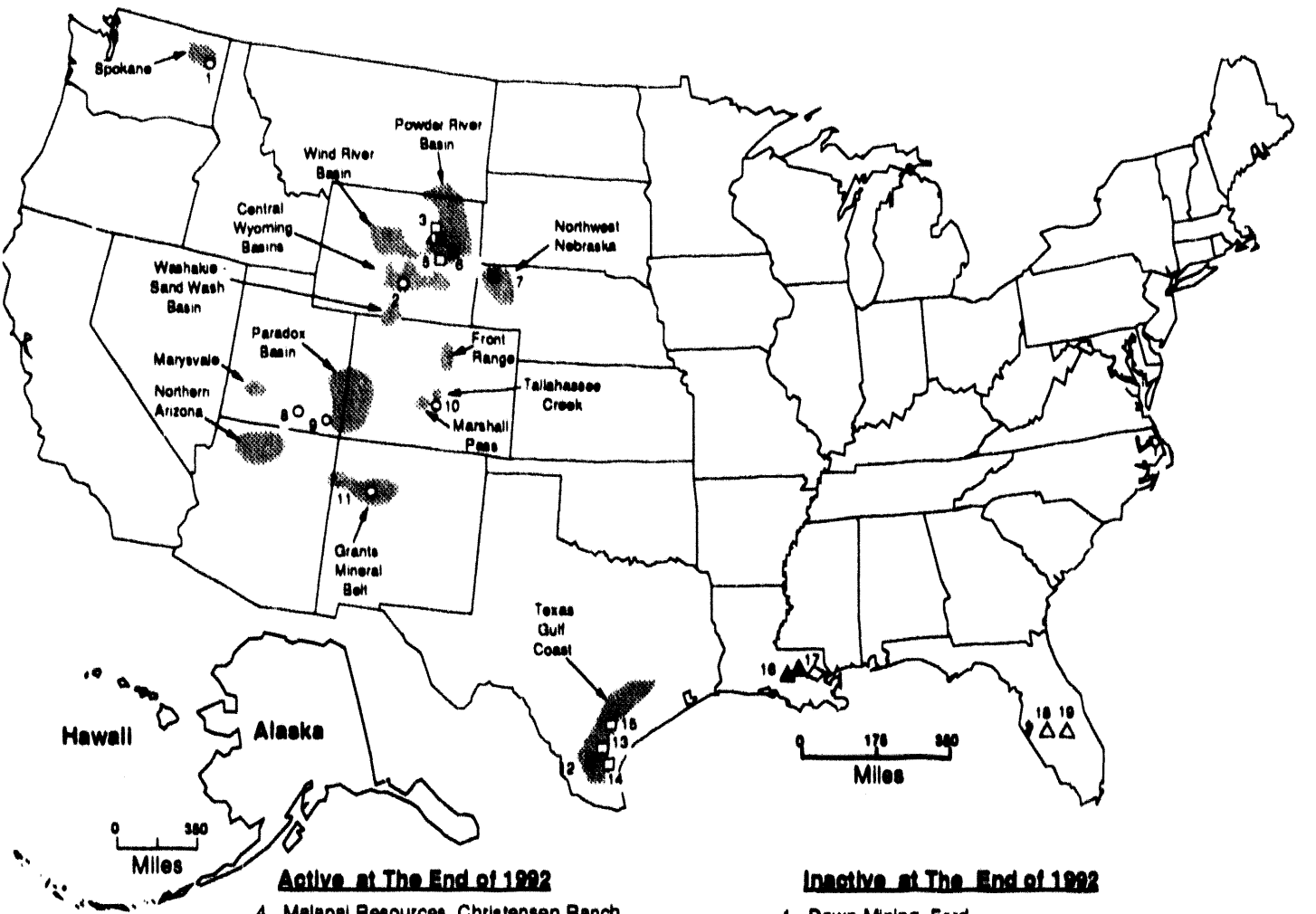
[a]Rounded value. Based on 350 workdays per year and total ore fed to process during the year shown in Table 18.
[b]Rounded value. Calculated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on ore fed to process (Table 18) during 350 workdays per year.
R = Revised.
Sources: **1987-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 21. Status of Nonconventional Uranium Plants at the End of the Year, 1992

Plant Owner	Plant/Location	Plant Type	Operating Status at the End of the Year[a]
Power Resources, Inc.	Highland, WY	*In Situ* Leach	O
Everest Minerals	Hobson, TX	*In Situ* Leach	I
Ferret Exploration of Nebraska	Crow Butte, NE	*In Situ* Leach	O
Freeport Uranium Recovery Company	Sunshine Bridge, LA	Phosphate Byproduct	O
Freeport Uranium Recovery Company	Uncle Sam, LA	Phosphate Byproduct	O
IMC Fertilizer, Inc.	Plant City, FL	Phosphate Byproduct	I
IMC Fertilizer, Inc.	New Wales, FL	Phosphate Byproduct	I
Malapai Resources	Christensen Ranch, WY	*In Situ* Leach	O
Malapai Resources	Holiday-El Mesquite, TX	*In Situ* Leach	O
Malapai Resources	Irigaray, WY	*In Situ* Leach	[b]I
Rio Algom Mining Company	Bill Smith, WY	*In Situ* Leach	I
Uranium Resources, Inc.	Kingsville Dome, TX	*In Situ* Leach	I
Uranium Resources, Inc.	Rosita, TX	*In Situ* Leach	I

[a]O = Operating at the end of the year; I = Inactive at the end of the year.
[b]In restoration.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 8. Major Uranium Reserve Areas and Status of Mills and Plants, December 31, 1992



Active at The End of 1992

4. Malapai Resources, Christensen Ranch
6. Power Resources, Highland
7. Ferret Exploration of Nebraska, Crow Butte
12. Malapai Resources, Holiday-El Mesquite
16. Freeport Uranium Recovery , Sunshine Bridge
17. Freeport Uranium Recovery, Uncle Sam

Inactive at The End of 1992

1. Dawn Mining, Ford
2. Green Mountain Mining Venture, Red Desert
3. Malapai Resources, Irigaray
5. Rio Algom Mining, Bill Smith
8. Plateau Resources, Ticaboo
9. Umetco Minerals / Energy Fuels Nuclear, Blanding
10. Cotter Corp., Canon City
11. Rio Algom Mining, Grants
13. Uranium Resources, Rosita
14. Uranium Resources, Kingsville Dome
15. Everest Minerals, Hobson
18. IMC Fertilizer, Inc., Plant City
19. IMC Fertilizer, Inc., New Wales

Uranium Production Centers

Active	Inactive	
●	○	Conventional Mill
■	□	In Situ Leach Plant
▲	△	Byproduct From Phosphate Processing
		Major Uranium Reserve Areas[a]

[a] Major areas containing reasonably assured resources at $50-per-pound U or less.

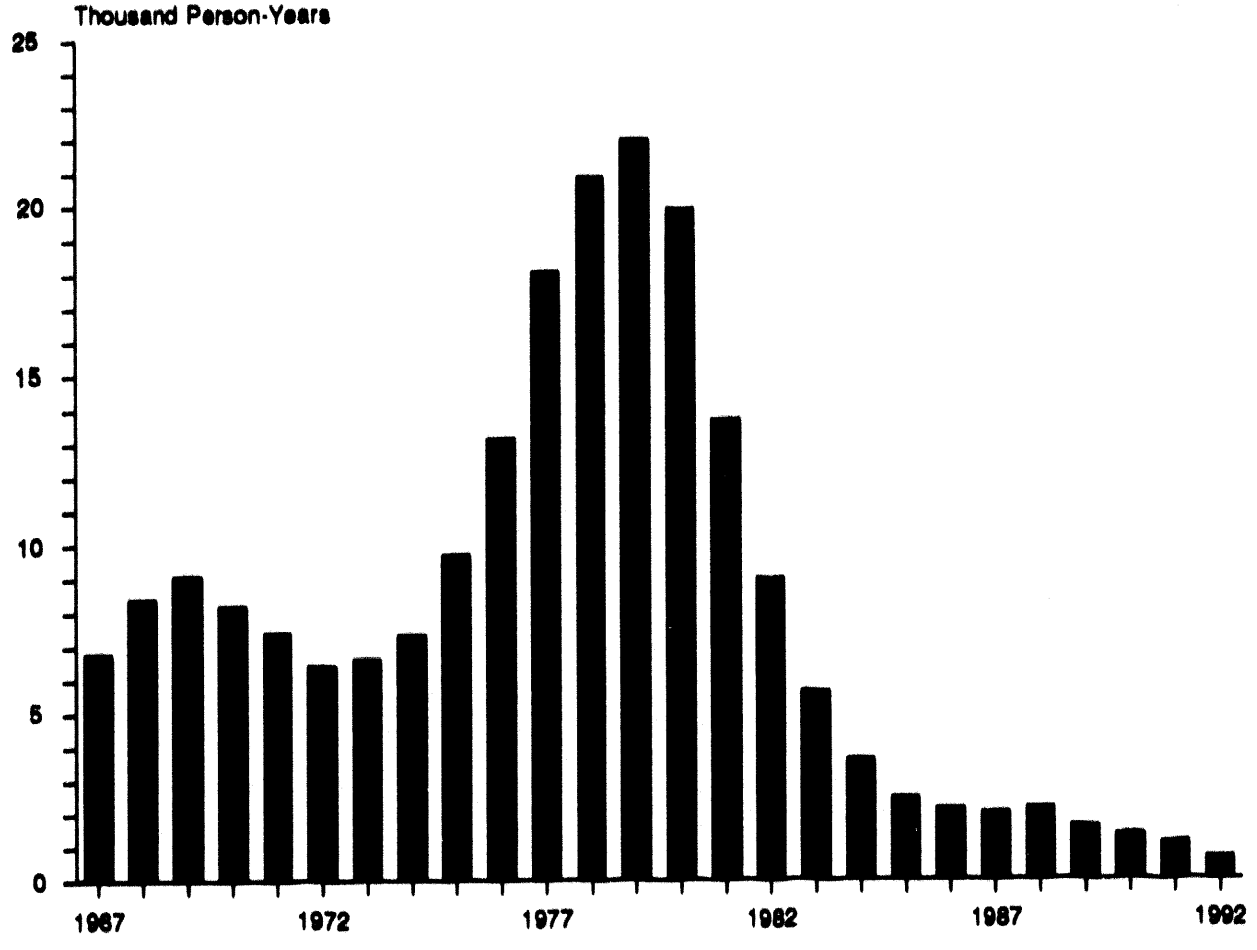
Sources: Based on U.S. Department of Energy, Grand Junction Project Office (GJPO), *National Uranium Resource Evaluation, Interim Report* (June 1979) Figure 3.2; GJPO data files; Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992); and site visits by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels.

Table 22. Employment in the U.S. Uranium Industry, 1967-1992
(Person-Years Expended)

Year	Exploration	Mining	Milling	Processing	Total	Percent Change from Prior Year
1967	1,291	3,798	1,662	NA	6,751	--
1968	2,198	4,440	1,717	NA	8,355	23.8
1969	2,632	4,702	1,725	NA	9,059	8.4
1970	2,059	4,428	1,678	NA	8,165	-9.9
1971	1,506	4,218	1,649	NA	7,373	-9.7
1972	1,152	3,721	1,530	NA	6,403	-13.2
1973	1,557	3,516	1,522	NA	6,595	3.0
1974	1,697	3,928	1,668	NA	7,293	10.6
1975	2,049	5,386	2,237	NA	9,672	32.6
1976	2,793	7,092	2,727	511	13,123	35.7
1977	4,140	10,615	2,448	838	18,041	37.5
1978	4,449	12,071	3,053	1,267	20,840	15.5
1979	4,066	12,755	3,236	1,464	21,521	3.3
1980	3,370	11,768	3,251	1,530	19,919	-7.4
1981	2,300	7,473	2,367	1,536	13,676	-31.3
1982	769	5,057	1,956	1,185	8,967	-34.4
1983	374	2,794	1,518	929	5,615	-37.4
1984	235	1,675	987	700	3,597	-35.9
1985	163	1,212	514	557	2,446	-32.0
1986	162	954	513	490	2,120	-13.3
1987	183	819	432	568	2,002	-5.6
1988	144	849	572	576	2,141	6.9
1989	86	659	367	471	1,583	-26.1
1990	73	664	304	293	1,335	-15.7
1991	52	411	191	361	1,016	-23.9
1992	51	219	129	283	682	-32.9

-- = Not applicable.
NA = Not available.
Notes: Totals may not equal sum of components because of independent rounding.
Sources: **1967-1992, Except 1982 Exploration**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1993). **1982 Exploration**—Energy Information Administration, *1982 Survey of U.S. Uranium Exploration Activity* (August 1983). **1983 Exploration**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1983 Mining, Milling, and Processing**—Energy Information Administration, *Survey of United States Uranium Marketing Activity* (August 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 9. Employment in the Uranium Industry, 1967-1992



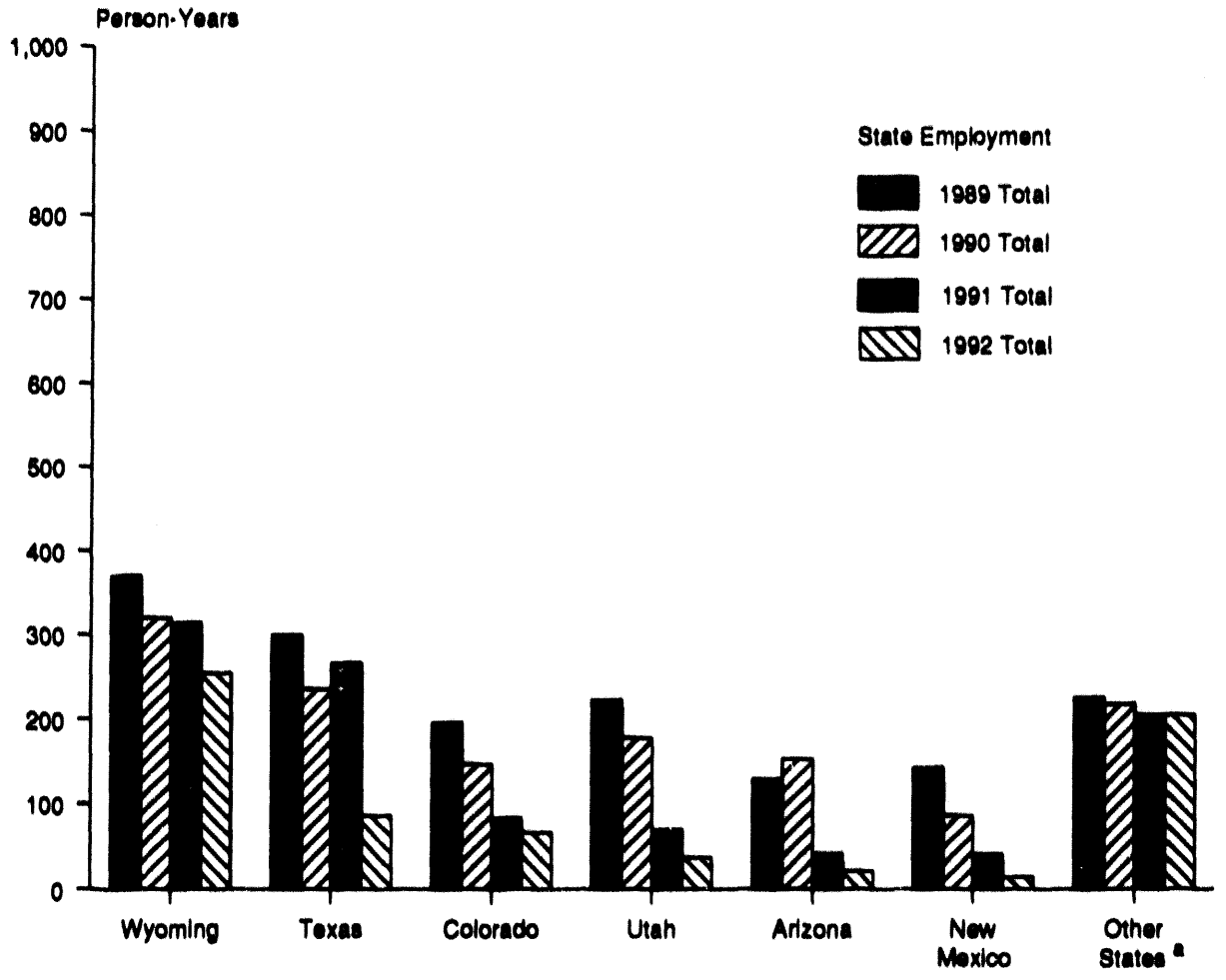
Sources: **1967-1982, Except 1982 Exploration**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1982 Exploration**—Energy Information Administration, *1982 Survey of U.S. Uranium Exploration Activity* (August 1983). **1983 Exploration**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1983 Mining, Milling, and Processing**—Energy Information Administration, *Survey of United States Uranium Marketing Activity* (August 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 23. Employment in the U.S. Uranium Industry by State, 1992
(Person-Years Expended)

State	Total	Percent of Total
Wyoming	254	37.2
Texas	86	12.6
Colorado	65	9.5
Utah	36	5.3
Arizona	21	3.1
New Mexico	14	2.1
Others[a]	206	30.2
Total	682	100.0

[a]Includes Florida, Louisiana, Nebraska, Nevada, Washington.
Note: Totals may not equal sum of components because of independent rounding.
Sources: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 10. Employment in the Uranium Industry by State, 1989-1992



[a]1989-1990—Florida, Louisiana, Nebraska, Oregon, Virginia and Washington; 1991-1992—Florida, Louisiana, Nebraska, Nevada, and Washington.

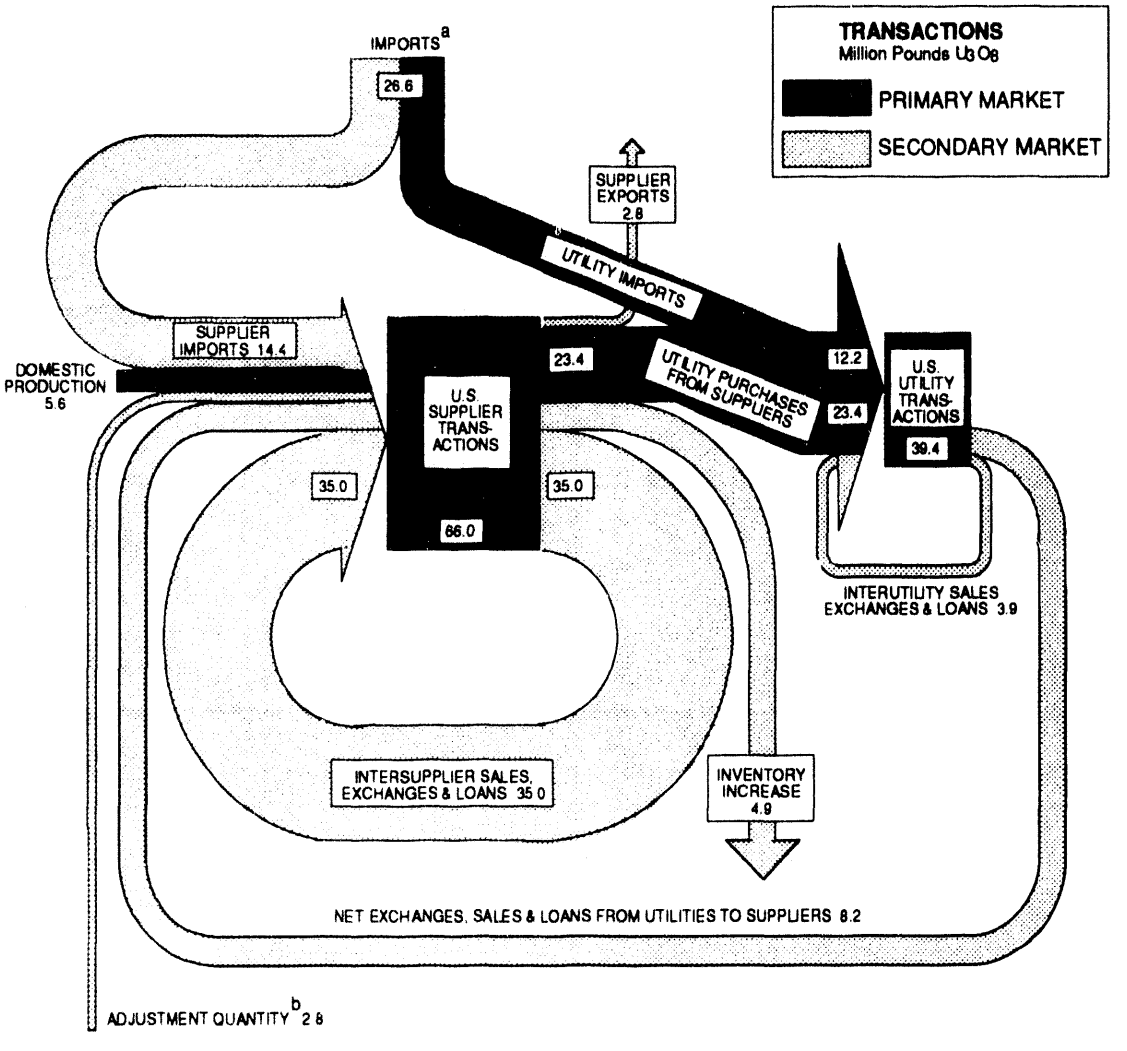
Sources: 1989-1991: Energy Information Administration, *Uranium Industry Annual 1991* (1986-1991). 1992: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

2. Uranium Marketing Activities

Introduction

This chapter contains information on uranium marketing activities, including the quantity of uranium delivered under purchase contracts in 1992 and expected to be delivered in 1993 and beyond, uranium prices, feed deliveries to domestic and foreign enrichment suppliers, uranium inventories, secondary market transactions, and uranium available for sale by domestic suppliers and utilities for 1993 through 2002. In Figure 11, movement of both natural and enriched uranium materials in the primary and secondary markets

Figure 11. Uranium Marketing Activity During 1992



[a]Includes imported uranium from purchases and net inflows from exchanges and loan transactions.

[b]The adjustment quantity represents an amount of uranium needed to make the inputs and outputs equal.

Notes: See Table 18 for Domestic Production. See Table 24 for Utility Purchases From Suppliers. See Table 30 for Utility Imports and Supplier Imports/Exports. See Table 40 for Supplier Inventory Increase. See "Secondary Market Activities," p. 61, for Net Exchanges, Sales & Loans From Utilities to Suppliers; and Intersupplier/Interutility Sales, Exchanges & Loans.

Sources: Prepared by the staff of the Survey Management Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on data reported on Form EIA-858 for 1992.

is shown. This figure illustrates for 1992 the normal market mechanisms used by domestic utilities and suppliers to procure and dispose of uranium. The numbers indicate the totals in million pounds of uranium for each type of transaction.

In 1992, domestic suppliers[2] obtained uranium from a number of sources. Most of the uranium sold by domestic suppliers (as a group) in 1992 came from foreign production facilities. Imports under purchase-contracts as well as loan- and exchange-contracts and custody storages have become important factors in the U.S. uranium market in recent years. Exports to foreign utilities by domestic suppliers and utilities exceeded imports from 1967 through 1974 and again from 1978 through 1980. From 1975 through 1977 and since 1981, imports have exceeded exports, and this trend is expected to continue (Table 30). Nevertheless, U.S. utilities' requirements continued in 1992 to be filled with uranium from domestic suppliers, although 64 percent of the uranium delivered was of foreign origin (Table 26).

Domestic Purchase Commitments by Utilities

The annual delivery commitments to domestic utilities from domestic uranium suppliers are listed in Table 24. Actual deliveries in 1992 were 23.4 million pounds U_3O_8, 12.3 million pounds more than the expected deliveries for contracts in place at the beginning of 1992. Low spot-market prices for uranium during 1992 appear to be a contributing factor for this increase. Projected cumulative deliveries reported from current contracts for the years beyond 1992 are 77.5 million pounds, up from the 64.9 million pounds reported for 1991. For the period 1993 and beyond, firm delivery commitments were increased by 19.1 million pounds and optional deliveries were increased by 4.6 million pounds, bringing the total increase in delivery commitments to 23.7 million pounds U_3O_8 for the period 1993 and later.

The number of new contracts signed each year from 1982 through 1992 by U.S. utilities for purchases from domestic suppliers is shown in Table 25. Utilities signed 53 uranium procurement contracts with domestic suppliers in 1992—40 short-term contracts and 13 long-term contracts (Table 25). The total amount of uranium represented by these new contracts was 23.3 million pounds U_3O_8, of which 13.9 million pounds were long-term contracts and the remaining 9.4 million pounds will be delivered under short-term contracts.

Of the total uranium delivered to U.S. utilities from domestic suppliers in 1992, 7.9 million pounds were of

Table 24. Commitments for Delivery of Uranium from Domestic Suppliers to U.S. Utilities, 1992-2000 and Later
(Million Pounds U_3O_8 Equivalent)

	As of December 31, 1991				As of December 31, 1992				Change in Total from December 31, 1991 to December 31, 1992	
Year of Delivery	Firm	Optional	Total	Cumulative	Firm	Optional	Total	Cumulative	Total	Cumulative
1992	10.4	0.7	11.1	11.1	23.4	0	23.4	23.4	12.3	12.3
1993	11.0	1.3	12.3	23.3	17.1	0.8	17.9	41.3	5.6	18.0
1994	8.3	1.2	9.6	32.9	13.3	3.1	16.4	57.7	6.8	24.8
1995	8.2	2.1	10.3	43.2	13.0	3.4	16.4	74.1	6.1	30.9
1996	5.8	1.7	7.5	50.7	6.2	3.3	9.5	83.6	2.0	32.9
1997	5.2	1.1	6.2	56.9	4.5	1.6	6.1	89.7	-0.1	32.8
1998	2.3	1.3	3.6	60.5	3.0	1.4	4.4	94.2	0.9	33.7
1999	1.3	0.7	2.0	62.5	1.7	0.6	2.3	96.4	0.3	33.9
2000 and Later	1.9	0.5	2.4	64.9	4.1	0.3	4.4	100.8	2.0	36.0
Total	**54.3**	**10.6**	**64.9**	--	**86.3**	**14.5**	**100.8**	--	--	--

[a]Actual deliveries.
-- = 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" (1992).

[2]In this report, "domestic suppliers" are domestic companies (including U.S. subsidiaries of foreign companies) that sell uranium and are not U.S. electric utility companies. This includes uranium producers and agents. See the Glossary for a definition of "domestic uranium industry."

Table 25. New Contracts Signed by U.S. Utilities for Purchases from Domestic Suppliers, 1982-1992

Year of Signing	Short-Term Contracts[a]		Long-Term Contracts[b]		Total	
	Number of Contracts	Million Pounds U_3O_8	Number of Contracts	Million Pounds U_3O_8	Number of Contracts	Million Pounds U_3O_8
1982	7	0.5	7	9.1	14	9.6
1983	16	2.7	5	15.5	21	18.2
1984	12	W	2	W	14	6.5
1985	32	4.8	3	3.4	35	8.2
1986	19	5.4	6	8.9	25	14.3
1987	36	5.6	12	19.7	48	25.3
1988	26	4.1	7	11.1	33	15.2
1989	37	6.9	8	11.0	45	17.9
1990	38	12.0	11	15.4	49	27.4
1991	50	9.9	4	2.7	54	12.6
1992	40	9.4	13	13.9	53	23.3

[a]A short-term contract, as used in this table, is a purchase contract under which all deliveries of materials are scheduled to be completed by the end of the first calendar year following the contract-signing year. Deliveries can be made during the contract-signing year, but deliveries are not scheduled to occur beyond the first calendar year thereafter.

[b]A long-term purchase, as used in this table, is a purchase contract under which at least one delivery of material is scheduled to occur during the second calendar year after the contract-signing year. Deliveries also can occur during the contract-signing year, during the first calendar year thereafter, or during any subsequent calendar year.

W = Withheld to avoid disclosure of company data.

Note: Quantities of uranium are U_3O_8 equivalent.

Sources: **1982**—Energy Information Administration, *1982 Survey of United States Uranium Marketing Activity* (September 1983). **1983**—Energy Information Administration, *1983 Survey of United States Uranium Marketing Activity* (August 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

domestic origin and 14.9 million pounds were imported by domestic suppliers from foreign sources and resold to utilities (Table 26).

Uranium delivery commitments to utilities for options and for firm and captive commitments for 1992 through 2000 and later are displayed in Figure 12.

Domestic Procurement Arrangements

The distribution of uranium deliveries by U.S. suppliers, by year of delivery and by type of domestic uranium procurement, for contracts in place as of December 31, 1992 is shown in Table 27 and Table 28. Three types of procurement are recognized: contract price, market price, and "other." In contract-price procurements, prices and the associated escalation factors (if any) are specified when the contract is signed. In market-price contracts, the prices are commonly (but not always) determined at or some time before delivery and are based on market prices prevailing at that time. Some market-price contracts contain floor (minimum) prices that provide a lower limit on the eventual price. A base floor price and the means of escalation (if any) may be specified when the contract is signed. "Other" procurement refers to captive production and other arrangements that fall outside the contract-price and market-price categories. Procurement from captive production refers to procurement by utilities from uranium properties they directly control.

Of uranium deliveries in 1992, about 59 percent were contract price, 40 percent market price, and less than one percent "other." For 1992 and future years, contract-price procurement accounts for 38 percent, market-price procurements account for about 60 percent, and "other" procurement arrangements account for 2 percent of all delivery commitments in place as of December 31, 1992. As noted previously, 53 new uranium contracts were signed by utilities with domestic suppliers in 1992. Of these contracts, 40 were short-term contracts, all but 3 of which were reported to have a contract-specified pricing mechanism with a fixed price. Eight of the long-term contracts were reported to be in the contract-price category.

A more detailed breakdown on fixed price and base-price escalated in contract-specified price contracts is provided in Table 27. Two categories are presented: (1) contracts with a specified fixed-price, (2) contracts that

Table 26. Origin of Uranium Committed for Delivery to U.S. Utilities from Domestic Suppliers, 1992-2000 and Later, as of December 31, 1992
(Million Pounds U_3O_8 Equivalent)

Year of Delivery	Origin of Committed Uranium			Total
	Domestic	Unspecified	Foreign[a]	
1992[b]	7.9	0.5	14.9	23.4
1993	5.0	11.1	1.8	17.9
1994	4.9	9.1	2.4	16.4
1995	4.8	9.7	1.9	16.4
1996	3.9	4.5	1.1	9.5
1997	2.7	2.3	1.1	6.1
1998	1.7	2.0	0.7	4.4
1999	1.0	0.6	0.7	2.3
2000 and Later	0.7	2.3	1.4	4.4
Total	**32.7**	**42.0**	**26.1**	**100.8**

[a]Includes domestic utility, supplier, and trader/broker purchases reported on Form EIA-858 as imports of foreign-origin uranium materials into the United States. Uranium materials reported as imports under loan and exchange transactions as excluded.
[b]Actual deliveries.
Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

begin with a base price, which is escalated in future-year deliveries. For 1992 deliveries under contract-price contracts, 11.0 million pounds U_3O_8 (80 percent) had a fixed price; and 2.8 million pounds (20 percent) had a base price with escalation. For all contract-price contracts in place as of December 31, 1992, 58 percent of the quantity to be delivered in all years had a fixed price and the remaining 42 percent were base-price escalated.

A more detailed breakdown on the use of floor price in market-price contracts is provided in Table 28. Three categories are presented: (1) contracts with a specific floor price, (2) contracts in which the floor price is related to production cost, and (3) contracts with no floor price provision. For 1992 deliveries under market-price contracts, 4.4 million pounds U_3O_8 (47 percent) had a price floor; 4.6 million pounds (49 percent) had no floor associated with the market price; and 0.3 million pounds U_3O_8 (3 percent) had a cost floor. For all market-price contracts in place as of December 31, 1992, 32 percent of the total quantity to be delivered in all years had a price floor, 2 percent had a cost floor, and the remainder had no floor.

U.S. Uranium Prices

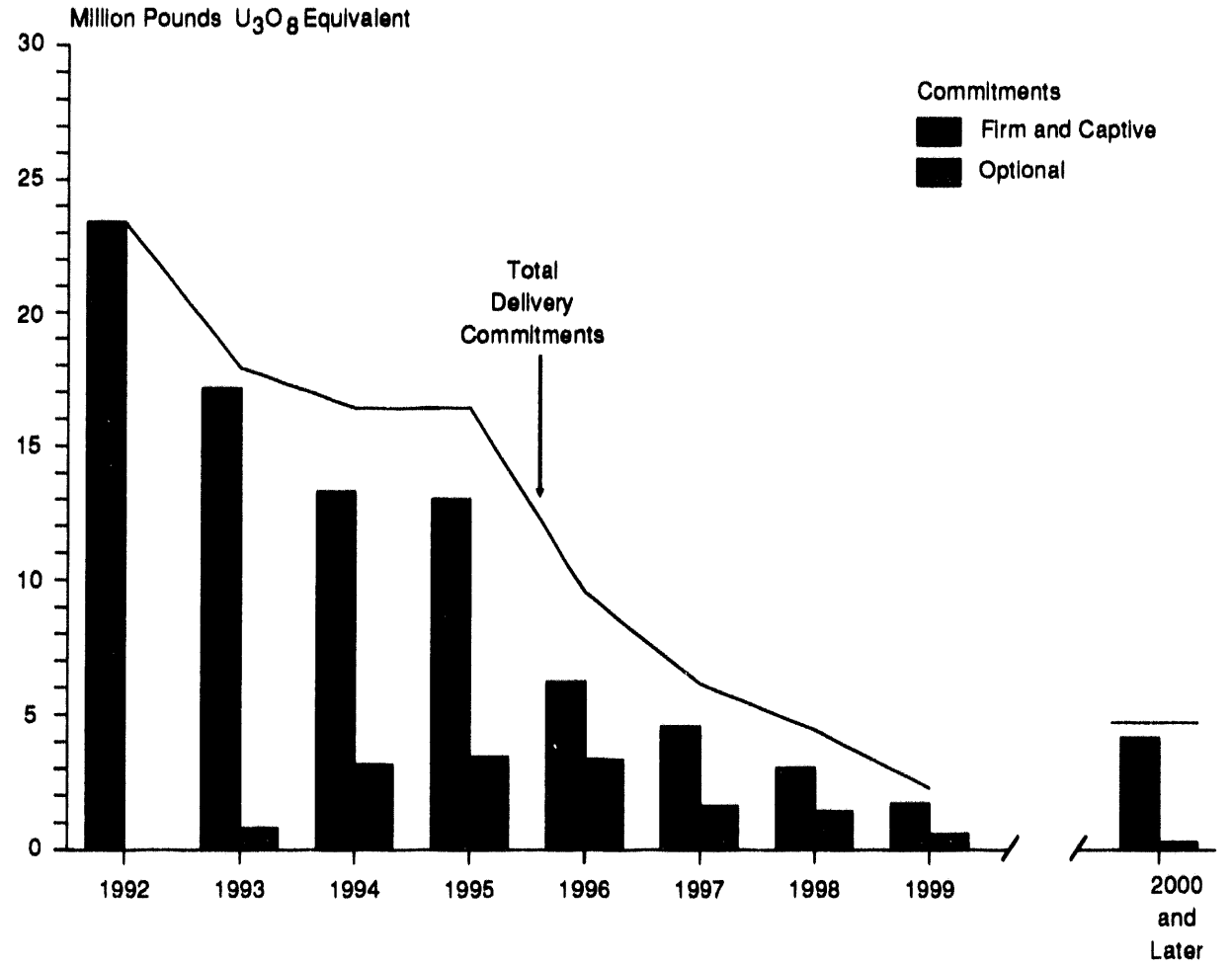
Data on uranium prices reported for deliveries made from 1982 through 1992 under contracts between domestic suppliers and domestic utilities are presented in Table 29. Prices are given for contract-price and market-price procurements. All prices are quantity weighted averages.

The first section of Table 29 presents data on the weighted-average of reported prices for deliveries under contracts with contract-specified prices. The average price for this type of delivery in 1992 was $13.16 per pound U_3O_8 equivalent, down 6 percent from the average of $13.94 reported for 1991. The weighted-average of the prices paid for contract-price related contracts specifying a fixed price was $9.25 per pound U_3O_8 in 1992. The weighted-average of the prices paid for base-price-escalated contracts was $27.55 per pound U_3O_8.

The second section of Table 29 presents data on the average of reported prices for deliveries under market-price related contracts. As shown, the overall average price for this type of delivery rose 10 percent from $12.62 in 1991 to $13.89 in 1992. Prices for market-price related contracts with a floor price declined 16 percent from $21.84 in 1991 to $18.35 in 1992, while the aggregate average for all other market-price related contracts declined 4 percent from $9.04 in 1991 to $8.65 in 1992.

The final section of Table 29 presents data on deliveries and prices for contract-price and market-price related

Figure 12. Uranium Delivery Commitments to Utilities from Domestic Suppliers, 1992-2000 and Later, as of December 31, 1992



Note: The data plotted for "2000 and Later" include more than one year.
Sources: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

procurements combined. This provides a comprehensive average price for all deliveries made by domestic suppliers to U.S. utilities, except those made under litigation settlements and "other" pricing mechanisms.

As shown, the reported prices for 1992 averaged $13.45 per pound U_3O_8 equivalent, a 2-percent decrease compared with the 1991 average of reported prices of $13.66 per pound. As noted previously (see Table 25), 40 new short-term contracts were signed by utilities with domestic suppliers in 1992. The amount of uranium delivered to utilities under these new contracts was 9.4 million pounds. The quantity-weighted average of the prices paid under these 40 new short-term contracts was $7.97 per pound U_3O_8 equivalent.

Foreign Uranium Purchases and Sales

The history and projections of U.S. imports under purchase contracts and export sales of uranium by utilities and domestic suppliers from 1967 to 2000 and later years are shown in Table 30 and Figure 13. These data do not include purchases of foreign-origin uranium by U.S. companies to be delivered to foreign customers. Purchase-contract imports include domestic utility, supplier, and trader/broker purchases reported as imports of foreign-origin uranium materials into the United States. Uranium materials reported as imports under loan and exchange transactions, custody/storage arrangements, and the delivery of foreign material for enrichment in U.S. Department of Energy facilities that

Table 27. Contract Arrangements Specified in Contract-Price Contracts for Delivery of Uranium from Domestic Suppliers to Utilities, 1992-2000 and Later, as of December 31, 1992

Year of Delivery	Fixed Price		Base-Price Escalated		Annual Total (million pounds U_3O_8)
	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	
1992[a]	11.0	79.6	2.8	20.4	13.9
1993	2.6	44.5	3.2	55.5	5.9
1994	3.0	54.7	2.5	45.3	5.5
1995	4.1	63.4	2.4	36.6	6.4
1996	0.4	16.0	2.0	84.0	2.4
1997	0.4	21.8	1.5	78.2	1.9
1998	0.3	21.4	1.2	78.6	1.5
1999	0.1	63.6	0.1	36.4	0.2
2000 and Later	0.3	32.4	0.7	67.6	1.0
Total	**22.3**	**57.6**	**16.4**	**42.4**	**38.7**

[a]Actual deliveries.

Notes: Totals may not equal sum of components because of independent rounding. Percentages were calculated using unrounded data. Quantities of uranium are U_3O_8 equivalent.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 28. Floor Price Arrangements Specified in Market-Price Contracts for Delivery of Uranium from Domestic Suppliers to Utilities, 1992-2000 and Later, as of December 31, 1992

Year of Delivery	Price Floor[a]		Cost Floor[b]		No Floor[c]		Annual Total (million pounds U_3O_8)
	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	
1992	4.4	47.4	0.3	3.2	4.6	49.3	9.3
1993	2.3	19.3	0.3	2.5	9.4	78.2	12.0
1994	2.3	21.4	0.3	2.8	8.2	75.8	10.8
1995	2.4	25.3	0	0	7.2	74.7	9.6
1996	2.7	40.0	0	0	4.1	60.0	6.8
1997	1.4	36.1	0	0	2.5	63.9	3.9
1998	1.2	46.3	0	0	1.4	53.7	2.6
1999	0.9	48.7	0	0	0.9	51.3	1.8
2000 and Later	1.7	50.1	0	0	1.7	49.9	3.4
Total	**19.3**	**32.2**	**0.9**	**1.5**	**39.8**	**66.3**	**60.0**

[a]Refers to contracts with a specific floor price.

[b]Refers to contracts in which the floor price is related to production cost.

[c]Refers to contracts with no floor price provision.

Note: Totals may not equal sum of components because of independent rounding. Percentages were calculated using unrounded data. Quantities of uranium are U_3O_8 equivalent.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 29. Average of Prices Paid for Purchases by U.S. Utilities from Domestic Suppliers, 1982-1992

Contract Type	Year of Delivery										
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Contract Price											
Averages of Reported Prices (dollars per pound U_3O_8)	35.36	39.90	33.60	34.74	32.58	29.16	28.20	20.87	17.94	13.94	13.16
Amount of Uranium for Which Price Was Reported (million pounds U_3O_8)	8.2	9.5	7.2	8.9	6.1	10.1	7.4	9.6	12.0	17.3	13.2
Market Price											
No Floor											
Averages of Reported Prices (dollars per pound U_3O_8)	21.50	24.05	16.87	15.46	16.93	17.53	16.12	11.48	9.18	9.04	8.65
Amount of Uranium for Which Price Was Reported (million pounds U_3O_8)	2.8	4.3	4.1	2.9	3.4	2.7	2.3	1.9	5.1	3.5	3.9
Price and Cost Floor											
Averages of Reported Prices (dollars per pound U_3O_8)	50.98	50.67	44.71	35.62	41.06	34.34	33.52	22.50	19.40	21.84	18.35
Amount of Uranium for Which Price Was Reported (million pounds U_3O_8)	5.7	3.6	4.8	4.0	2.6	1.3	1.1	1.1	1.6	1.3	4.6
Total											
Averages of Reported Prices (dollars per pound U_3O_8)	41.27	36.18	31.88	27.15	27.39	22.85	21.59	15.42	11.65	12.62	13.89
Amount of Uranium for Which Price Was Reported (million pounds U_3O_8)	8.5	7.9	8.9	6.9	6.0	4.0	3.4	3.0	6.7	4.8	8.5
Contract & Market											
Averages of Reported Prices (dollars per pound U_3O_8)	38.37	38.21	32.65	31.43	30.01	27.37	26.15	19.56	15.70	13.66	13.45
Amount of Uranium for Which Price Was Reported (million pounds U_3O_8)	16.7	17.4	16.1	15.8	12.1	14.1	10.8	12.6	18.7	22.1	21.8

Notes: Price excludes uranium delivered under litigation settlements. Prices shown are quantity-weighted averages per pound U_3O_8 equivalent in nominal U.S. dollars.

Sources: **1982-1983**—Energy Information Administration, Form EIA-491, "Survey of United States Uranium Marketing Activity" (1982, 1983). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

is subsequently exported are also included in Table 30. In 1992, loan- and exchange-contract imports amounted to 2.4 and 0.8 million pounds, respectively. Foreign uranium held under custody, primarily for conversion, was 10.1 million pounds U_3O_8 equivalent in 1992. Foreign uranium imported for enrichment by the U.S. Department of Energy that was exported in 1992 was 8.7 million pounds U_3O_8 equivalent.

Table 30. Deliveries and Commitments of Uranium Imports and Exports by Transaction Type, 1967 to 2000 and Later

(Million Pounds U_3O_8 Equivalent)

Year of Delivery	Imports by Transaction Type[a]					Exports by Transaction Type[a]				
	Purchases[b]	Loans	Exchanges	Other	Total	Sales[c]	Loans	Exchanges	Other	Total
Actual Deliveries										
1967	0	NA	NA	NA	0	1.4	NA	NA	NA	1.4
1968	0	NA	NA	NA	0	1.6	NA	NA	NA	1.6
1969	0	NA	NA	NA	0	1.0	NA	NA	NA	1.0
1970	0	NA	NA	NA	0	4.2	NA	NA	NA	4.2
1971	0	NA	NA	NA	0	0.4	NA	NA	NA	0.4
1972	0	NA	NA	NA	0	0.2	NA	NA	NA	0.2
1973	0	NA	NA	NA	0	1.2	NA	NA	NA	1.2
1974	0	NA	NA	NA	0	3.0	NA	NA	NA	3.0
1975	1.4	NA	NA	NA	1.4	1.0	NA	NA	NA	1.0
1976	3.6	NA	NA	NA	3.6	1.2	NA	NA	NA	1.2
1977	5.6	NA	NA	NA	5.6	4.0	NA	NA	NA	4.0
1978	5.2	NA	NA	NA	5.2	6.8	NA	NA	NA	6.8
1979	3.0	NA	NA	NA	3.0	6.2	NA	NA	NA	6.2
1980	3.6	NA	NA	NA	3.6	5.8	NA	NA	NA	5.8
1981	6.6	NA	NA	NA	6.6	4.4	NA	NA	NA	4.4
1982	17.1	NA	NA	NA	17.1	6.2	NA	NA	NA	6.2
1983	8.2	NA	NA	NA	8.2	3.3	NA	NA	NA	3.3
1984	12.5	NA	NA	NA	12.5	2.2	NA	NA	NA	2.2
1985	11.7	0	0	NA	11.7	5.3	0	0	NA	5.3
1986	13.5	0	0.9	NA	14.4	1.6	0	0	NA	1.6
1987	15.1	0.8	0	NA	15.9	1.0	0	0	NA	1.0
1988	15.8	0	1.2	NA	17.0	3.3	0	1.0	NA	4.3
1989	13.1	0.3	0.3	NA	13.7	2.1	0	0.4	NA	2.5
1990	23.7	0.1	2.8	NA	26.6	2.0	0.4	0	NA	2.4
1991	16.3	5.7	1.1	NA	23.1	3.5	0	0	NA	3.5
1992	23.3	2.4	0.8	18.8	45.4	2.8	0	0	18.1	20.9
Commitments										
1993	17.7	W	0	W	18.8	2.8	0	0	0	2.8
1994	15.9	W	0	W	16.2	2.1	0	0	0	2.1
1995	15.1	W	0	W	15.4	1.9	0	0	0	1.9
1996	13.4	0	0	0	13.4	1.6	0	0	0	1.6
1997	12.5	0	0	0	12.5	1.3	0	0	0	1.3
1998	8.3	0	0	0	8.3	1.1	0	0	0	1.1
1999	5.8	0	0	0	5.8	1.1	0	0	0	1.1
2000 and Later	9.3	0	0	0	9.3	0	0	0	0	0

[a] **1967-1991**—Does not include transactions involving the delivery of uranium materials imported for custody/storage siting, conversion, enrichment, and/or fuel fabrication at U.S. facilities and subsequently exported or uranium materials exported for conversion, fuel fabrication, and/or enrichment at foreign facilities. **1992**—"Other" imports include uranium shipped under transactions involving custody/storage siting, conversion, enrichment, and/or fuel fabrication at U.S. facilities. "Other" exports include uranium shipped from conversion, enrichment, and/or fuel fabrication facilities in the United States.

[b] 1975-1981, Annual total represents direct purchase of foreign-origin uranium by U.S. companies.

[c] 1967-1981, Annual total represents exports by U.S. uranium producers only.

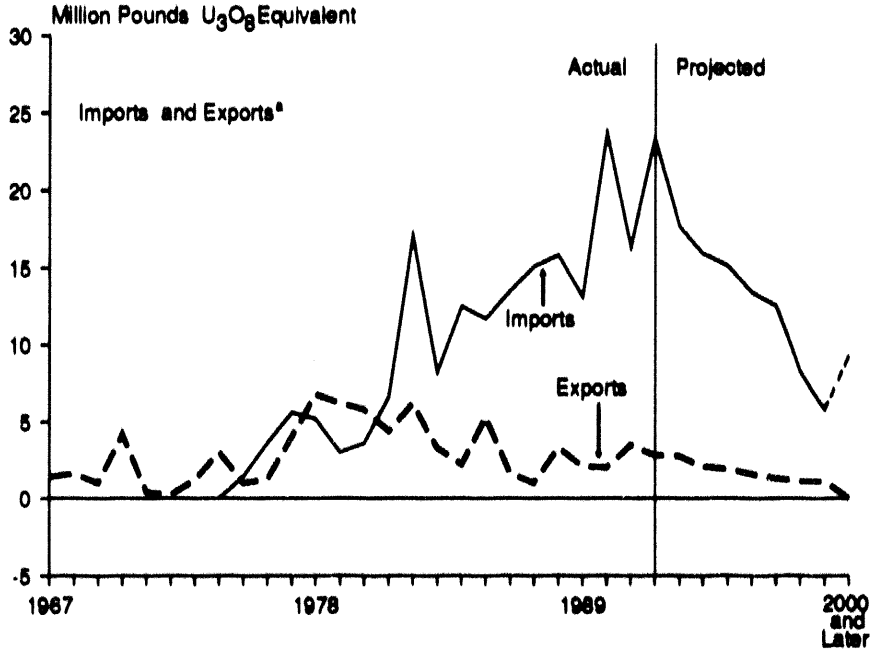
W = Withheld to avoid disclosure of company data.

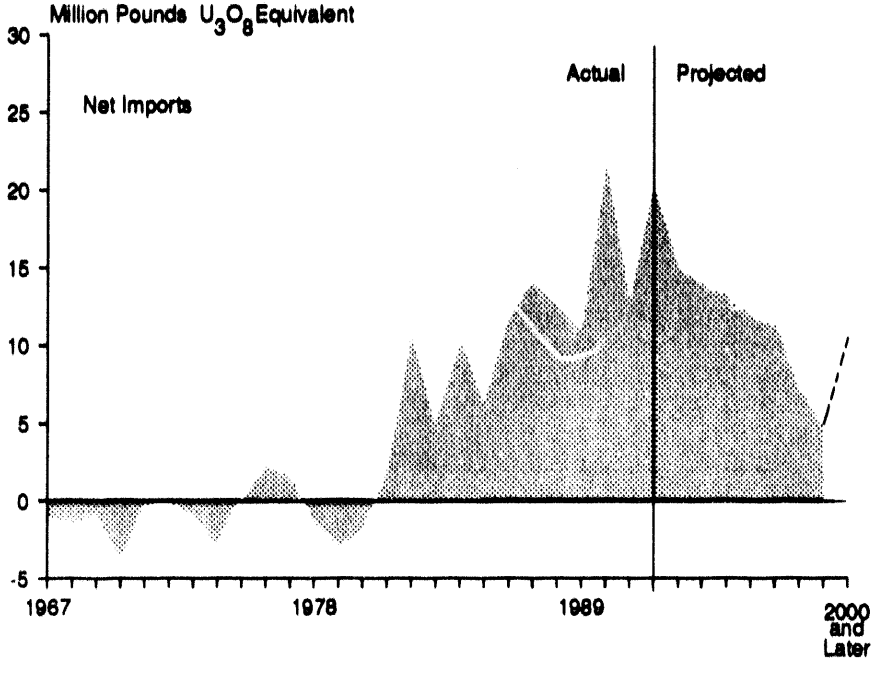
NA = Not available.

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

Sources: **1967-1983**—Purchases and Sales, Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983* (August 1984), **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 13. Actual and Committed Imports and Exports of Uranium for Commercial Uses, 1967-2000 and Later





[a]Annual totals for imports are for purchase contracts only and for exports are for sales contracts only.

Note: Data plotted for years 1967 through 1992 are for actual deliveries; data plotted for 1993 and later are commitments. The data point plotted for "2000 and later" includes data for more than one year. This results in an exaggerated slope for this line segment.

Sources: **1967-1983**—Purchases and Sales, Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983* (August 1984), **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

U.S. utilities and domestic suppliers imported 23.3 million pounds of uranium under purchase contracts in 1992, 43 percent more than the 16.3 million pounds of like imports in 1991. From 1975 through 1992, U.S. companies imported a cumulative total of 199.4 million pounds U_3O_8 equivalent under purchase contracts. Most of this imported material came from Canada, Australia, and former Russia in 1992.

Export sales of uranium by domestic suppliers in 1992 totaled 2.8 million pounds, down from the 3.5 million pounds reported for 1991. Since 1967, U.S. companies have exported a cumulative total of 75.7 million pounds U_3O_8 equivalent under sales contracts. As of December 31, 1992, export sales contracts were in place for an additional 11.8 million pounds from 1993 through 1999. No commitments for exports of uranium were reported for the period 2000 and later on the 1992 survey.

Additional detailed data on purchase-contract imports of uranium by U.S. utilities and domestic suppliers during 1992, and commitments for future deliveries through 2000 and later are displayed in Table 31. These data reveal that utilities accounted for roughly 51 percent of 1992 purchase-contract imports. For years beyond 1992, utility commitments account for 92 percent of the total quantity under purchase contracts from foreign suppliers as of December 31, 1992. Information on the pricing mechanisms employed in contracts between U.S. utilities and foreign suppliers for purchase-contract imports of uranium in 1992 and later years is provided in Tables 32 and 33. This information is similar to the information presented in Tables 27 and 28 for domestic procurement arrangements.

Thirty-two percent of the uranium imported by U.S. utilities in 1992 was delivered by foreign suppliers under contract-price contracts. For 1992 deliveries under contract-price contracts, 81 percent had a fixed price and the remaining 19 percent had base price with escalation (Table 32). By comparison, contract-price contracts accounted for 59 percent of the uranium delivered to U.S. utilities by domestic suppliers, and 80 percent were fixed-price (see Table 27).

Sixty-eight percent of the uranium imported by U.S. utilities in 1992 was delivered under market-price-related contracts, and about 46 percent of these contracts included a cost or price floor (Table 33). By comparison, of the uranium delivered to U.S. utilities by domestic suppliers, market-price-related contracts accounted for about two-fifths of the total and about 51 percent of the contracts included a cost or floor price (see Table 28).

Table 31. Commitments for Delivery of Uranium from Foreign Suppliers to Domestic Utilities and Suppliers Under Purchase-Contract Imports, 1992-2000 and Later, as of December 31, 1992
(Million Pounds U_3O_8 Equivalent)

Year of Delivery	Imports by Utilities*				Imports by Suppliers*				Combined Imports*			
	Firm	Optional	Total	Cumulative	Firm	Optional	Total	Cumulative	Firm	Optional	Total	Cumulative
1992	11.8	0	11.8	11.8	11.5	0	11.5	11.5	23.3	0	23.3	23.3
1993	12.0	0.8	12.8	24.6	4.9	0	4.9	16.4	16.9	0.8	17.7	41.0
1994	12.3	2.8	15.1	39.8	0.5	0.3	0.8	17.2	12.8	3.1	15.9	56.9
1995	11.1	3.3	14.4	54.2	0.4	0.3	0.7	17.9	11.5	3.6	15.1	72.1
1996	10.1	2.9	13.0	67.2	0.4	0	0.4	18.3	10.6	2.9	13.4	85.5
1997	8.7	3.5	12.2	79.4	0.4	0	0.4	18.7	9.1	3.5	12.5	98.0
1998	4.9	3.2	8.1	87.4	0	0.2	0.2	18.9	4.9	3.4	8.3	106.3
1999	3.1	2.6	5.7	93.1	0	0.1	0.1	19.0	3.1	2.7	5.8	112.1
2000 and Later	4.2	5.0	9.2	102.3	0	0.1	0.1	19.1	4.2	5.1	9.3	121.4
Total	**78.2**	**24.1**	**102.3**	--	**18.1**	**1.0**	**19.1**	--	**96.2**	**25.1**	**121.4**	--

*For 1992, includes domestic utility, supplier, and trader/broker purchases reported as imports of foreign-origin uranium materials into the United States. Uranium materials reported as imports under loan and exchange transactions are excluded. For 1993-2000 and Later, the figure shown equals the amount of import commitments in each year under purchase contracts by utilities, suppliers, and traders/brokers.

-- = 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" (1992).

Table 32. Contract Arrangements Specified in Contract-Price Contracts for Delivery of Uranium from Foreign Suppliers to Domestic Utilities, 1992-2000 and Later, as of December 31, 1992

Year	Fixed Price		Base-Price Escalated		Annual Total
	Million Pounds U_3O_8[a]	Percent of Annual Total	Million Pounds U_3O_8[a]	Percent of Annual Total	Million Pounds U_3O_8[a]
1992	3.0	81.0	0.7	19.0	3.7
1993	1.5	51.6	1.4	48.4	3.0
1994	0.7	28.6	1.8	71.4	2.5
1995	0.2	9.8	2.3	90.2	2.5
1996	0.3	11.6	2.3	88.4	2.6
1997	0.2	8.4	2.7	91.6	2.9
1998	0.0	0.0	1.2	100.0	1.2
1999	0.0	0.0	1.2	100.0	1.2
2000 and Later	0.0	0.0	3.2	100.0	3.2
Total	**6.1**	**26.6**	**16.7**	**73.4**	**22.8**

[a]For 1992, includes domestic utility, supplier, and trader/broker purchases reported as imports of foreign-origin uranium materials, U_3O_8 equivalent, into the United State Uranium materials reported as imports under loan and exchange transactions are excluded. For 1993-2000 and Later, the figure shown equals the amount of import commitments in each year under purchase contracts by utilities, suppliers, and traders/brokers

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 33. Floor Price Arrangements Specified in Market-Price Contracts for Delivery of Uranium from Foreign Suppliers to Domestic Utilities, 1992-2000 and Later, as of December 31, 1992

Year	Price Floor		Cost Floor		No Floor		Annual Total
	Million Pounds U_3O_8[a]	Percent of Annual Total	Million Pounds U_3O_8[a]	Percent of Annual Total	Million Pounds U_3O_8[a]	Percent of Annual Total	Million Pounds U_3O_8[a]
1992	3.3	40.3	0.4	5.5	4.4	54.1	8.1
1993	6.0	60.5	0.2	2.1	3.7	37.5	9.9
1994	7.5	59.6	0.3	2.5	4.8	37.9	12.6
1995	7.0	58.9	0.3	2.7	4.6	38.5	11.9
1996	6.1	58.1	0.3	3.0	4.1	38.8	10.4
1997	4.8	52.1	0.3	3.0	4.1	44.9	9.2
1998	3.0	43.1	0.3	4.0	3.6	52.9	6.9
1999	1.8	40.1	0.0	0.0	2.7	59.9	4.5
2000 and Later	1.6	26.1	0.0	0.0	4.4	73.9	6.0
Total	**41.0**	**51.5**	**2.2**	**2.7**	**36.4**	**45.8**	**79.5**

[a]For 1992, includes domestic utility, supplier, and trader/broker purchases reported on Form EIA-858 as imports of foreign-origin uranium materials, U_3O_8 equivalent, into the United States. Uranium materials reported as imports under loan and exchange transactions are excluded. For 1993-2000 and Later, the figure shown equals the amount of import commitments in each year under purchase contracts by utilities, suppliers, and traders/brokers.

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

For years beyond 1992, most of the uranium for which U.S. utilities have current import commitments will be delivered under market-price-related contracts, and roughly one-half of the total committed quantity under this type of contract is attributable to contracts which specify a floor price.

Similar data on contracts for imports by domestic suppliers are not presented because the number of contracts is insufficient to avoid disclosure of individual company data.

The history of contracting by U.S. companies under purchase-contract arrangements for importation of foreign-origin uranium is shown in Table 34. Since 1970, 236 import contracts have been signed for purchase of 325.2 million pounds U_3O_8. Because of litigation, cancellations, and contract modifications, however, many of the originally scheduled commitments were not delivered to U.S. customers. The actual deliveries for 1970 through 1992 have amounted to 199.3 million pounds.

New Import Commitments

Domestic suppliers and utilities signed 37 purchase contracts in 1992 with foreign suppliers for imports totaling 29.5 million pounds of new uranium commitments (Table 34). Short-term transactions signed by utilities (purchase contracts signed in 1992 for delivery from 1992 through 1993) totaled 3.1 million pounds of uranium. The remaining 26.4 million pounds U_3O_8 were under long-term purchase contracts signed in 1992 by domestic suppliers and utilities and have scheduled deliveries in the years 1994 and beyond.

Prices of Imported Uranium

The quantity-weighted averages of prices paid by all domestic customers for deliveries of foreign-origin uranium under purchase contract imports from 1983 through 1992 are shown in Table 35. The price paid for 1992 deliveries averaged $11.34 per pound U_3O_8, down 27 percent from the $15.55 for deliveries in 1991. Of the 23.3 million pounds delivered in 1992 under import purchase contracts, the greater portion was under contracts for which the weighted average price was about $8.00 per pound. New short-term (deliveries in 1992 through 1993) import purchase contracts signed by domestic suppliers and utilities with foreign suppliers in 1992 totaled 3.1 million pounds of uranium, and the quantity-weighted average of the prices paid under these contracts was $8.10 per pound U_3O_8 equivalent.

Table 34. Historical Commitments and Actual Deliveries of Foreign-Origin Uranium, 1970-1992

Year Contract Signing	New Contracts and Commitments		Actual Deliveries[b] (million pounds U_3O_8)
	Number	Million Pounds U_3O_8[a]	
1970-1980	18	63.4	22.4
1981	4	9.8	6.6
1982	17	28.4	17.1
1983	8	6.2	8.2
1984	15	11.1	12.5
1985	10	14.9	11.7
1986	15	22.1	13.5
1987	30	26.6	15.1
1988	23	28.6	15.8
1989	19	19.7	13.1
1990	22	38.9	23.7
1991	18	26.0	16.3
1992	37	29.5	23.3
Total	**236**	**325.2**	**199.3**

[a]Total new contractual commitments, U_3O_8 equivalent, as of the year shown for delivery in the year of contract signing and/or future years.
[b]For 1985-1992, the figure shown includes domestic utility, supplier, and trader/broker purchases reported as imports of uranium materials, U_3O_8 equivalent, into the United States. Uranium materials reported as imports under loan and exchange transactions are excluded. Actual deliveries began in 1975.

Sources: **1970-1983**—Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983* (August 1983). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 35. Average of Prices Paid for Imported Uranium Delivered to Domestic Utilities and Suppliers, 1983-1992

(Million Pounds U_3O_8 Equivalent)

Item	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Averages of Reported Prices (dollars per pound U_3O_8)	26.16	21.86	20.08	20.07	19.14	19.03	16.75	12.55	15.55	11.34
Amount of U_3O_8 for Which Price Data Were Reported[a] (million pounds U_3O_8)	8.2	11.1	10.7	12.8	12.9	15.2	13.1	23.5	15.9	22.4
Amount of U_3O_8 Delivered[a] (million pounds U_3O_8)	8.2	12.5	11.7	13.5	14.8	15.8	13.1	23.7	16.3	23.3
Percentage of Imports Delivered with Reported Prices	100	89	91	95	87	96	100	99	98	96

[a]The figure shown includes domestic utility, supplier, and trader/broker purchases reported as imports of uranium materials into the United States. Uranium materials reported as imports under loan and exchange transactions are excluded.

Notes: Prices shown are quantity-weighted averages per pound U_3O_8 equivalent in nominal U.S. dollars. Material quantities are millions of pounds of U_3O_8 equivalent.

Sources: **1983**—Energy Information Administration, *United States Uranium Marketing Activity 1983* (August 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 36. Price Distribution of Uranium Purchases by U.S. Utilities, 1989-1992

Decile	1989		1990		1991		1992	
	Quantity with Reported Price (million pounds U_3O_8)	Quantity-Weighted Average Price (dollars per pound U_3O_8)	Quantity with Reported Price (million pounds U_3O_8)	Quantity-Weighted Average Price (dollars per pound U_3O_8)	Quantity with Reported Price (million pounds U_3O_8)	Quantity-Weighted Average Price (dollars per pound U_3O_8)	Quantity with Reported Price (million pounds U_3O_8)	Quantity-Weighted Average Price (dollars per pound U_3O_8)
First	2.9	9.29	3.9	7.70	4.7	7.45	4.1	7.11
Second	2.9	9.80	3.9	8.91	4.7	8.52	4.1	7.75
Third	2.9	10.57	3.9	9.13	4.7	8.93	4.1	7.98
Fourth	2.9	11.77	3.9	9.59	4.7	9.31	4.1	8.56
Fifth	2.9	15.19	3.9	10.21	4.7	10.12	4.1	9.75
Sixth	2.9	17.33	3.9	14.09	4.7	12.67	4.1	13.54
Seventh	2.9	30.21	3.9	20.72	4.7	18.66	4.1	18.90
Eighth	2.9	48.18	3.9	44.60	4.7	39.10	4.1	37.37

Note: Quantities of uranium are U_3O_8 equivalent.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1989-1992).

Utility Purchase-Price Distribution

In 1989, 29 utilities purchased 23.5 million pounds U_3O_8 from domestic and foreign suppliers; 39 utilities purchased 31.5 million pounds U_3O_8 in 1990; 39 utilities purchased 37.4 million pounds U_3O_8 in 1991 and 40 utilities purchased 32.7 million pounds U_3O_8 in 1992. These quantities are only for purchases with a reported price and for contracts not under litigation. A price distribution of the quantity-weighted average of the prices paid by utilities for 1989 through 1992 is presented in Table 36. The lowest average price for each year's price distribution decreased annually, ranging from $9.29 per pound U_3O_8 in 1989 to $7.11 per pound in 1992. The highest average price for each distribution also decreased annually, ranging from $48.18 per pound

U_3O_8 in 1989 to $37.37 per pound in 1992. Also, the quantity-weighted average price for the first through the eighth octile diminishes each succeeding year for 1989 through 1992.

Comparing the overall domestic-purchase price for 1989 through 1992 (see Table 29) with the corresponding price-distributions shown in Table 36, the domestic-purchase price would fall between the fifth and sixth octile average price for 1989, 1990 and 1992 and between the sixth and seventh octile average price for 1991.

Deliveries to Enrichment Suppliers by U.S. Utilities

In 1992, U.S. utilities delivered 32.0 million pounds of uranium to enrichment suppliers (Table 37). This quantity includes exchanges of natural uranium for enriched uranium. Of the 32.0 million pounds of uranium, 27.6 million pounds were delivered to DOE enrichment plants (9.1 million pounds of domestic-origin material and 18.5 million pounds of foreign-origin material). A total of 4.4 million pounds of uranium was delivered to foreign enrichment plants in 1992. Annual deliveries for U.S. enrichment as a percentage of total deliveries declined from about 95 percent in 1990 to 86 percent in 1992. Conversely, annual deliveries to foreign enrichment suppliers increased from 5 percent in 1990 to near 14 percent in 1992. Projected feed deliveries for 1993 through 2000 decreased by 5.9 million pounds from those reported in the 1991 survey (Table 38).

Uranium Inventories

Data on total U.S. commercial inventories of uranium (expressed in million pounds U_3O_8 equivalent), as of December 31, 1990, 1991, and 1992, are presented in Table 39. Data are given for inventories held only by utilities and inventories held by all companies (utilities and suppliers). Domestic and foreign-origin components of natural and enriched uranium inventories are identified separately. These inventory figures include material in the processing stream, as well as material in storage.

Total commercial inventories decreased by 1.5 million pounds, from 118.7 million pounds U_3O_8 as of December 31, 1991, to 117.2 million pounds as of December 31, 1992. Utility inventories decreased by 6.4 million pounds—from 98.0 million pounds as of December 31, 1991, to 91.6 million pounds as of December 31, 1992.

Data on the total inventories of commercially owned and Government-owned natural and enriched uranium held in the United States as of December 31, 1990, 1991, and 1992, are provided in Table 40. The Government's inventory of natural uranium decreased from 46.8 million pounds U_3O_8 equivalent in 1991 to 45.8 million pounds in 1992. The amount of enriched uranium held in inventory by the Government decreased from 36.7 million pounds to 23.1 million pounds. This material is planned for use through the mid-1990s as working and strategic inventories at DOE enrichment plants and for meeting the long-term requirements of U.S. Government programs.

U.S. commercial inventories of natural uranium as of December 31, 1992, compared with scheduled utility enrichment feed deliveries for 1993 through 1994 are shown in Figure 14. The inventories at the end of 1992 are equivalent to more than 2 years of supply for utility enrichment feed deliveries.

Some U.S. utilities reported having a forward-coverage uranium inventory policy. This level of inventory held constitutes each utilities' requirement for planned uranium use in the near-term. The average desired level of inventory in 1992 was 0.6 million pounds as U_3O_8 with an average forward coverage of 14 months and 0.4 million pounds as natural UF_6 with an average forward

Table 37. Shipments of Uranium by Utilities to Domestic and Foreign Enrichment Suppliers in 1992
(Million Pounds U_3O_8 Equivalent)

Type of Shipment	Domestic Uranium	Foreign Uranium	Total
To Domestic (DOE) Enrichment Plants	9.1	18.5	27.6
To Foreign Enrichment Plants	1.0	3.4	4.4
Total	**10.1**	**21.9**	**32.0**

Note: Totals may not equal sum of components because of independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 38. Projected Shipments of Uranium by Utilities to Domestic and Foreign Enrichment Suppliers, 1993-2002

(Million Pounds U_3O_8 Equivalent)

Year of Shipment	Amount to be Shipped		Change from 1991 to 1992	
	As of December 31, 1991	As of December 31, 1992	Annual	Cumulative
1993	42.8	38.0	-4.8	-4.8
1994	42.8	43.4	0.6	-4.2
1995	45.9	42.0	-3.9	-8.1
1996	45.8	48.3	2.5	-5.6
1997	48.8	46.9	-2.0	-7.6
1998	50.1	48.5	-1.5	-9.1
1999	47.2	45.8	-1.4	-10.5
2000	45.1	49.5	4.4	-6.1
2001	45.8	46.0	0.2	-5.9
2002	NR	46.9	--	--

NR = Not reported.
-- = Not applicable.
Sources: **1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

coverage of 9 months. Data reported for the desired levels of inventory for enriched UF_6 and fabricated fuel are withheld to prevent disclosure of company specific information.

Uranium Used in Fuel Assemblies

The total amount of uranium fuel loaded into U.S. nuclear reactors during 1992 was 43.0 million pounds U_3O_8 equivalent, as reported by utilities and reactor operators. In 1991, 34.6 million pounds U_3O_8 equivalent was inserted into the nuclear reactors. These quantities do not include any fuel rods removed from reactors and later reloaded into the reactor.

Secondary Market Activities

Secondary market transactions include sales, exchanges, and loans of uranium other than direct sales by domestic suppliers to U.S. utilities or direct imports by U.S. utilities. The relationship between primary and secondary market activities is shown in Figure 11. For 1992, utility net exchanges and net loans of uranium with domestic suppliers totaled 8.1 million pounds U_3O_8. Utility sales to suppliers totaled 0.1 million pounds.

Intersupplier transactions totaled 35.0 million pounds U_3O_8 in 1992. Intersupplier sales were 14.5 million pounds. Intersupplier net exchanges were 14.5 million pounds and net loans were 6.0 million pounds. Inter-utility transactions totaled 3.9 million pounds U_3O_8 in 1992.

Apparent Uranium Market Requirements of Domestic Utilities

Unfilled Uranium Requirements

Unfilled requirements are the additional natural uranium that utilities need to purchase after considering their total future enrichment feed delivery requirements, less inventory drawdowns and deliveries under existing procurement contracts. Unfilled requirements also include purchases necessary to maintain a desired level of inventory coverage.

Annual unfilled uranium requirements for reactors in operation, under construction, or on order, as reported by domestic utilities as of December 31, 1990, 1991, and 1992 are listed in Table 41. Total unfilled requirements for 1993 through 2002 are reported, as of the end of 1992, to be 236.1 million pounds U_3O_8. Unfilled requirements for the period 1993 through 2001 show a decrease, from 250.7 million pounds reported at the end of 1991, to 195.0 million pounds reported at the end of 1992.

Table 39. Commercial Uranium Inventories at End of Year, 1990-1992

(Million Pounds U_3O_8 Equivalent)

Type of Uranium Inventory	Utilities			All Companies		
	1990	1991	1992	1990	1991	1992
U_3O_8						
Domestic	17.0	R13.8	12.6	33 6	R27.7	25.8
Foreign	8.9	R11.0	13.4	12.1	R13.4	19.0
Total	**25.9**	**R24.9**	**26.0**	**45.7**	**R41.1**	**44.7**
Natural UF_6						
Domestic	6.1	R1.8	1.5	6.4	R2.2	2.0
Foreign	2.2	R1.9	4.0	2.4	R2.0	4.2
Total	**8.3**	**R3.7**	**5.5**	**8.8**	**R4.2**	**6.2**
Natural UF_6 Under Usage Agreements						
Domestic	22.6	R25.2	18.0	23.9	R25.5	18.1
Foreign	4.7	R7.9	8.9	5.1	R7.9	8.9
Total	**27.3**	**R33.2**	**26.9**	**29.0**	**R33.5**	**27.0**
Natural UF_6 at Enrichers[a]						
Domestic	7.4	R3.3	1.8	7.4	R5.0	1.8
Foreign	3.3	R5.8	6.4	3.3	R5.8	6.4
Total	**10.7**	**R9.1**	**8.2**	**10.7**	**R10.7**	**8.2**
Enriched UF_6 at Enrichers						
Domestic	NR	R1.3	1.6	NR	R1.3	1.6
Foreign	NR	R1.0	0.9	NR	R1.0	0.9
Total	**--**	**R2.3**	**2.5**	**--**	**R2.3**	**2.5**
Enriched UF_6						
Domestic	6.4	R4.2	3.2	7.5	R5.0	4.4
Foreign	4.0	R4.6	5.1	7.3	R5.9	10.0
Total	**10.4**	**R8.8**	**8.3**	**14.8**	**R10.8**	**14.4**
Fabricated Fuel (Enriched UF_6)						
Domestic	12.3	R7.6	7.8	12.3	R7.6	7.8
Foreign	7.7	R8.4	6.4	7.7	R8.4	6.4
Total	**20.0**	**R16.0**	**14.2**	**20.0**	**R16.0**	**14.2**
Total Inventories						
Domestic	71.8	R57.3	46.5	91.1	R74.4	61.4
Foreign	30.9	R40.6	45.1	38.0	R44.3	55.8
Total	**102.7**	**R98.0**	**91.6**	**129.1**	**R118.7**	**117.2**

[a]Includes both natural and enriched uranium for 1990. Beginning in 1992, natural UF_6 and enriched UF_6 at enrichment suppliers were reported separately.

R = Revised data. NR = Not Reported. UF_6 = Uranium hexafluoride.

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

Sources: **1990**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1991-1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 40. Commercial and U.S. Government Inventories of Natural and Enriched Uranium as of End of Year, 1990-1992

(Million Pounds U_3O_8 Equivalent)

Type of Uranium Inventory	Inventories at the End of the Year		
	1990	1991	1992
Utility Stocks			
Natural Uranium	61.5	R70.9	66.6
Enriched Uranium[a]	41.2	R27.1	25.0
Domestic Supplier Stocks			
Natural Uranium	22.0	R18.7	19.5
Enriched Uranium[a]	4.4	R2.0	6.1
Total Commercial Stocks	129.1	R118.7	117.2
Government-Owned Stocks[b]			
Natural Uranium	59.8	46.8	45.8
Enriched Uranium	32.8	36.7	23.1

[a]Includes amounts reported as inventories of UF_6 at Enrichment Suppliers.
[b]Government-owned stocks were reported as of September 30 of each year.
R = Revised data. UF_6 = Uranium hexafluoride.
Note: Totals may not equal sum of components because of independent rounding.
Sources: **1990-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992). **1989-1992, Government-owned uranium only**—Office of the Deputy Assistant Secretary for Uranium Enrichment, U.S. Department of Energy.

Uranium Requirements

Data from various parts of this chapter are combined in Table 42 to produce an aggregate picture of selected aspects of U.S. uranium requirements. Apparent market requirements are computed by summing the quantities of natural uranium under contract and unfilled requirements. Utility contracts for natural uranium include firm and optional domestic purchase commitments and imports.

The two components of apparent market requirements are shown in Figure 15. Unfilled requirements constitute a small portion of apparent market requirements in 1993. However, they increase to 56 percent of total apparent requirements by 1997 and to 94 percent by 2001.

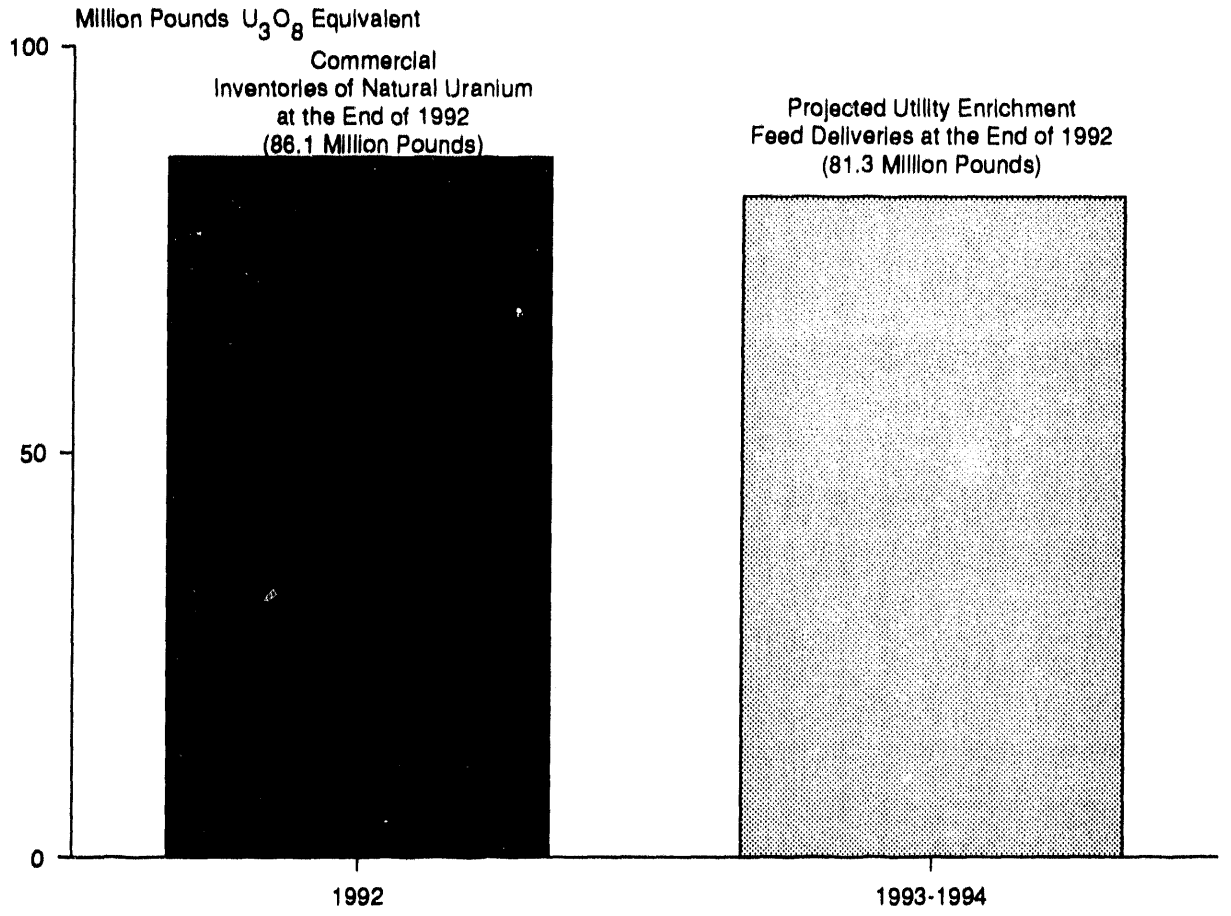
Also shown in Figure 15 is the schedule reported by utilities for enrichment feed deliveries to their enrichment suppliers. For the years 1993 through 1996, utilities apparently plan to meet a portion of their enrichment feed deliveries by drawing down natural uranium inventories.

On Figure 15, "Potential Inventory Drawdown" represents the difference between apparent market requirements and reported enrichment feed deliveries shown in Table 42. When reported enrichment feed deliveries in a year exceed apparent market requirements, a potential can exist for drawdown of inventory. When feed deliveries are less than apparent market requirements, a potential can exist for build-up of inventory.

Uranium Available for Sale by Domestic Suppliers

The amounts of uncommitted uranium available for sale by domestic suppliers at a range of prices are shown in Table 43. As of December 31, 1992, domestic suppliers reported having a total of 69.7 million pounds U_3O_8 available for sale from 1993 through 2002, all of which is available for sale at $30 per pound or less. For the years 1993 through 2001, the data show that 62.1 million pounds could be available for sale, compared with 119.1 million pounds reported on the 1991 survey for the same years.

Figure 14. Commercial Inventories of Natural Uranium for 1992 and Utility Enrichment Feed Deliveries for 1993-1994 as of December 31, 1992



Note: Values for Projected Utility Enrichment Feed Deliveries for the years indicated equal the amounts to be shipped shown in Table 38.

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

Uranium available for sale by U.S. suppliers at a range of prices and by year of delivery is shown in Figure 16. Also shown are U.S. utilities' annual unfilled market requirements. The amount of unfilled requirements that can be met by U.S. suppliers at a given price category is indicated where the unfilled requirements line is on or below the particular price line. The prices are in January 1993 dollars. For example, prices of $20 per pound or less would bring forth sufficient domestic production to meet unfilled requirements on an annual basis through about 1994. As of the end of 1992, the reported quantity of uncommitted uranium for sale by domestic suppliers at an unlimited price would not be sufficient to satisfy requirements after 1994.

Table 41. Unfilled Uranium Requirements of Utilities, 1993-2002

(Million Pounds U_3O_8 Equivalent)

Year	As of December 31, 1990		As of December 31, 1991		As of December 31, 1992	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1993	13.0	13.0	7.4	7.4	1.2	1.2
1994	18.7	31.7	9.3	16.7	6.2	7.5
1995	22.8	54.5	17.4	34.1	8.8	16.3
1996	25.1	79.6	22.9	56.9	15.4	31.7
1997	34.3	113.9	27.9	84.8	22.2	53.9
1998	34.7	148.6	38.6	123.4	29.8	83.7
1999	41.7	190.3	41.7	165.2	32.4	116.1
2000	39.1	229.4	40.3	205.5	38.1	154.2
2001	--	--	45.2	250.7	40.8	195.0
2002	--	--	--	--	41.1	236.1

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

Sources: **1990-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, "Uranium Industry Annual Survey" (1992).

Table 42. Apparent Uranium Market Requirements of Utilities, 1993-2001, as of December 31, 1992

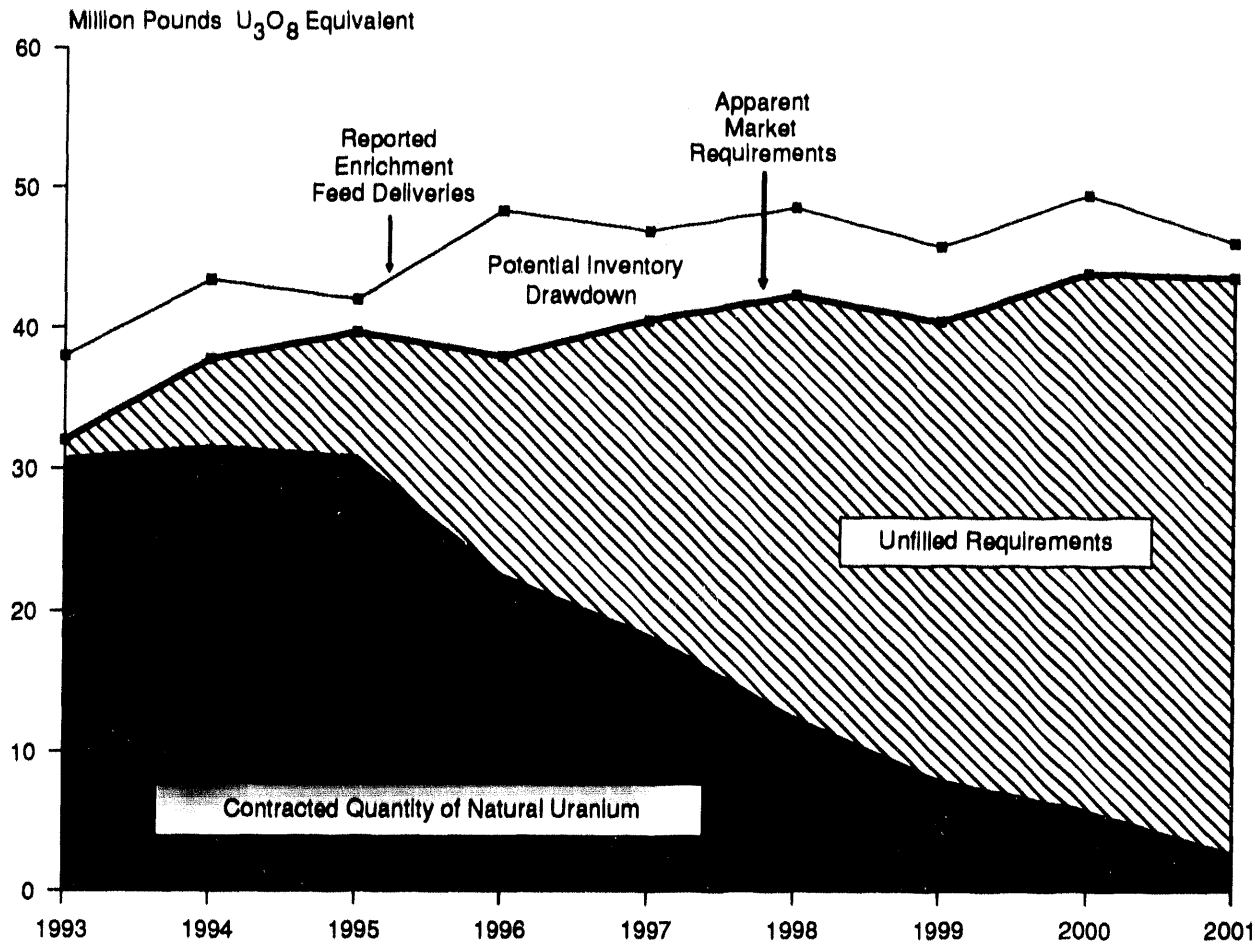
(Million Pounds U_3O_8 Equivalent)

Year of Delivery	Quantity of Natural Uranium Under Contract	Unfilled Requirements	Apparent Market Requirements	Reported Enrichment Feed Deliveries
1993	30.7	1.2	32.0	38.0
1994	31.5	6.2	37.7	43.4
1995	30.8	8.8	39.6	42.0
1996	22.5	15.4	37.9	48.3
1997	18.3	22.2	40.5	46.9
1998	12.5	29.8	42.3	48.5
1999	8.0	32.4	40.4	45.8
2000	5.8	38.1	43.8	49.5
2001	2.7	40.8	43.5	46.0

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

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 15. Apparent Uranium Market Requirements of Utilities, 1993-2001, as of December 31, 1992



Note: Values for Projected Enrichment Feed Deliveries equal the amount to be shipped shown in Table 38. Values for contracted quantities and unfilled requirements are cumulative.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table 43. Uncommitted Uranium Available for Sale from 1993 to 2002
(Million Pounds U_3O_8 Equivalent)

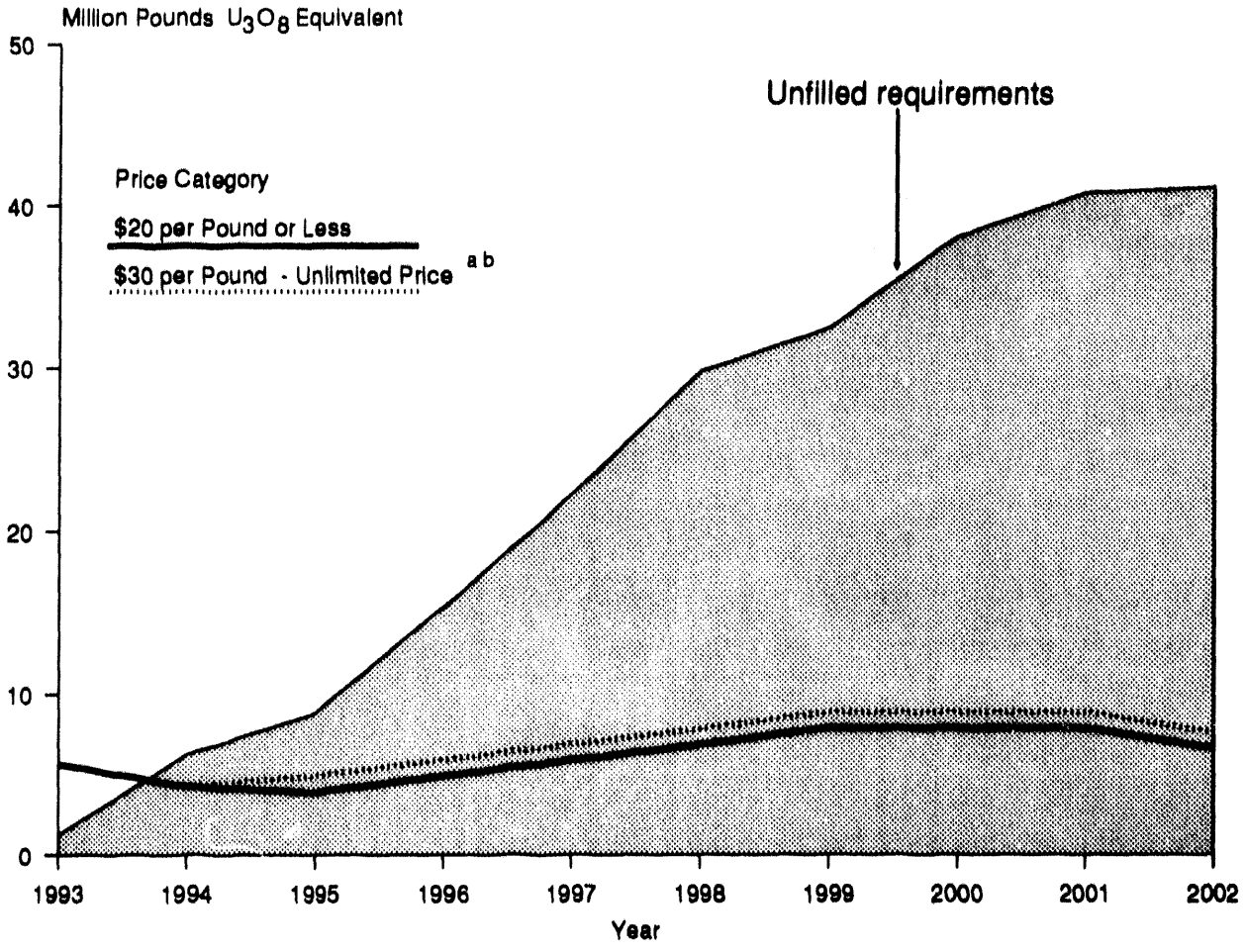
Year of Sale	Price Category[a]					
	$10 Per Pound or Less	$20 Per Pound or Less	$30 Per Pound or Less	$40 Per Pound or Less	$50 Per Pound or Less	Unlimited Price
1993	0.5	5.6	5.6	5.6	5.6	5.6
1994	0	4.2	4.2	4.2	4.2	4.2
1995	0	3.9	4.9	4.9	4.9	4.9
1996	0	4.9	5.9	5.9	5.9	5.9
1997	0	5.9	6.9	6.9	6.9	6.9
1998	0	6.8	7.8	7.8	7.8	7.8
1999	0	7.9	8.9	8.9	8.9	8.9
2000	0	7.9	8.9	8.9	8.9	8.9
2001	0	7.9	8.9	8.9	8.9	8.9
2002	0	6.6	7.6	7.6	7.6	7.6
Total	**0.5**	**61.6**	**69.7**	**69.7**	**69.7**	**69.7**

[a]Prices are in constant January 1993 dollars.

Notes: These data are based on estimates made by domestic suppliers as of December 31, 1992. Totals may not equal sum of components because of independent rounding. Quantities of U_3O_8 in price categories are cumulative within each year, that is, for each year the quantities of higher price categories include all quantities in the lower price categories.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Figure 16. Uncommitted Uranium Available for Sale, 1993-2002, as of the End of 1992



[a]For 1993-2002, the values on Table 43 for the "$30 per Pound or Less" category and each higher category are identical in each year. For 1995-2002, values shown for the "$20 per Pound or Less" category are less than the "$30 per Pound or Less" and each higher price category by 1.0 million pounds U_3O_8 in each year.

[b]Includes price categories of "$30 per Pound or Less" through "Unlimited Price" shown on Table 43.

Note: Prices are in constant January 1, 1993 dollars. Data are based on estimates made by domestic suppliers as of December 31, 1992. Quantities of U_3O_8 in price categories are cumulative within each year; that is, for each year the quantities at higher price categories include all quantities in the lower price categories.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Appendix A

Survey Methodology

Excavating an openpit uranium mine at a sandstone-type uranium deposit. The ore-bearing sandstone will be exposed by removal of overlying, barren strata in preparation for recovery of the uranium ore. Walls of the openpit are benched to assure slope stability.

Appendix A

Survey Methodology

Survey Design

The ninth comprehensive survey of the U.S. uranium industry was conducted in 1993 by the Energy Information Administration (EIA) using the "Uranium Industry Annual Survey," Form EIA-858. Data were collected from all companies involved in the U.S. uranium industry. The survey form was mailed to these firms in January 1993. The data reported in this publication were developed from the Form EIA-858 survey for 1992 and predecessor data systems.

Respondents to the "Uranium Industry Annual Survey" were asked to provide data current to the end of 1992 about the following: uranium raw materials activities (including land holdings, exploration and development activities, uranium-bearing properties and resources, uranium mines, uranium processing facilities, and uranium industry employment for exploration, mining, milling, and processing); uranium marketing activities (including contracts, contract prices, delivery schedules, uranium inventories, and material available for sale); and the uranium industry's financial status (including current and noncurrent assets, current and long-term debt, stockholders' equity and other liabilities, sources and uses of funds, planned capital expenditures, operating revenues, and operating expenses).

The data collected on Form EIA-858 are subject to various sources of error. These sources are: (1) coverage (the list of respondents may not be complete or, on the other hand, there may be double counting); (2) nonresponse (all units that are surveyed may not respond or may not provide all the information requested); (3) respondents (respondents may commit errors in reporting the data); (4) processing (the data collection agency may omit or incorrectly transcribe a submission); (5) concept (the data collection elements may not measure the items they were intended to measure); and (6) adjustments (errors may 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.[3] Although it is not possible to present estimates of non-sampling 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 1992, 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 State; (3) incurred uranium exploration expenditures in 1992 or plan such expenditures in 1993; (4) hold uranium reserves; (5) control uranium mining properties; (6) control commercial uranium extraction operations; and (7) purchase, sell, or own domestic- or foreign-origin uranium. (See Form EIA-858 in Appendix D for a complete explanation of these categories.)

The respondent list used for the Form EIA-858 survey was developed from a frame of all establishments known to meet the selection criteria. The frame of potential respondents was compiled from previous surveys and from information in the public domain. The frame was intended to cover the following: all utilities owning nuclear-fueled generating stations; large and small companies actively engaged in exploration, development, or extraction in the U.S. uranium industry; and companies holding all large properties with uranium reserves. Companies meeting these criteria

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

include: those involved in exploration, development, mining, milling, and trading of uranium; landowners, fuel converters, and fabricators; and utilities with whole or partial ownership in operating or planned uranium-fueled 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 and therefore were eliminated from the survey frame. All known companies currently conducting business in the U.S. uranium industry were contacted during this survey.

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

Cooperation from industry on the 1992 survey was, as in previous years, excellent. A large number of respondents replied to the form within the specified deadlines. Those that had not responded by the due dates (March 13th for Schedules A and B, and April 17th for Schedule C) were telephoned to encourage submission of the forms, and those calls resulted in the submission of most of the remaining forms. In addition, a followup letter was mailed to nonrespondents requesting compliance with the survey by May 15th. Subsequently, telephone calls were made to obtain forms not yet submitted. In a few instances, company data were collected through telephone conversations, followed by submissions of the survey forms.

In order to reduce the burden to the respondents, every effort was made to identify the properties, mines, mills, plants, and long-term contracts that form the bulk of responses to the 1992 survey. Selected data elements for these items that were reported by industry companies on the previous year's forms were preprinted on the 1992 form.

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 data base containing all current and historical data from each company's submissions. The data base is maintained on the EIA computer facility in Washington, DC. After entry into the data base, a copy of each section of the Form EIA-858 was distributed to the Survey Management Division analyst responsible for that section. 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 significantly from company to company. Most represented different interpretations of the data item definitions. No data in the data base were changed without first consulting with the reporting company. Computer edits were also used to identify keypunch errors, out-of-range values, and unlikely data combinations. These were also either corrected to represent the data reported on the submissions or were changed only after confirming the corrected values by telephone conversations with company representatives. Data coding and entry errors were eliminated by proofing data after entry. All changes to reported data are documented.

Response Rates

Schedule A of Form EIA-858 was mailed to 87 firms, Schedule B was mailed to 145 firms, and Schedule C was mailed to 32 firms. The response statistics for the 1992 survey are shown in Table A1. Overall, 100 percent of the schedules that were mailed to industry companies were returned with the data requested on the form or marked as not applicable to the company for this survey year.

Missing Data

Some omissions of data were identified during the prescreening and editing of the data. Most omitted data elements fell into two categories: withheld because of contractual constraints or contracts that were under litigation, or inadvertent omissions. Respondents were contacted regarding omissions to obtain the data or to verify that it could not be reported. Only confirmed company-reported data are contained in the data base 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)

Table A1. Response Statistics for the 1992 Uranium Industry Annual Survey

Response Status	Schedule		
	A	B	C
Survey Schedules Mailed Out	87	145	32
Data Provided	68	126	30
Reported as Not Applicable[a]	19	19	2

[a]Includes respondents stating that in 1992 the company did not meet any of the criteria for inclusion in the survey.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

of data it collects and publishes. The policy covers revisions to prior published data. This new policy is 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 greater than one percent difference 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 inventories data are published as final data. Data on uranium inventories for the survey year are published as preliminary data because survey respondents are requested to make changes to their prior year inventories data, if necessary, when reporting inventories data for the current year. These revised inventory data are indicated by an "R" in front of the revised data cell.

Changes to the prior year total uranium inventory figures based on revisions reported on Form EIA-858 have been: for 1991, -1.3 million pounds U_3O_8 (-1.1 percent); 1990, -3.1 million pounds U_3O_8 (-2.3); 1989, 1.0 million pounds U_3O_8 (0.7); 1988, 0.1 million pounds U_3O_8 (<0.1); 1987, 0.3 million pounds U_3O_8 (0.2); and 1986, 0.4 million pounds U_3O_8 (0.2 percent).

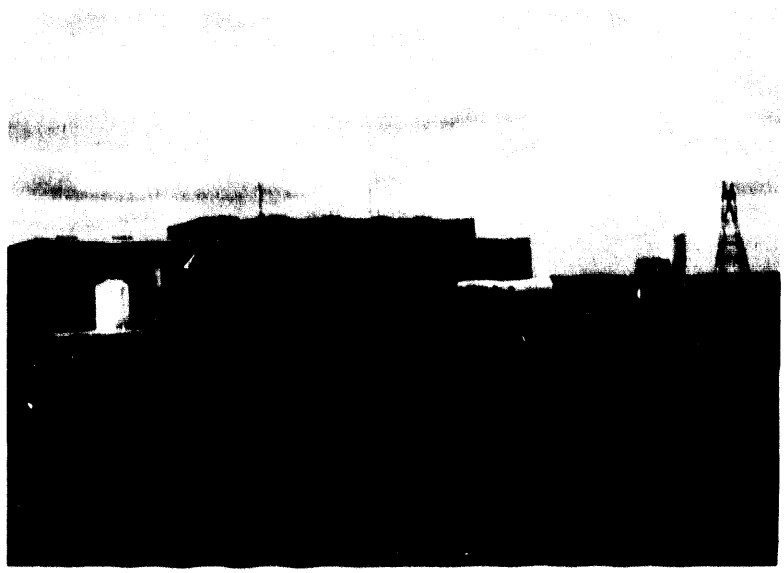
Nondisclosure of Data

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

A sensitive table-cell value can be reported, if permission is first obtained from each company (whose data contribute to the sensitivity) to publish the value and if the company believes that publishing the value would not harm its competitive position. This is the only exception to the application of EIA Standard No. 88-05-06 in this report.

Appendix B

Technical Notes



A facility for treating uranium-bearing solutions obtained from an in situ *mining operation. Uranium is recovered from the solutions for use as nuclear fuel.*

Appendix B

Technical Notes

History and Legal Authority

From August 1942 through 1946, the Manhattan Engineer District (MED), under the U.S. Army Corps of Engineers, was responsible for development of nuclear weapons.[4] In that role, MED administered U.S. uranium procurement programs along with its nuclear research and development, engineering, and production operations.[5] The Atomic Energy Act, signed on August 1, 1946, resulted in the establishment of the Atomic Energy Commission (AEC). By Executive Order 9816, the Government-owned facilities and functions of MED were transferred to the AEC at midnight December 31, 1946. The following is quoted from a 1982 DOE publication.[6]

> *Procurement of uranium concentrates by the AEC spanned the period from 1947 through 1970. During those years, in definable stages, the market for uranium concentrates changed from a monopsony with the Federal Government as the only buyer, to a completely commercial market with no Government purchases. From the viewpoint of the Government as a consumer, the foreseeable supply of uranium increased from desperately short of that which was required for defense needs, to adequate, to surplus. Procurement policies and contracting practices were adopted, implemented, and modified in response to the Government's changing needs and the perceived lack or adequacy of uranium supplies with which to meet them.*
>
> *The AEC procurement policies and practices were not dictated solely by its defense needs, however. The agency was also guided by provisions of the Atomic Energy Acts of 1946 and 1954, which were designed to foster development and utilization of atomic energy for peaceful purposes. Therefore, procurement policies also reflected concern for fostering and maintaining a producing uranium industry which would be able to supply the nation's expected uranium requirements for private nuclear power development.*

The Atomic Energy Act of 1954 (Public Law 83-703) eased the Government's control over nonmilitary uses of atomic energy by making lawful the private development and ownership of reactors. However, the Act stipulated that the fuel to power privately owned reactors could be obtained only from the AEC through lease arrangements. By 1963, advances had taken place to further the commercial viability of nuclear power, and many interest groups contended that nuclear fuels should be allowed to compete with other fuels in the marketplace.

Legislation to permit private ownership of nuclear fuels was passed in 1964 in the form of the Private Ownership of Special Nuclear Materials Act (Public Law 88-489). This Act allowed the AEC to provide toll-paid enrichment services for privately owned uranium. It also authorized the AEC to limit the offering of enrichment services for foreign-origin uranium owned by domestic customers to the extent necessary to maintain a viable domestic uranium industry. The latter provision has been the authority upon which the AEC and successor agencies have monitored the status of the U.S. uranium industry.

Public Law No. 97-415, the Nuclear Regulatory Commission (NRC) Authorization Act of 1983 enacted on January 4, 1983, further strengthened the Federal Government's role in monitoring the status of the U.S. uranium industry. This law amended the Atomic Energy Act of 1954 by adding Section 170B, which

[4]R.G. Hewlett and O.E. Anderson, Jr., "A History of the United States Atomic Energy Commission," *The New World, 1939-1946*, Volume 1 (University Park, Pennsylvania: The Pennsylvania State University Press, 1962), p. 82.

[5]U.S. Department of Energy, *Summary History of Domestic Uranium Procurement Under U.S. Atomic Energy Commission Contracts*, Final Report, GJBX-220(82) (Grand Junction, Colorado, October 1982), p. 3.

[6]U.S. Department of Energy, *Summary History of Domestic Uranium Procurement Under U.S. Atomic Energy Commission Contracts*, GJBX-220(82) (Grand Junction, Colorado, October 1982), pp. 3-4.

required the Secretary of Energy to determine annually, for the years 1983 through 1992, the viability of the domestic uranium industry.

Determination of the uranium industry's viability requires a continuing review of the industry's status and prospects. Reports on domestic uranium raw materials and marketing activities have been published since 1968, first under the direction of the AEC, later by the Energy Research and Development Administration, then by the Assistant Secretary for Nuclear Energy, Office of Uranium Enrichment and Assessment in the U.S. Department of Energy (DOE), and more recently by the Energy Information Administration (EIA). The legal authority for Form EIA-858, "Uranium Industry Annual Survey," is stated on the form as follows:

> *Data on this mandatory survey are collected under authority of Section 170B of the Atomic Energy Act of 1954 as amended (42 U.S.C. 790a) and 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.

Uranium and the Uranium Industry: A Brief Description

Prior to 1942, uranium for domestic consumption was obtained from ores that were mined primarily for their associated radium and vanadium.[7] The radium was used in medical therapy; the vanadium was used primarily to improve the metallurgical properties of steel, cast iron, and other metals. The uranium was used in manufacturing glass and ceramics to produce yellow-to-brown colors; it was also used in making special alloys of steel, copper, and nickel.

Since passage of the Atomic Energy Act of 1954, uranium has been produced primarily as a fuel for nuclear reactors. Heat produced by the fissioning of U^{235} in a reactor is used to generate steam, which is then used to generate electricity. One pound of natural uranium can produce as much energy as about 14,000 pounds of coal. Uranium is also used in the production of various radioactive isotopes for medical and other applications and for scientific research.

The average concentration of uranium in the earth's crust is approximately 2 parts per million. Uranium is more abundant than such "common" elements as mercury, silver, and gold. Many rocks contain minor quantities of uranium, and economically important quantities occur in naturally formed concentrations of minerals such as pitchblende, uraninite, coffinite, and carnotite. Pitchblende, which contains various uranium oxides, is the richest uranium ore mineral.

In the United States, most uranium deposits occur in sandstone host rocks. Significant deposits also occur in mineralized breccia in solution-collapse structures and as veins and fracture fillings in metamorphic and granitic rocks, and, to a lesser extent, in volcanic rocks which host lower-grade deposits. Uranium deposits in sandstones commonly consist of finely divided uranium mineral grains that fill pore spaces, and the uranium can replace some primary mineral grains and cementing materials of the host rock. Other metals associated with uranium in some deposits are vanadium, copper, selenium, molybdenum, beryllium, and chromium.

Exploration for uranium deposits can involve searching for near-surface targets as well as targets at depths of several thousand feet. A principal technique in uranium exploration involves the measurement of radioactivity in holes drilled to evaluate a prospective target. Systematic logging of boreholes with a variety of geophysical techniques, including gamma-ray, self-potential, resistivity, and other surveys, is a standard practice in uranium exploration. Modern exploration procedures also include detailed geological mapping, geochemical

[7]U.S. Geological Survey, Warren I. Finch and others, "Uranium," *United States Mineral Resources*, Professional Paper 820 (Washington, DC, 1973), pp. 455-468.

surveys, and analysis of borehole cuttings and cores in the field and laboratory.

The principal States in which uranium-bearing ores have been mined (including *in situ* mining), primarily for their uranium content, are Arizona, Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Washington, and Wyoming. Both openpit and underground mining methods can be used to produce uranium ores from the ground; these methods are referred to as "conventional" mining. In addition, significant amounts of uranium concentrate are produced by "nonconventional" methods, such as solution (*in situ*) mining. Uranium has been recovered as a byproduct of phosphate, copper, and beryllium production.

At uranium mills, usually located near conventional mines, uranium is extracted from ores by chemical leaching to obtain uranium concentrate. The concentrate from mills, *in situ* mining (including slurry), and byproduct recovery is shipped to conversion facilities, where it is used in the production of uranium hexafluoride (UF_6).

Uranium hexafluoride is the feed material for the uranium enrichment process. Currently there are two types of enrichment processes used commercially: gaseous diffusion and centrifugal. In the gaseous diffusion process used in the United States, gaseous UF_6 is passed through a series, or cascade, of porous membrane filters. The UF_6 contains the uranium isotopes U^{235} (0.7 percent), which is naturally fissionable, and U^{238} (99.3 percent), which is not naturally fissionable. In the filtering process, UF_6 molecules containing the U^{235} isotope diffuse through the filters more readily than molecules containing the U^{238} isotope. Repeated several times in series, the diffusion process eventually results in two product streams of UF_6. Compared with the original feed material, one product stream is relatively enriched in the isotope U^{235}, and the other is relatively depleted in U^{235}.

In the enrichment process for commercial nuclear fuel, the concentration of U^{235} is increased from the naturally occurring 0.7 percent to about 3.5 percent. Enrichment is necessary for uranium used as fuel in light-water reactors, because the amount of fissile U^{235} in natural uranium is too low to sustain a nuclear chain reaction in those reactors. Uranium used as fuel for heavy-water reactors does not require enrichment.

At the fuel fabrication plant, the enriched UF_6 is converted to uranium dioxide (UO_2). The uranium dioxide is compressed into solid, cylinder-shaped pellets that are placed in hollow rods made of a zirconium stainless-steel alloy. These rods are grouped to form fuel-rod assemblies, which, in various configurations, are shipped to nuclear power plants for use as nuclear reactor fuel.

Estimation of Reserves and Potential Resources

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 have been updated using information provided by the U.S. Geological Survey (USGS).

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

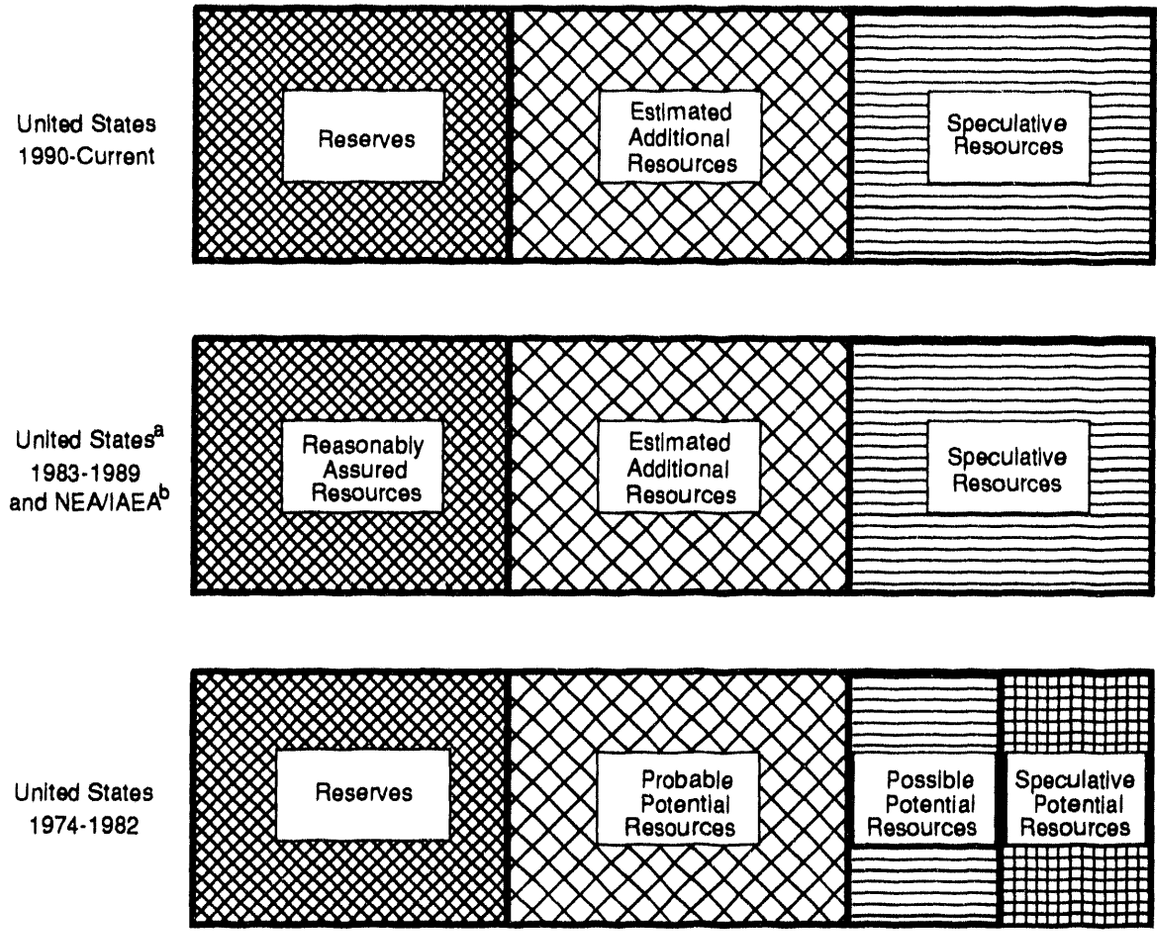
Appraisal of Potential Resources

The appraisal of the Nation's potential resources of uranium, which comprise the EAR and SR categories, is based on extensive data collected under the uranium procurement and resource appraisal programs of DOE, its predecessor agencies, and the USGS. These data include: analyses of company-supplied gamma-ray logs of drill holes; chemical assays of core samples; data from geochemical surveys of groundwater and stream water and sediment; aerial radiometric surveys; limited selective drilling to fill voids in subsurface information; and extensive geological studies of field areas throughout the United States.

An estimate of the uranium endowment is calculated for each geologically favorable setting delineated. The estimate is derived through evaluation and integration of data from field studies, as well as from mathematical and geological models of known uranium deposits (control areas). The uranium endowment, for a given geographical area under study, is an estimate of the quantity of all uranium-bearing material with a grade of at least 0.01 percent U_3O_8 postulated to occur in that setting. This estimate is made before any consideration is given to the economics of exploration and exploitation. It therefore includes undiscovered resources (EAR and SR), as well as associated additional material at or above the 0.01 percent cut-off grade within the area for which the estimate is made.

In the estimation of potential resources, economic factors for discovering, mining, and milling the

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



[a]This nomenclature was adopted in 1983 by the U.S. Department of Energy and was patterned after the Nuclear Energy Agency/International Atomic Energy Agency Standard.

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

[b]NEA/IAEA: Nuclear Energy Agency/International Atomic Energy Agency.

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

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

undiscovered deposits in the favorable area are determined, and the costs are computed considering information about deposit location, depth, and other parameters. Computer-based models are used to determine operating costs for mining, hauling, milling, severance and ad valorem taxes, royalty, and capital costs for land acquisition, exploration, development, mining, and milling. All costs are forward costs: that is, costs that have not been incurred. The cost factors are used to calculate average and cut-off grades that are expected to be economic for the $30-, $50-, and $100-per-pound U_3O_8 category in each favorable area. A grade-tonnage relationship, usually derived from the selected control area, is also needed to calculate

economic potential resources. The grade-tonnage relationship is used to define a probability distribution for various grades, which in turn is used to develop a probability statement about the quantity of resources likely to meet or exceed the grade criteria.

Estimates of Potential Uranium Resources, 1965 Through 1973

Prior to 1974, estimates of undiscovered uranium resources made by the U.S. Department of Energy (DOE) were assigned to a single resource class, potential uranium resources. The estimates were made for geologically favorable settings in the western United States, primarily in and adjacent to established uranium mining districts, by using the principles of geological analogy to compare geological characteristics favorable for the occurrence of uranium deposits between a "favorable" area and a similar area with known deposits. The methodology yielded point estimates that lacked associated probability distributions. The estimates of potential uranium resources made for 1965 through 1973 are shown in Table B1.

Potential Uranium Resources, 1974 Through 1991

From January 1974 through September 1983, the Atomic Energy Commission (AEC), the Energy Research and Development Administration (ERDA), and the DOE conducted the National Uranium Resource Evaluation (NURE) program to appraise the uranium resources (including uranium reserves) in favorable geological settings throughout the United States. Estimates of potential resources made during these years were reported for three resource classes to aid in describing the reliabilities of potential resources across the wide variety of geological environments investigated during the nationwide program. The three classes of resources used during the NURE program were Probable Potential, Possible Potential, and Speculative Potential Resources. The NURE program was terminated in 1983.

Support from the U.S. Geological Survey

In accordance with a Memorandum of Understanding (MOU) signed in 1984 between the EIA and the U.S. Geological Survey (USGS) of the U.S. Department of the Interior, the USGS provides to the EIA annual estimates of the Nation's uranium endowment and its undiscovered uranium resources. Through its ongoing geological programs, the USGS conducts studies of uranium districts and favorable geological environments in selected localities where, because of the availability of new scientific knowledge or industry-developed information relating to uranium resources, opportunities exist for updating the National uranium resource data base, the Uranium Resources Assessment Data (URAD) System, first developed under the NURE program. In this manner, the USGS is continuing the assessment of the Nation's uranium endowment and undiscovered uranium resources begun under the DOE's uranium resource appraisal program. The methodology used by

Table B1. Potential Uranium Resources at the End of the Year, 1965-1973
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]			
	$8 per pound	$10 per pound	$15 per pound	$30 per pound
1965	(b)	650	1,050	1,330
1966	(c)	(c)	(c)	(c)
1967	490	700	1,140	2,000
1968	(c)	(c)	(c)	(c)
1969	770	1,200	1,920	3,200
1970	980	1,360	2,080	3,200
1971	920	1,300	2,000	3,200
1972	900	1,400	2,000	3,200
1973	900	1,400	2,000	3,200

[a]See Glossary for definition of forward cost.
[b]Not estimated at this forward cost.
[c]No estimates were made for the end of years 1966 and 1968.
Note: Potential resources at forward costs above $30 per pound U_3O_8 were not estimated prior to 1977.
Source: U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983).

the USGS to develop the U.S. uranium endowment estimates is described in USGS Circular 994 (1987).[8]

In 1989, the EIA's estimate of potential resources reported for the Colorado Plateau region incorporated for the first time values for uranium endowment supplied by the USGS for deposits associated with the solution-collapse, breccia-pipe environment common in the northern Arizona area. The USGS endowment estimates were used in the EIA cost model, along with endowment estimates for other localities to develop estimates of U.S. potential resources.

Uranium Endowment by Resource Region

The distribution of mean values of uranium endowment estimates provided by the USGS for U.S. resource regions for 1992 is shown in Table B2. The distribution of endowment values for all regions are unchanged from 1991 values. These endowment values represent the aggregate totals across all favorable localities within each region of the estimated uranium at a grade of 0.01 percent U_3O_8 and higher grades. Uranium resource regions are defined by geologic and physiographic characteristics and the regions are shown in Figure B2.

Potential Uranium Resources for 1992, EAR and SR

Annual estimates of U.S. potential uranium resources as EAR and SR are prepared from the uranium endowment data. These estimates consist of the portions of the endowment for over 700 favorable localities that could be recoverable at selected forward costs of production based on economic evaluation of anticipated operating

Table B2. Uranium Endowment by Resource Region at the End of 1992
(Million Pounds U_3O_8)

Resource Region	Endowment Associated with Estimated Additional Resources[a]	Endowment Associated with Speculative Resources[a]
Colorado Plateau	3,950	2,430
Wyoming Basins	1,990	450
Coastal Plain	910	410
Northern Rockies	680	3,940
Colorado and Southern Rockies	320	360
Great Plains	310	950
Basin and Range	1,420	1,080
Central Lowlands	(b)	280
Appalachian Highlands	120	1,140
Other Regions[c]	50	120
Total	**9,750**	**11,160**

[a]Values shown are the mean values for the distribution of estimates for each forward-cost category, rounded to the nearest 10 million pounds U_3O_8.

[b]No uranium endowment in the Estimated Additional Resources category is estimated for this resource region.

[c]Includes endowment associated with Estimated Additional Resources for Pacific Coast region and Alaska and endowment associated with Speculative Resources for Columbia Plateau, Pacific Coast, and Southern Canadian Shield regions and Alaska.

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

Sources: Estimates are based on uranium resources data developed under the DOE National Uranium Resources Evaluation (NURE) program using methodology described in *An Assessment Report on Uranium in the United States of America* (October 1980), in U.S. Department of Energy *Uranium Industry Seminar* (October 1980), and under the USGS Uranium Resource Assessment project using the methodology described in *Uranium Resources Assessment by the Geological Survey:* Methodology and Plan to Update the National Resource Base, U.S. Geological Survey Circular 994 (1987).

[8]W.I. Finch and R.B. McCammon, "Uranium Resource Assessment by the Geological Survey: Methodology and Plan to Update the National Resource Base," U.S. Geological Survey Circular 944 (Denver, Colorado, 1987), p. 31.

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).

and capital costs, cutoff grade, minimum mining grade, and other factors.

Estimates of U.S. EAR and SR for 1992 were generated using revised economic index values (current to December 1992) in the URAD System's cost model, new geological data and analyses provided by the U.S. Geological Survey, and the extensive data on potential uranium resources that were compiled during the NURE program. The economic indexes are the Wholesale Price Index-Industrial Commodities (WPI), the Marshall and Swift Mining-Milling Equipment Cost Index (MSI), and the Chemical Engineering Plant Cost Index (CEP). For 1990, the URAD System cost model was updated to raise the pre-set threshold value for the average-grade cutoff to reflect the higher range of average grades encountered in deposits in the breccia-pipe environment in northern Arizona. For 1991, the threshold value for the average grade cutoff was removed altogether. This was done in order to reflect more accurately the entire range in grades of the uranium inventory represented by the grade-tonnage curves across all control areas. This change resulted in overall increases in the estimates for the total EAR and SR cost categories with progressively smaller increases with each higher cost category. Estimates for years prior to 1990 would also be affected by this change; however, the changes in the values are not significant and therefore have not been made. Estimates of potential resources in the EAR and SR classes for 1974 through 1992 are shown in Table B3.

For 1992, the mean values for the $30-, $50-, and $100-per-pound U_3O_8 forward-cost categories of EAR showed no significant changes when compared with the EAR values for 1991 (Table B3). Estimates of potential resources in the SR class decreased by 4, 3, and 1 percent, respectively, in the $30-, $50- and $100-per-pound forward-cost categories (Table B4).

Distribution of EAR and SR by Resource Region

The mean values of EAR and SR are summarized for principal resource regions and forward-cost categories

Table B3. Estimated Additional Resources (EAR) and Speculative Resources (SR) at the End of the Year, 1974-1992

(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]									
	$10 per pound		$15 per pound		$30 per pound		$50 per pound		$100 per pound	
	EAR	SR	EAR	SR	EAR	SR	EAR	SR	EAR	SR
1974	900	1,000	1,400	1,700	2,300	3,500	(b)	(b)	(b)	(b)
1975	900	1,100	1,300	1,900	2,100	3,700	(b)	(b)	(b)	(b)
1976	600	400	1,200	1,400	2,200	3,200	2,700	3,900	(b)	(b)
1977	(b)	(b)	1,100	1,300	2,000	3,100	2,800	4,200	(b)	(b)
1978	(b)	(b)	800	600	2,000	2,000	3,000	3,400	(b)	(b)
1979[c]	(b)	(b)	800	600	2,000	2,000	3,000	3,400	(b)	(b)
1980	(b)	(b)	600	300	1,800	1,300	2,900	2,200	4,200	3,400
1981	(b)	(b)	(b)	(b)	1,200	900	2,200	1,800	3,500	2,900
1982	(b)	(b)	(b)	(b)	1,300	900	2,300	1,800	3,800	3,000
1983	(b)	(b)	(b)	(b)	1,300	1,000	2,400	2,000	3,800	3,200
1984	(b)	(b)	(b)	(b)	1,300	1,000	2,300	2,000	3,700	3,200
1985	(b)	(b)	(b)	(b)	1,300	1,000	2,400	1,900	3,800	3,200
1986	(b)	(b)	(b)	(b)	1,300	1,000	2,400	1,900	3,800	3,200
1987	(b)	(b)	(b)	(b)	1,300	1,000	2,300	2,000	3,700	3,200
1988	(b)	(b)	(b)	(b)	1,300	1,000	2,300	2,000	3,800	3,200
1989	(b)	(b)	(b)	(d)	2,300	1,400	3,400	2,300	5,000	3,500
1990	(b)	(b)	(b)	(d)	2,200	1,300	3,400	2,200	4,900	3,500
1991	(b)	(b)	(b)	(d)	2,200	1,400	3,400	2,300	4,900	3,600
1992	(b)	(b)	(d)	(d)	2,200	1,300	3,400	2,300	4,900	3,500

[a]Values shown are the mean values for the distribution of estimates for each forward-cost category, rounded to the nearest 100 million pounds U_3O_8. 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.

[b]Not estimated for the indicated forward-cost category.

[c]No new estimates were released for the end of 1979, since the NURE program was to publish estimates of potential resources by October 1980.

[d]Resource values were estimated for the $15 per pound U_3O_8 forward-cost category, but were not included in the table.

Sources: **1974-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1983-1988**—Estimates based on uranium resources data developed under the DOE National Uranium Resource Evaluation (NURE) program. **1974-1983**, using methodology described in *An Assessment Report on Uranium in the United States of America* (October 1980) in U.S. Department of Energy, *Uranium Industry Seminar* (October 1980);and under U.S. Geological Survey (USGS) Uranium Resource Assessment Project. **1989-1992**—Estimates based on uranium resources data developed under the NURE program and USGS Uranium Resource Assessment Project using methodology described in *Uranium Resource Assessment by the Geological Survey: Methodology and Plan to Update the National Resource Base*, U.S. Geological Survey Circular 994 (1987).

in Table B4. Resource regions are shown on Figure B2. Declines occurred in 1992 in the $30-per-pound U_3O_8 EAR values for the Colorado Plateau, Wyoming Basins, Coastal Plain, and Basin and Range regions and in the SR values for the Colorado Plateau, Northern Rockies, Basin and Range, and Other Regions. Declines also are shown for several regions at the higher forward-cost categories. The declines were caused by higher values for the economic indexes used in the URAD cost model for 1992. For some regions and cost categories, the declines in the EAR and SR estimates were partially offset by the removal of the threshold factor for grade-cutoff from the URAD cost model, which resulted in increases for EAR and SR estimates for those regions.

Distribution of EAR and SR by Land Status

The distribution by land status of mean values for $50-per-pound EAR and SR at the end of 1992 is shown in Table B5. Estimates for the quantities of EAR show minor changes compared with 1991. The full extent of these small changes is not apparent in the values shown on Table B5, because those values are rounded to the nearest 10 million pounds of U_3O_8. Decreases in

Table B4. Estimated Additional Resources (EAR) and Speculative Resources (SR) by Resource Region at the End of 1992
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]					
	$30 per pound		$50 per pound		$100 per pound	
	EAR	SR	EAR	SR	EAR	SR
Colorado Plateau	1,360	490	1,930	790	2,500	1,230
Wyoming Basins	160	90	350	160	670	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	100	160	180	400	330
Other Regions[b]	110	340	190	620	270	1,000
Total	**2,220**	**1,340**	**3,360**	**2,270**	**4,900**	**3,530**

[a]Values shown are the mean values for the distribution of estimates for each forward-cost category, rounded to the nearest 10 million pounds U_3O_8. 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.

[b]Includes Appalachian Highlands, Great Plains, Pacific Coast and Sierra Nevada, Central Lowlands, and Columbia Plateau regions and Alaska.

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

Sources: Prepared by the staff of the U.S. Geological Survey, U.S. Department of the Interior, 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).

the quantities over those for 1991 are shown for EAR for Bureau of Land Management Land and Private Fee Lands and for SR for Bureau of Land Management Land, State Land, and Private Fee Lands.

U.S. Uranium Reserves

Uranium reserves are the estimated quantities of uranium that occur in known deposits of such grade, quantity, configuration, and depth that they can be recovered at or below a specified cost with state-of-the-art mining and processing technology. Estimated reserves are based on direct radiometric and chemical measurements in drill holes and other types of sampling of 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 specified forward-cost levels are estimated according to conventional engineering practices, using available engineering, geologic, and economic data. Uranium reserves estimated by the DOE have been adjusted for mining dilution and mill recovery.

The costs used to categorize uranium resources are forward costs (operating and capital costs) in current (year of estimate) dollars that would be incurred in producing the uranium. The costs indirectly cover power and fuel, labor, materials, royalties, payroll, severance and ad valorem taxes, insurance, and applicable general and administrative costs. Previous expenditures (before the time of the estimate) for such items as property acquisition, exploration, mine development, and mill construction are excluded. Also excluded are income taxes, profit, and the cost of money. The forward-cost categories are independent of the market price at which the uranium might be sold. In estimating reserves for developed properties, land acquisition and exploration costs commonly are past expenditures and thus are excluded from the cost estimates.

Procedure for Estimating Reserves, 1964-1983

U.S. uranium reserves from 1964 to 1983 were estimated by the DOE using data voluntarily provided by uranium companies to DOE's Grand Junction Projects Office. Reserves were estimated for each property individually and were based on available data

Table B5. Estimated Additional Resources (EAR) and Speculative Resources (SR) in the $50-per-Pound Forward-Cost Category by Land Status at the End of 1992

Land Status	Estimated Additional Resources[a]		Speculative Resources[a]	
	Million Pounds U_3O_8	Percent of Total EAR	Million Pounds U_3O_8	Percent of Total SR
Public Lands				
Bureau of Land Management and Forest Service Lands	970	28.9	480	21.1
Bureau of Reclamation	(b)	(c)	(b)	0.2
Wilderness Areas	20	0.5	20	0.7
National Park Service Lands	110	3.3	10	0.6
Wildlife Refuges	(b)	(c)	(b)	0.1
DOE-Administered	10	0.2	(b)	(c)
Indian Lands	460	13.5	230	10.2
State Lands	200	5.9	160	7.2
Private Fee Lands[d]	1,540	45.9	1,310	57.7
Other (Military Reservations, Waterways, Reclamation Projects, Proposed Withdrawals, etc.)	60	1.8	50	2.2
Total	**3,360**	**100.0**	**2,270**	**100.0**

[a]Values shown are the mean values for the distribution of estimates of EAR and SR, rounded to the nearest 10 million pounds U_3O_8.
[b]Value is less than 5 million pounds U_3O_8.
[c]Value is less than 0.05 percent.
[d]Includes railroad lands and patented claims.
Note: Totals may not equal sum of components because of independent rounding.
Sources: Prepared by the staff of the USGS Geological Survey, U.S. Department of the Interior, 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).

from samples, drill holes, and property maps. The amounts of uranium in ore that could be produced from a property at maximum forward costs of $15-, $30-, $50-, and $100-per-pound U_3O_8 were estimated by the general procedure outlined below. This procedure was applied to the estimates of reserves to be recovered by openpit, underground, and *in situ* leaching operations.

1. The cut-off grade was determined to define the lowest grade (in percent U_3O_8) of material that could be mined from a property at a given thickness, where the total operating cost per pound of recoverable U_3O_8 in such material would be equal to the chosen cost ($15-, $30-, $50-, or $100-) per-pound. The cut-off grade was determined by the following formula:

$$CG = \frac{(M_n + H + R + M_l)(100)}{(CC)\,(M_r)\,(2{,}000)},$$

where:

CG = cut-off grade in percent,
M_n = cost of mining per ton of ore,
H = cost of hauling per ton of ore,
R = royalty costs per ton of ore,
M_l = cost of milling per ton of ore,
CC = chosen cost per pound U_3O_8, and
M_r = mill recovery rate (in percent).

2. The quantity of mineralized material in the deposit that met or exceeded the cut-off grade and thickness criteria was estimated, in tons of material and average grade adjusted for mining recovery and dilution.

3. All forward operating and capital costs not yet incurred were applied to determine the average cost for mining and processing per pound U_3O_8.

4. If the average cost per pound U_3O_8 derived in Step 3 was equal to or less than the chosen cost

category, the material was assigned to that cost category.

The procedures described above applied to reserves suitable for conventional mining. The quantities of U_3O_8 estimated to be recoverable from *in situ* leaching operations are included in reserves totals but were estimated by another method. *In situ* leaching above a selected minimum thickness were calculated for those properties on which *in situ* mining was in progress or was planned. The minimum grade-thickness was determined for each property, and the reserves were determined by multiplying the estimated amount of U_3O_8 by a mining recovery factor.

Procedure for Estimating Reserves for 1984 to 1989

During 1983, the estimation procedure described above was ended. Estimates for the end of 1984 through 1989 were made by adjusting the estimates made for the end of 1983. For this period, additions to reserves were made for properties not in the NURE data base. Deletions from reserves were made during the period for properties reported as mined out. Adjustments were also made to account for production, including "erosion" of higher cost reserves caused by the mining of lower cost reserves.

Beginning in 1984, the Energy Information Administration (EIA), through the Form EIA-858, "Uranium Industry Annual Survey," requested that domestic uranium industry companies report their estimates of economic reserves of uranium. Aggregations of U.S. economic reserves quantities were published in the report series *Uranium Industry Annual* beginning in 1985. Domestic uranium companies also were requested, beginning in 1985, to report estimates of their subeconomic uranium reserves. The estimates of economic and subeconomic reserves were derived by the uranium companies based on analyses of all pertinent data acquired in the exploration and development of individual properties and on cost anticipated for the individual mining operations.

Current Procedure for Estimating Reserves

Estimates of reserves as of the end of 1990 through 1992 reflect the phasing in of a new approach to estimation now employed by the EIA. The previous procedure in which estimates were made by modifying earlier deposit-by-deposit estimates made by DOE staff, which was in use since 1984 and is described above, has been phased out. The basic deposit estimates that were being modified are now thought to be too old to serve as a suitable base for making current reserve estimates. Additional changes have taken place affecting the status of the deposits that cannot be reflected in a modification of the estimates based primarily on adjustment for annual production. These include increased knowledge of the deposits from recent exploration and mining and environmental restriction that impact on the ability of the domestic industry to economically produce uranium, the changing status of industry firms, and changes in mining and processing technology.

The new procedure develops current estimates of reserves producible at selected cost levels using basic information provided by the mining companies. This approach relies on closer cooperation and information exchange with the uranium companies. Direct use of company estimates and information are made to the maximum extent possible. Company reserve estimates are used directly where they conform to EIA definitions and criteria. Modification to company estimates are made as needed to put them in conformity with the EIA standards or use of historical data to develop missing estimates. Where this is not possible independent deposit reserve estimates using methods similar to the 1964-1983 procedure described above are made by EIA staff.

The costs considered for each cost level includes all forward-cost estimates required to develop and produce the uranium that will be recovered in the mining and processing of ores. This includes capital and operating costs incurred from the nominal date of the estimate.

There are three main components to the new approach;

1. Gathering of Information by Questionnaire, Form EIA-858

   Form EIA-858 was revised for 1990 to clearly lay out EIA objectives and criteria to encourage full reporting of essential reserve data and related information. In addition, the Form was simplified and clarified. Some items previously requested, such as company estimates of "economic" and "subeconomic" reserves, were eliminated. The responses to the Form provide the basic input from the industry on the status of the properties with uranium resources, exploration and development activities, and the company estimates of reserves under the EIA criteria or under the criteria being used by the companies, together with information on the criteria and procedures used. Review of the information received from the Form provides a basis for determining further action by EIA, in conjunction with historical information

held by the EIA concerning company estimation procedures.

2. Review of Company Procedures

   Building on information provided by companies in the Form EIA-858 provides a basis for determining whether the company's estimates meet EIA criteria without modification. If EIA criteria are not met, followup meetings are held with company staff. In these meetings a detailed discussion of the company criteria and procedures for reserve estimation is held. A clear understanding of company procedures can provide a basis for modifying company estimates to make them consistent with EIA criteria. Establishment of such understanding with a company can provide a simplified procedure for the EIA to use in handling data received from the company in the future.

3. Independent EIA Estimates

   Where a review of company procedures indicates it is not feasible to accept company estimates directly or to modify them to conform to EIA criteria, independent EIA estimates of reserves are made using company-provided basic data. In some cases, independent reserve estimation and analysis are done to establish ore deposit parametric relationships that provide a means to modify company estimates to EIA criteria without complete deposit reevaluation.

Compilation of the estimates for individual uranium properties gathered at the various steps results in a national uranium reserve estimate at various cost categories. Since a complete cycle of review of industry procedures has not been completed, the currently reported estimates do not completely reflect the results of the new procedure. This will take a few more years to complete. The current reserve estimates are based on a combination of EIA-held historical data, company-reported data, and independent reserve estimates.

The 1992 estimates of national uranium reserves are based on current knowledge about domestic deposits and on a consistently applied set of estimating criteria. Current and historical estimates of reserves since 1947 are shown in Table B6. The trends in estimated reserves quantities in each forward-cost category are shown in Figure B3 for the period 1964-1992.

Table B6. U.S. Uranium Reserves at the End of the Year, 1947-1992
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars[a]				
	$8 per pound	$15 per pound	$30 per pound	$50 per pound	$100 per pound
1947	4	(a)	(a)	(a)	(a)
1948	4	(a)	(a)	(a)	(a)
1949	4	(a)	(a)	(a)	(a)
1950	6	(a)	(a)	(a)	(a)
1951	12	(a)	(a)	(a)	(a)
1952	16	(a)	(a)	(a)	(a)
1953	30	(a)	(a)	(a)	(a)
1954	55	(a)	(a)	(a)	(a)
1955	135	(a)	(a)	(a)	(a)
1956	240	(a)	(a)	(a)	(a)
1957	333	(a)	(a)	(a)	(a)
1958	364	(a)	(a)	(a)	(a)
1959	394	(a)	(a)	(a)	(a)
1960	374	(a)	(a)	(a)	(a)
1961	348	(a)	(a)	(a)	(a)
1962	332	(a)	(a)	(a)	(a)
1963	320	(a)	(a)	(a)	(a)
1964	302	(a)	(a)	(a)	(a)
1965	290	(a)	(a)	(a)	(a)
1966	282	(a)	(a)	(a)	(a)
1967	296	496	(a)	(a)	(a)
1968	322	530	(a)	(a)	(a)
1969	403	634	(a)	(a)	(a)
1970	492	782	(a)	(a)	(a)
1971	546	1,040	(a)	(a)	(a)
1972	546	1,040	(a)	(a)	(a)
1973	554	1,040	1,268	(a)	(a)
1974	400	840	1,200	(a)	(a)
1975	(b)	860	1,280	(a)	(a)
1976	(b)	860	1,360	1,660	(a)
1977	(b)	820	1,380	1,760	(a)
1978	(b)	740	1,380	1,840	(a)
1979	(b)	580	1,290	1,672	2,244
1980	(b)	450	940	1,574	2,068
1981	(b)	224	410	1,186	1,788
1982	(b)	(b)	360	1,152	1,778
1983	(b)	(b)	360	1,140	1,770
1984	(b)	(b)	[c]359	[c]1,106	1,719
1985	(b)	(b)	[c]345	[c]1,072	1,675
1986	(b)	(b)	[c]322	[c]1,036	1,630
1987	(b)	(b)	[c]304	[c]1,005	1,592
1988	(b)	(b)	[c]289	[c]981	1,560
1989	(b)	(b)	[c]277	[c]962	1,537
1990	(b)	(b)	[c]265	[c]926	1,511
1991	(b)	(b)	[c]304	[c]975	1,542
1992	(b)	(b)	[c]295	[c]959	[c]1,523

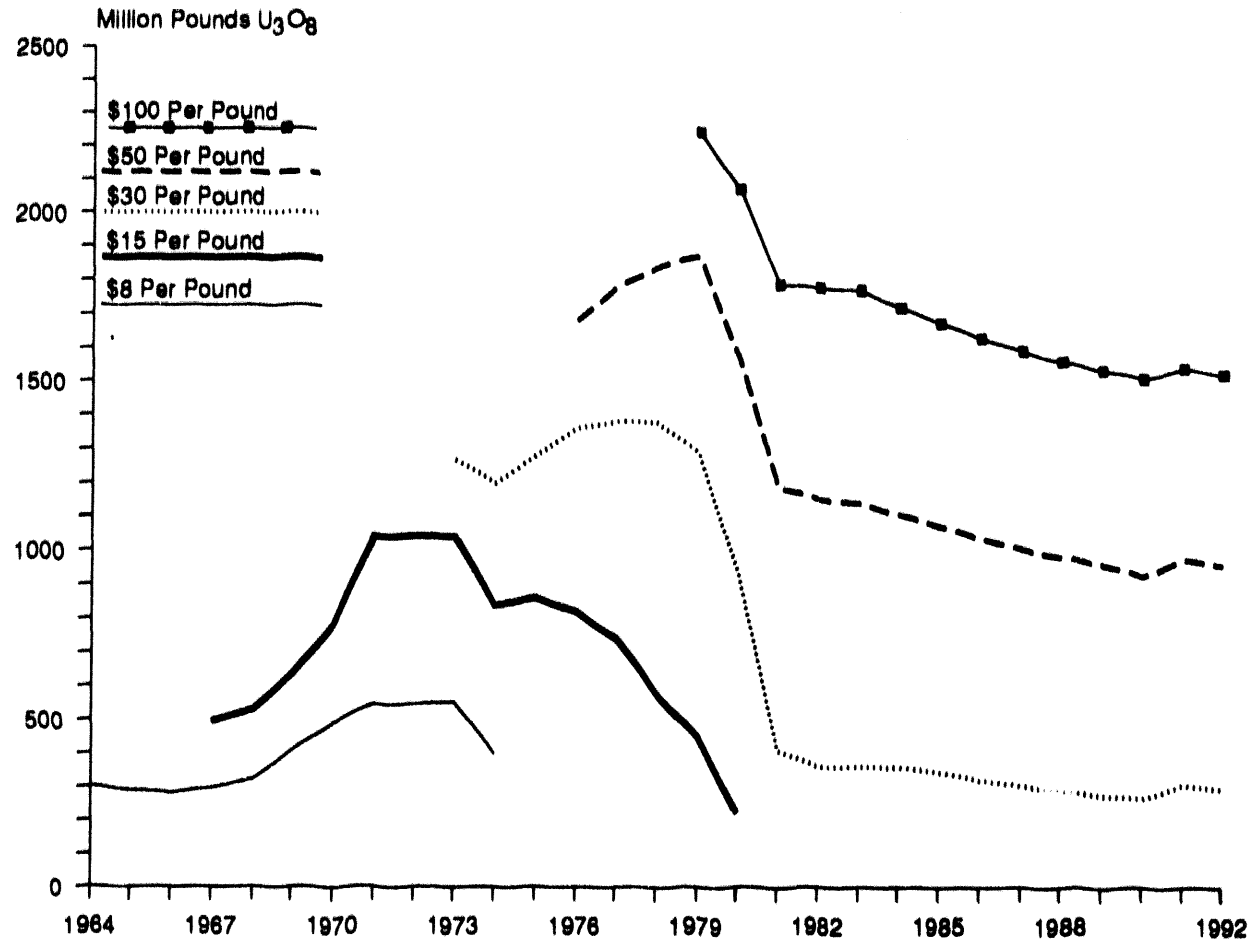
[a]Not estimated for the indicated forward-cost category.

[b]For 1974, separate evaluations were made of the amounts of Reserves that could be exploited at the maximum forward-costs of $8, $15, and $30 per pound U_3O_8. Forward-cost Reserves were not estimated for the $8 per pound category in 1975, largely because sharp increases in production costs and market prices in the 1972-1975 period focused attention on the economic availability of Reserves at higher forward-cost categories. After January 1, 1975, the $8 per pound forward-cost category was no longer reported for domestic Reserves. Rapidly rising production costs during 1980-1982 resulted in greatly reduced amounts of forward-cost Reserves in the $15 per pound category in each of those years. The quantity estimated for 1981 was insignificant, and this category of forward-cost Reserves was not reported after January 1, 1982. 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.

[c]Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in these reserves.

Sources: **1947-1963**—U.S. Department of Energy, Grand Junction Projects Office, Statistical Data of the Uranium Industry (January 1978). **1964-1982**—U.S. Department of Energy, Grand Junction Projects Office, Statistical Data of the Uranium Industry (January 1983). **1983-1992**—Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Projects Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1984-1992).

Figure B3. Reserves by Cumulative Forward-Cost Categories at the End of the Year, 1964-1992



[a]Reserves in the $8 per pound forward-cost category were not reported after January 1, 1975.

[b]Reserves in the $15 per pound forward-cost category were not reported after January 1, 1981.

Note: Reserves estimated at the end of the year. Forward-cost categories of reserves are cumulative within each year; that is, the quantity at each level of forward cost includes all resources at the lower cost levels.

Sources: **1964-1982**—U.S. Department of Energy, Grand Junction Projects Office, Statistical Data of the Uranium Industry (January 1983). **1983-1992**—Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Projects Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1984-1992).

Appendix C

Respondents to the Uranium Industry Annual Survey

Settling tanks for the separation of liquid and solid phases during milling of uranium ore at a conventional mill.

Appendix C

Respondents to the Uranium Industry Annual Survey

Electric Utility Companies

Alabama Power Company (Southern Nuclear Operating Co.)
American Electric Power Service Corp.
Arizona Public Service Company
Baltimore Gas & Electric
Boston Edison Company
Carolina Power & Light
Centerior Energy Corp.
Commonwealth Edison
Consolidated Edison Company of New York, Inc.
Consumers Power Company
Detroit Edison
Duke Power Company
Duquesne Light Company
Entergy Operations Inc.
Florida Power & Light
Florida Power Corp.
Georgia Power Company (Southern Nuclear Operating Co.)
GPU Nuclear Corp.
Gulf States Utilities Company
Houston Lighting & Power Company
Illinois Power Company
Iowa Electric Light & Power Company
Long Island Lighting Company
Maine Yankee Atomic Power Company
Nebraska Public Power District
New York Power Authority
Niagara Mohawk Power Corp.
North Atlantic Energy Service Corp.
Northeast Utilities Service Company
Northern States Power Company
Ohio Edison Company
Omaha Public Power District
Pacific Gas & Electric Company
Pennsylvania Power & Light Company
Philadelphia Electric Company
Portland General Electric Company
Public Service Electric & Gas
Riverside Public Utility Dept.
Rochester Gas & Electric Corp.
Sacramento Municipal Utility Dist.
San Diego Gas & Electric
South Carolina Electric & Gas
Southern California Edison Company
Southern Cross Services, Inc.
Tennessee Valley Authority
Texas Utilities Electric Company
Union Electric Company
Utah Power & Light Company
Vermont Yankee Nuclear Power Corp.
Virginia Electric and Power Company
Washington Public Power Supply System
Wisconsin Electric Power Company
Wisconsin Public Service Corp.
Wolf Creek Nuclear Operating Corp.
Yankee Atomic Electric Company

Uranium Mining Companies

Albuquerque Uranium Corp.
American Nuclear Corp.
Andrews Mining Company
Atlas Corp.
B.B. Brooks Company
BGS Mining Corp.
Calvin Black Enterprises
Cargill Fertilizer, Inc.
Catalyst Equity Corp.
Cherokee Exploration/Groth Mining
Cobb Resources Corp.
Cogema, Inc.
Cotter Corp.
Cyprus Foote Mineral Company
Cyprus Mines Corp.
Dale Lyman
Dave Blake Mining Company
Dawn Mining Company
Dolores Bench Ltd. Partnership
Energy Fuels Corp.
ENSERCH Exploration, Inc.
Everest Exploration, Inc.
Ferret Exploration Company, Inc.
Ferret Exploration Company of Nebraska
Freeport Uranium Recovery Company

Geomex Minerals, Inc.
Global Nuclear Services and Supply Ltd.
Graves and Hudspeth Company
Green Mountain Mining Venture
Harold Kramer Company
Homestake Mining Company
IMC Fertilizer Group, Inc.
Kennecott Corp.
LeeRoy & Jane Casper
Malapai Resources Company
Marquez Development Corp.
Melvin Staats Company
Mesa Limited Partnership
Mike Rodel Mining Company
Minerals Exploration Company (UNOCAL)
Mining Unlimited, Inc.
Mr. & Mrs. Charlie Nichols Company
Noranda Exploration, Inc.
Nose Rock, Inc.
Nuclear Fuel Services, Inc.
Oliver and Buss Company
PacifiCorp
Pathfinder Mines Corp.
Petrotomics Company
Placer Dome U.S., Inc.
Plateau Resources Ltd.
Power Resources, Inc.
Rajah Ventures, Ltd.
Ralph Foster & Sons
R.E. Beck Mining Company
Rhone-Poulenc, Inc.
Rio Algom Mining Corp.
Rio Grande Resources Corp.
RME Partners, L.P.
San Rafael Energy, Inc.
Santa Fe Pacific Mining, Inc.
Section 2 Joint Venture-Continental Materials
Sheep Mountain Partners
Simons Associates
Solution Mining Corp.
State of Colorado
TKS Mining Company
Taminco, Inc.
Todilto Exploration & Development Corp.
Total Minerals Corp.
UG U.S.A., Inc.
Umetco Minerals Company
Union Pacific Resources Company
United Nuclear Corp.
Uranerz USA, Inc.
Uranium King Corp.
Uranium Resources Inc.
Urralburu Mining Company
USX Corp.
Western Nuclear, Inc.
Western States Resources Company
Westinghouse Electric Corp.
W.K. Enterprises
Wold Nuclear Company

Uranium Conversion

Allied-Signal, Inc.
Sequoyah Fuels Corp.

Uranium Enrichment

Deputy Assistant Secretary for
Uranium Enrichment (NE)

Uranium Fuel Fabricators

B & W Fuel Company
Combustion Engineering, Inc.
General Electric Company
Siemens Nuclear Power Corp.
Westinghouse Electric Corp.

Uranium Traders/Brokers

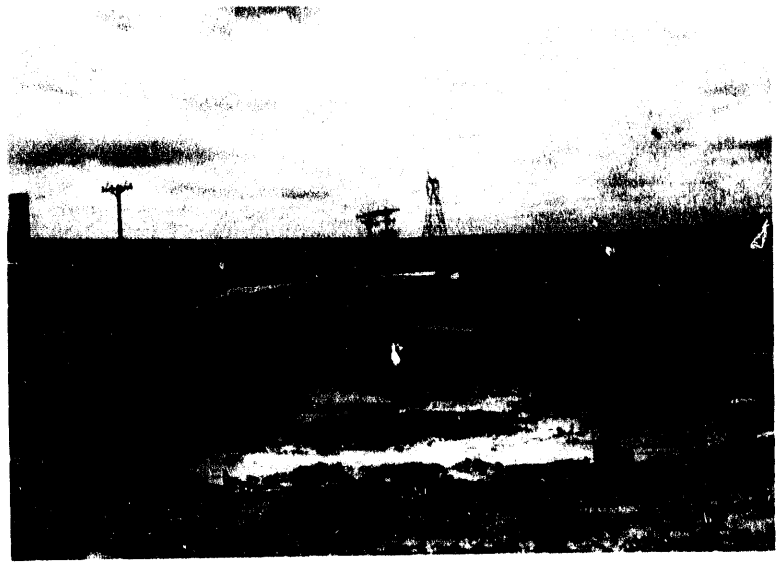
Cycle Resources Investment Corp.
Global Nuclear Services and Supply Ltd.
New York Nuclear Corp.
Nuclear Material Storage
Nuclear Transport and Storage, Inc.
NUEXCO Trading Corp.
NUKEM, Inc.
The Uranium Exchange Company

Nuclear Material Storage

Nuclear Transport and Storage, Inc.

Appendix D

Form EIA-858: Uranium Industry Annual Survey



View across well field at an in situ *uranium mine. The well field consists of injection and recovery wells used to circulate a leaching solution through the uranium bearing ore zone. From these wells, drilled at regular spacings, uranium-bearing solutions are recovered. The dark boxes mark locations of instrumented well heads.*

Energy Information Administration
U.S. Department of Energy

Form Approved
O.M.B No. 1905-0160
Expiration Date: 12/31/94

Instructions for Uranium Industry Annual Survey Form EIA-858

Survey Year 1992

For assistance concerning the Form EIA-858, contact the Survey Manager on (202) 254-5565.

I. Purpose

The Form EIA-858, "Uranium Industry Annual Survey", is used to collect data about the U.S. uranium industry. The data are collected under authority of Section 170B of the Atomic Energy Act of 1954, as amended (42 U.S.C. 790a), and the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b).

The data appear in these Energy Information Administration (EIA) publications: *Uranium Industry Annual, Domestic Uranium Mining and Milling Industry - Viability Assessment,* and *Annual Energy Review.*

II. Form EIA-858 Format

The three Schedules of Form EIA-858 collect industry data about these topics:

Schedule	Topic
A	Uranium Raw Materials Activities
B	Uranium Marketing Activities
C	Industry Financial Status

Schedules A and B, which are included in this package, are mailed to respondents in late December of the Survey Year. Schedule C is mailed in mid February of the following year to respondents who meet minimum criteria.

III. Who Must Respond

The Form EIA-858 must be completed by firms and individuals that were involved in the U.S. uranium industry (that is, within the 50 States, District of Columbia, Puerto Rico, the Virgin Islands, Guam, and other U.S. possessions) during 1992. Specific Criteria that define conditions for responding to all or portions of Schedules A and B are provided below under General Instructions.

IV. Sanctions

The timely submission of EIA-858 by those required to report is mandatory under section 13(b) of the Federal Energy Administration Act of 1974 (FEAA) (Public Law 93-275), as amended. Failure to respond may result in a civil penalty of not more than $2,500 for each violation, or a fine of not more than $5,000 for each willful violation. The government may bring a civil action to prohibit reporting violations which may result in a temporary restraining order or a preliminary or permanent injunction without bond. In such civil action, the court may also issue mandatory injunctions commanding any person to comply with these reporting requirements.

V. When to Respond

Schedules A and B of the Form EIA-858 must be filed with the EIA by March 13,1993. Schedule C must be filed with the EIA by April 17, 1993.

VI. How and Where to Respond

Schedules A and B of Form EIA-858 can be submitted by mail, either in hard copy or micro-computer diskette versions (see below), or by facsimile transmission.

Mail: Hard copy and micro-computer diskette versions should be mailed to: (A pre-addressed envelope is provided)

Energy Information Administration
Mail Station: BG-094 Forrestal
U.S. Department of Energy
Washington, D.C. 20277-7091

Facsimile (FAX): Respondents who do not use the diskette version and who want to submit Form EIA-858 by FAX should call to inform the Survey Manager (see number above) of the incoming transmission. The FAX transmission number at the Technical Assistance Center (TAC), Energy Information Administration, 1707 H Street, Washington, D.C., is shown below. The TAC is staffed Monday through Friday from 6:30 a.m. until 6:00 p.m. each day.

Transmission	**Verification**
(202) 254-5765	(202) 254-5568
	(202) 254-5509

To assure successful data transmission by FAX, respondents should verify receipt of complete and legible data pages at the EIA's Technical Assistance Center by calling a verification number shown above upon completion of data transmission. The name of the person who verifies receipt of the transmission should be noted.

Micro-Computer Form EIA-858: If you wish to receive the micro-computer version of Form EIA-858, contact the Survey Manager. This version operates on an IBM PC, PC/XT, PC/386, or compatible computer with either: (1) a floppy-disk drive (5 1/4 inch) plus a hard disk drive or (2) two floppy-disk drives. It requires a minimum system memory of 512 kilo-bytes and the Disk Operating System (DOS), Version 2.0 or above.

OVERVIEW AND CRITERIA FOR SCHEDULES A AND B

Overview

Your firm's name and address are preprinted on Form EIA-858. Selected data also are preprinted, where applicable, on Schedule A for uranium properties, mills, and plants and on Schedule B for contracts and uranium inventories. The preprinted information, reported on your firm's Form EIA-858 for the previous Survey Year, is duplicated here to aid in completing the current Form EIA-858. Review all preprinted information, and **update**, **change**, or **correct** it as necessary to report current Survey Year information.

A set of blank pages is provided for reporting data on other (not preprinted) uranium-reserves properties, mills, plants, and market commitments that your firm acquired during the Survey Year.

On page 1, complete the section "Applicability of Schedules A and B" by stating (in column b or c) whether Schedule A (Parts I through IV) and Schedule B apply to your firm for Survey Year 1992. If **Parts II** and **III** apply, enter in column d the **total number of reserves properties, mill, and plants** you are reporting. If **Schedule B** applies, enter the **total number of contracts** you are reporting.

Within a Part that is applicable to your firm, an Item that is not applicable should be marked as "NA." If zero or none is the answer to an Item, please enter a "0" or "none" for that Item, not the symbol "NA".

On page 1, give the names and phone numbers of contact persons for the data reported on Schedules A and B, if different from the person who signed the certification statement.

If Schedules A and B are separated for completion by different persons in your firm, please provide a copy of the instructions with each Schedule.

If more space is needed to report information for any Item, use the **COMMENTS** spaces provided at the end of each Schedule. Please key each comment or note to its Item number.

A Glossary is provided at the end of the instructions.

Criteria for Responding to Form EIA-858

In the Criteria below, controllers are firms or individuals that, by virtue of title, contract, lease, or concession, own properties with uranium reserves or are responsible for the exploration and development of uranium reserves and the extraction of uranium as a primary product or byproduct; own or are responsible for the operation of uranium mines, mills, or processing plants; or are the operators of uranium-industry joint ventures.

Criteria for Schedule A

Firms that during 1992:

A. Were controllers or were identified in EIA records as the most recent controllers of uranium-reserves properties and uranium mines, mills, or plants in the United States, including, but not limited to, those named on pages 3 and 5 of Form EIA-858;

B. Were involved as controllers of uranium exploration and development ventures in the United States: U.S. firms that conducted in foreign countries uranium exploration and development activities that were funded by U.S. operations;

C. Incurred expenditures for uranium exploration in the Survey Year or plan such expenditures during the following year;

D. Held uranium reserves in specific properties by right of title, contract, lease, or concession and that were directly responsible for the development and exploitation of those reserves;

E. Were controllers of uranium mining properties, including firms that were controllers of mines under joint-ownership agreements or by contract agreements; firms that were controllers of *in situ* uranium recovery facilities; or

F. Were controllers of commercial extraction of uranium from ore (or leach solution) or as a byproduct of the processing of a diffe
rent commodity.

Criteria for Schedule B

Firms that during 1992:

G. Held existing contracts covering the Sale, Purchase, Exchange, Loan, or Loan Repayment of uranium or entered into similar new contracts;

H. Held inventories of uranium in any form excluding reactor-inserted, fabricated fuel; maintained a forward-coverage, uranium-inventory policy (utilities only);

I. Had uncommitted uranium available for sale; or

J. Made actual deliveries of uranium feed materials to any enrichment supplier.

INSTRUCTIONS FOR COMPLETING

SCHEDULE A, URANIUM RAW MATERIALS ACTIVITIES

General Outline

The four Parts of Schedule A cover:

Part	Topic
I	Exploration and Development
II	Reserves and Mine Production by Property
III	Milling and Processing
IV	Employment (*including contractor support*)

Data reported should be current to December 31, 1992.

Part I. Exploration and Development

Item 1. Joint Venture Arrangements

The controlling partner in a joint venture should report on the full scope of activities conducted under the venture. To prevent duplicate reporting, the other venture partners should not report data for those same activities.

Item 2. Exploration Land Status and Cost for the Survey Year

Enter in the table the amount of land acquired in 1992 for uranium exploration. Examples of land that should be reported included: mineral fee, patented and unpatented mining claims, and options to purchase mineral fee land. Exclude land held for uranium production and land held in foreign countries.

Item 3. Exploration and Development Drilling by State and Total Cost

Enter by state the number of drill holes and footage completed during 1992 for exploration and development. Do not include drilling done in foreign countries. Definitions of drilling categories are provided in the Glossary.

For projected drilling in the following year, enter on the line provided the numbers of drill holes and footage planned for exploration and development.

Item 4. Other Exploration and Development Expenditures

Report all other expenditures directly associated with your company's domestic exploration and development effort. Include expenditures for geological research; geochemical, and geophysical surveys; costs incurred by field personnel in the course of exploration work; and overhead and administrative charges directly associated with supervising and supporting field and exploration activities. **Do not include** expenditures for land acquisitions and drilling programs reported under Items 2 and 3 above or for internal corporate charges, such as directors' salaries, not directly associated with the company's exploration effort.

Item 5. Foreign Contributions to Exploration Expenditures

Report the percentages of your total exploration expenditures (sum of Items 2 + 3 + 4) contributed by foreign-controlled companies in 1992 (Survey Year) and planned for 1993 (Following Year). Foreign controlled means majority-owned by non-U.S. entities.

Item 6. Expenditures for Uranium Exploration in Foreign Countries

Report total exploration expenditures by country for 1992 (Survey Year) and amount planned for 1993 (Following Year).

General Procedure for Responding to Parts II, III and IV

In a case of jointly-owned land, mine, mill, plant, or other entity for which data are requested under one or more items of Form EIA-858, the operating (or controlling) partner must report the total data for that entity. That is, the data relative to each owner's participation in activities germane to an Item must be included in your response given on Form EIA-858.

Part II. Reserves and Mine Production by Property

Under Part II, the following data are requested for each property with uranium reserves controlled by your firm during 1992: quantity of uranium reserves and related costs, reserves-estimation parameters, and conventional and nonconventional mine status and related mine production.

If, during 1992, your firm controlled other (not preprinted) uranium-reserves properties also complete Items 7 through 12 for each such property. A blank set of Items 7 through 12 (pages 3 and 4) is provided. Append additional pages at the end of Part II.

Item 7. Property Information

Property Name and Location: Enter property name and location information as requested. Give longitude and latitude to the nearest degree and minute.

Ownership: Self explanatory.

Controllership: If your firm no longer controls this property, give name, address, and phone number of the party to which it was transferred. If the property reverted to a State or Federal agency during the Survey Year, provide the name and address of the agency.

Status: Check **only one box.** If a mine was temporarily closed or permanently closed, you must provide the date (MM/YY). Temporarily closed includes long-term closure, but is short of permanent closure.

Studies: Check **all** boxes that apply.

Item 8. Property Uranium Reserves Estimates

For each reserves property, enter in the table your estimates of uranium reserves for the forward cost categories of $15, $30, $50, and $100 by the mining method used to calculate the reserves. Report the reserves anticipated to be recoverable considering ore recovery and dilution. If reserves estimates are not available for the forward cost categories shown, enter in the far right columns the cost category (or categories) you chose for estimating reserves and the quantity of reserves estimated at that cost by mining method.

Give the date (month/year) the reported estimates of reserves were made.

Item 9. Operating Costs Used in Estimating Reserves

Enter in the table the costs used in estimating reserves for this property. Definitions of cost terms are provided in the Glossary. If the costs for your reserves estimates are defined differently, enter your costs and state how they are defined (that is, what each cost includes) under **Comments for Schedule A** on page 6. For openpit and underground mining, provide costs per ton of ore mined. For *in situ* leaching or other leaching, provide the average cost per pound of U_3O_8 recovered. Report all costs in current 1992 dollars.

Item 10. Capital Costs by Mining Method

Enter in the table capital costs for the chosen mining method for a mine or ISL field and for a mill or plant associated with this property. Report all costs in current 1992 dollars.

Item 11. Drilling and Reserves Estimation Parameters

Give total number of holes drilled, including barren holes, in the reserves outline on this property during 1992 and total holes drilled prior to 1992.

Enter in the table, by applicable mining method (openpit, underground, or *in situ* leach), the parameters used in calculating the reported estimates of reserves for this property.

Item 12. Mine Production and Shipments of Ore or Pregnant Solutions

Report quantities of ore and pounds mined to the nearest ton of ore and pound of U_3O_8 and V_2O_5.

Uranium and Vanadium Mined: Enter in the table the quantities of uranium and vanadium mined during 1992 for each applicable mining method. For *in situ* leaching, state the grade of ore. If quantities are reported for "Other" mining method, specify the method in the space provided.

Shipment of Ore or Pregnant Solutions: Enter in the table the quantities of ore or pregnant solutions shipped to mills, plants, or to other sites during 1992. State the name of each mill, plant, or other site to which the shipments were made.

Part III. Uranium Milling and Processing

Under Part III, data are requested on the status of mills and plants, their operations, and production of uranium concentrate for 1992.

If your firm controlled other (not preprinted) uranium milling and processing facilities during 1992, also complete Items 13 through 16 for each such facility. A set of blank Items 13 through 16 (page 5) is provided. Append additional pages at the end of Part III.

Item 13. Mill or Plant Information

Name and Location: Enter mill or plant name and location information as requested. Provide longitude and latitude to the nearest degree and minute.

Ownership: Self explanatory.

Controllership: If your firm no longer controls this facility, give the name, address, and phone number of the party to which it was transferred. Mark **one** box to indicate the nature of the arrangement between your firm and the party to which the facility was transferred.

Item 14. Rated Capacity

Rated capacity is synonymous with nominal capacity and nameplate capacity.

Item 15. Operating Status During Survey Year

If the facility was not operated during the Survey Year, the date of the facility closing must be entered.

Note: The EIA might publish your firm's responses for the *Rated Capacity* and the *Status at End of Survey Year* for each mill and plant in selected data reports. Refer to the section "Provisions Regarding Confidentiality of Information" on page ix.

Item 16. Uranium Concentrate Production

Conventional Mills and Nonconventional Plants: Enter requested data on uranium concentrate production for each facility. Please include all concentrate produced from cleanup/reclamation operations. Mark **all** boxes necessary to indicate sources of "Other Mill Feed" and "Total Plant Feed."

Part IV. Employment

Item 17. Employment by State

Enter the number of person-years (see Glossary) by state expended by your firm during 1992 in uranium exploration, mining, milling, and processing, and **person-years for assessment work.** Include person-years expended for standby and maintenance operations, site-security personnel and for **contracted manpower** paid for by your firm during the year. See "**Person Year**" in the Glossary.

INSTRUCTIONS FOR COMPLETING

SCHEDULE B, URANIUM MARKET ACTIVITIES

General Outline

The seven Items of Schedule B cover:

Item	Topic
1	Contract (Market Commitment)
2	Projected Uncommitted Uranium Available for Sale
3	Uranium Inventories
4	Utility Uranium Inventory Policy
5	Actual Enrichment Feed Deliveries
6	Projected Enrichment Feed Deliveries and Unfilled Market Requirements.
7	Uranium used in Fuel Assemblies

Item 1. Contract (Market Commitment)

Item 1 covers *Sale, Purchase, Exchange, Loan, Loan Repayment* and/or *Other* contracts and *Custody* contracts active during 1992. Exchanges include physical-origin and ownership exchanges. Instructions for each contract type (transaction) are given below. Report each contract that was active at the end of 1992 or that was performed (completed) during 1992.

EIA must be able to account for all *transfers of title to uranium materials* during the Survey Year. Any transaction that involved the transfer of title, i.e., a Sale, Purchase, Exchange, Loan, Loan Repayment, or *Other* mechanism should be reported. A separate Item 1 must be completed to report the information requested under Items 1.A through 1.M for each quantity of uranium (Item 1.J) involved in a transfer of title during 1992.

Under certain conditions, a Sale or Purchase of separative work units (SWU) in the secondary market constitutes such a transfer. A Sale or Purchase of SWU that, in fact, involves the transfer of a title to enriched uranium for a title to natural uranium, or vice-versa, should be reported as an Exchange. A sale or purchase of SWU through assignment of an enrichment contract should not be reported on Form EIA-858.

Uranium materials of foreign ownership that were physically located during Survey Year at any of your company's sites should be reported under the Item 1.C.2 *Custody Transactions.* An example could be uranium materials entering the United States under a contribution of capital arrangement (but that does not result in a transfer of title to the custody company). For materials that fall under this category, a separate Item 1 must be completed to report the information requested under 1.A through 1.F and 1.J for each custody transaction during the Survey Year.

Data on active contracts reported on your firm's Form EIA-858 for the prior Survey Year might be preprinted under Item 1. If, during 1992, your firm held or entered into other contracts (that is, those not preprinted), a separate Item 1 must be completed to report each such contract. A blank Item 1 (page 7) is provided.

You may append copies of contract pages or quoted contract information **after each Item 1, Contract,** to report information that cannot be entered onto the form or to include additional information that will assist EIA in utilizing the contract data provided under Item 1.

A. Name of Other Party

Self explanatory.

B. Date Contract Signed

Give the date a contract was originally signed. Give the latest date it was renegotiated, if applicable.

C. Types of Transactions

Transfer of Title: Indicate whether a contract is a Sale, Purchase, Exchange, Loan, Loan Repayment, or Other by marking the appropriate boxes. If Other, specify. If more than one transaction type is involved, mark all that apply.

For a Loan and Loan Repayment, indicate whether your firm was the Lender or the Borrower. A Purchase or Sale of SWU by, in effect, transferring title of enriched uranium for natural uranium (or vice versa) should be reported as an Exchange. Please indicate if this transaction involves an intracompany transfer of material.

Custody: If this transaction involves taking custody to uranium materials under a storage or holding agreement, mark this box. If other, specify.

Note that the question relating to intracompany transfer of materials in order to meet a contractual obligation being reported applies both to *transfer of title* and to *custody transactions.* Please answer *Yes* or *No*, as appropriate.

D. Type of Material Covered Under this Contract

Mark the appropriate box (or boxes) to indicate the material type (or types) sent or received under this contract. If more than one type of material is marked, explain under **Comments.**

E. Origin and Destination

State the country of uranium mining, of conversion service, and of enrichment service corresponding to the type of material marked under D. The term **Actual** refers to material delivered during the Survey Year; the term **Future** refers to material to be delivered during a future year. If the Future material can have more than one origin and destination, state the material types, countries, quantities, and prices applicable under **Comments.** If the contract does not specify the country where the uranium was mined or the country of component-service performance, please write in "Unspecified."

Provide the country of destination for the **Actual** and **Future** (estimated) uranium commitments (or SWU transfer agreement). Country of destination refers to the country to which the material ultimately will be delivered under this contract.

F. Importation and Exportation of Uranium

Receivers: Indicate whether your firm is importing material under this contract, and, if so, name the shipping facility.

If your firm is buying uranium from a foreign company and taking title after it has entered the United States, this is considered an importation by your firm. Foreign-origin uranium already within the United States bought by your firm from another U.S. company is not an importation by your firm.

Foreign-origin uranium, located at a foreign site, that is purchased, borrowed, or exchanged by your firm and then is sent directly to another foreign destination is not an importation until the uranium enters the United States. The transaction, however, should be reported under Item 1.

Shippers: Indicate whether your firm is exporting uranium under this contract, and, if so, name the country of end use: that is, the country to which the uranium ultimately will be delivered under this contract. Exports can include loans and loan repayments.

If your firm is delivering uranium to a foreign firm that will take title to the uranium within the United States and will then ship it to a foreign destination, this should be reported as an export by your firm.

G. Pricing Mechanism

For a Sale or Purchase contract, indicate whether the pricing mechanism is "Contract Specified", "Market-Price Related", or "Other." Indicate under Contract Specified or Market-Price Related the appropriate pricing-mechanism mode.

In a Contract Specified contract, price is determined at the time of contract signing as either a Fixed Price or a Base Price with escalation factors. Spot and secondary-market purchases can be reported as Contract Specified.

In a Market-Price Related contract, price commonly is determined at or before delivery and is based on price prevailing at the time of delivery. If price is, or will be, tied to an external indicator (e.g., published spot price), mark "External Indicator" as the settlement mode. If price is settled by arm's-length negotiation, mark "Negotiated" as the settlement mode.

A Market-Price Related contract can have either an explicit floor price or a cost-related floor price. Mark all applicable boxes.

In some contracts, price is defined as the higher of either base-price escalated or market price. These contracts should be reported as Market-Price Related with a floor price rather than as Contract Specified.

Indicate whether the contract has provision for a Ceiling Price.

"Other" includes complex-pricing-mechanism contracts that do not fit readily into the Contract Specified or Market-Price Related categories. Describe the mechanism under **Comments.**

Other is always the pricing-mechanism category for a captive operation.

If a contract provides for delivery under a contract-price arrangement for a portion of the delivery period and under a market-price arrangement for the remainder of the period, you should follow instruction "a" or "b" below. Complete either:

(a) a separate Item 1 for each relevant combination of quantity-price-period (years) in the contract, or

(b) a single Item 1 and explain under **Comments** the period (years) for each quantity-price combination.

If a contract covers deliveries of materials of different origins at different prices, explain under **Comments** each combination of quantity-price-period (years). If a contract specifies a "flat" fee, as in a Loan, you may explain the fee arrangement under **Comments**. Please key your comments to specific contracts.

H. Litigation Status

Self explanatory.

I. Contract Options

Indicate whether the contract permits (at the buyer's or seller's option): (1) delivery of optional quantities (amount specified); (2) delivery of additional quantities (amount not specified); (3) cancellation of some or all deliveries; (4) substitution of material not from the seller's own production; and/or (5) change in delivery dates. Explain other options or flexibility in the contract under **Comments for Schedule B.**

J. Uranium Quantity

State the actual quantities of uranium, in thousand pounds U_3O_8 equivalent, that changed ownership under a contract during 1992 and the Firm and/or Optional quantities specified in the contract for delivery in future years. If different types of material are specified for any given year, state the amount of each type under **Comments for Schedule B.**

If UF_6 is the material under contract, give under **J** the U_3O_8 equivalent assuming a 0.20 percent U-235 tails assay value.

Under a Market-Price contract, if the price for 1992 and/or 1993 deliveries was settled by December 31, 1992, state the yearly quantities on the Settled Price rows. If the price for deliveries was not settled by December 31, 1992, state the yearly quantities on the Not Settled Price rows.

For a contract with Contract Specified or Other pricing mechanism, state the 1992 quantity in the Settled Price row.

K. Market-Price; L. Contract-Price; and M, Other Procurement

Prices need not be reported for Exchange, Loan, and Loan Repayment contracts and for captive production.

Enter actual price per pound U_3O_8 for 1992 and 1993 deliveries. For future years, enter estimated or fixed prices. Enter prices by column according to pricing mechanism marked under **G** above.

If contract quantities are quoted in UF_6 or other terms, convert to equivalent U_3O_8 values net of the UF_6 conversion cost.

For each year beyond 1992, give prices both in nonescalated dollars (use a factor of "1", or zero escalation) and in escalated dollars using either contract-specified escalators or your best estimate of escalators. The escalated column should contain the actual price paid or received for deliveries in 1992 and 1993 (when applicable), and estimates of future year's prices based on the price-escalation factors specified in the contract.

For a contract-price procurements with a fixed price, report the fixed price in Item 1.L using the column entitled **Escalated.**

For a market-price contract without a settled price, enter the floor price if applicable. State escalated and nonescalated floor prices as appropriate. If the floor price is expressly related to a seller's production cost and the production cost cannot be estimated, enter "Cost" in the Settled Price column. If price is not settled in a market-price contract without a floor, leave **K** blank; however, do report applicable quantities under column **J.**

Item 2. Projected Uncommitted Uranium Available for Sale at Specified Prices

Data are requested on uncommitted uranium that could be made available for sale by utilities and suppliers in the period 1993 through 2001. Quantities reported should be those in excess of your firm and optional sales commitments reported under Item 1. For each year, give cumulative quantities: for example, if quantities are available at $10 or less, then they are available at $20 or less.

In the table, column-head prices are in constant dollars as of December 31, 1992. For succeeding years, assume that: (1) prices will increase at the general rate of monetary inflation for the year; and (2) all excess uranium will be sold in the year it becomes available.

Instructions for Utilities: Enter projected amounts from inventories plus purchase commitments in excess of reactor and inventory-policy requirements and sale commitments in place on December 31, 1992.

Instructions for Suppliers: Enter projected amounts from inventory, current milling or processing capacity, and planned production capability. Consider your costs, time required to develop recoverable reserves and resources controlled by your firm, availability of capital to open new mines or reopen shutdown facilities, constraints on production rates at new or existing mines, and other factors pertinent to your operations.

Item 3. Uranium Inventories

State the inventory quantities, both domestic- and foreign-origin, to which your firm held title as of December 31, 1992, including uranium under financial lease. Reported quantities should agree with inventory quantities reported last year and with data provided elsewhere in Form EIA-858. That is, 1992 inventory values should reflect last year's values (which are preprinted) with adjustments for subsequent stock additions, purchases, sales, and usages, etc., reported on other parts of this form. Please revise the preprinted values for 1991 to report any corrections for those data.

Item 4. Utility Uranium Inventory Policy

Mark the box to indicate whether your company has a uranium inventory policy. If Yes, fill in the table for each applicable type of inventory. The sum of the inventory values should equal your total desired inventory.

Item 5. Actual Uranium Enrichment Feed Deliveries

Enter the quantities of uranium feed materials (both U.S.- and foreign-origin) shipped to U.S. Department of Energy (DOE) enrichment plants and to foreign enrichment plants in 1992.

Do not include deliveries placed in your DOE usage agreement account that are not intended for withdrawal until 1993 or later. Withdrawals of enriched uranium from your usage agreement account in 1992, however, should be included as appropriate in your feed deliveries to DOE plants.

State under 5.E the equivalent of DOE separative work units (SWU) that your firm purchased in the secondary market in 1992.

Item 6. Projected Enrichment Feed Deliveries and Unfilled Market Requirements

In the left-hand column, enter your firm's total projected shipments to enrichment service suppliers (DOE- plus foreign-enrichment suppliers) for each year. Include enriched uranium (SWU) to be received through all purchase and exchange contracts in effect as of December 31, 1992. Exclude feed deliveries of uranium scheduled for a canceled reactor, unless the enriched product will be used in another of your firm's reactor units.

In the right-hand column, enter your firm's total unfilled market requirements for each year.

Item 7. Uranium Used in Fuel Assemblies

This item is to be answered only by utilities. Report only the total of unirradiated uranium in fuel assemblies loaded into reactors in 1991 and 1992, by origin. Do not include uranium removed from reactors that subsequently will be reloaded.

GLOSSARY

Acquisition Cost: Cost of acquiring mining and production rights to a uranium property.

Assessment Work: The annual or biennial work performed on a mining claim (or claims), after claim location and before patent, to benefit or develop the claim and to protect it from relocation by third parties.

Break-even Cutoff Grade: The lowest grade of material that can be mined and processed considering all applicable costs, without incurring a loss or gaining a profit.

Capital Cost: Cost of mine development and mill or plant construction and the equipment required for the production of uranium from a property, excluding sunk costs.

Development Drilling: Drilling done in an ore deposit to determine more precisely size, grade, and configuration subsequent to the time the determination is made that the deposit can be commercially developed. *Not included* are: (1) secondary development drilling, (2) solution-mining drilling for production, or (3) production-related underground and openpit drilling done for control of mining operations.

Direct Milling Cost: Operating costs directly attributable to the processing of ores or other feed materials including labor, supervision, engineering, power, fuel, supplies, reagents, and maintenance.

Direct Mining Cost: Operating cost directly attributable to the mining of ore including costs for labor, supervision, engineering, power, fuel, supplies, equipment replacement, maintenance, and taxes on production.

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 reserves are present to justify commercial development. Assessment drilling is reported as exploration drilling.

Forward Cost: Forward costs are those operating and capital costs yet to be incurred at the time an estimate of reserves is made. Profits and "sunk" costs, such as past expenditures for property acquisition, exploration, and mine development, are not included. Therefore, the various forward-cost categories are independent of the market price at which uranium produced from the reserves would be sold.

Haulage Cost: Cost of loading ore at a mine site and transporting it to a processing plant.

Indirect Cost: Costs not directly related to mining or milling operations, such as overhead, insurance, security, office expenses, property taxes, and similar administrative expenses.

***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."

Mill Capital: Cost for constructing and equipping a plant for processing ore or other feed materials.

Mine Capital: Cost for exploration and development, pre-mining stripping, shaft sinking and mine development (including *in situ* leaching), and the mine plant and its equipment.

Other Capital Costs: Costs for items or activities not included elsewhere under capital-cost tabulations, such as for and decommissioning, dismantling, and reclamation.

Other Operating Costs: Costs for other items or activities not included elsewhere in operating-cost tabulations, but required to support the calculation of a cutoff grade for ore reserves estimation.

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

Reserve Cost Categories of $15, $30, $50, and $100 per Pound U_3O_8: 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_3O_8.

Royalty Cost: A share of the profit or product reserved by the grantor of a mining lease, such as a royalty paid to a lessee.

Separative Work Unit (SWU): The standard measure of enrichment services. The effort expended in separating a mass F of feed assay x_F into a mass P of product of 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

$$SWU = W\ V(x_W) + P\ V(x_P) - F\ V(x_F)$$

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

$$V(x) = (1 - 2x)\ \ln\left[\frac{1-x}{x}\right]$$

Sunk Cost: Part of the capital costs actually incurred up to the date of reserves estimation minus depreciation and amortization expenses. Items such as exploration costs, land acquisition costs, and costs of financing can be included.

Uranium Exportation: The actual physical movement of uranium from a location inside the United States to a location outside the United States.

Uranium Importation: The actual physical movement of uranium from a location outside the United States to a location inside the United States.

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.

PROVISIONS REGARDING CONFIDENTIALITY OF INFORMATION

The following data elements will not be treated as confidential by the EIA:

a. Rated capacity of a conventional mill (under item 14).
b. Rated capacity of a nonconventional plant (under item 14).
c. Operating status of a facility at the end of the Survey Year (under item 15).

Otherwise, the Office of Legal Counsel of the Department of Justice concluded on March 20, 1991, that the Federal Energy Administration Act requires the Energy Information Administration to provide company-specific data to the Department of Justice, or to any other Federal agency when requested for official use, which may include enforcement of Federal law. The information contained on this form may also be made available, upon request, to another component of the Department of Energy (DOE); to any Committee of Congress, the General Accounting Office, or other Congressional agencies authorized by law to receive such information. A court of competent jurisdiction may obtain this information in response to an order.

The information contained on this form will be kept confidential and not disclosed to the public to the extent that it satisfies the criteria for exemption under the Freedom of Information Act (FOIA), 5 U.S.C. §552, the DOE regulations, 10 C.F.R. §1004.11, implementing the FOIA, and the Trade Secrets Act, 18 U.S.C. §1905.

Upon receipt of a request for this information under the FOIA, the DOE shall make a final determination whether the information is exempt from disclosure in accordance with the procedures and criteria provided in the regulations. To assist us in this determination, respondents should demonstrate to the DOE that, for example, their information contains trade secrets or commercial or financial information whose release would be likely to cause substantial harm to their company's competitive position. A letter accompanying the submission that explains (on an element-by-element basis) the reasons why the information would be likely to cause the respondent substantial competitive harm if released to the public would aid in this determination. A new justification does not need to be provided each time information is submitted on the form, if the company has previously submitted a justification for that information and the justification has not changed.

EIA-858 (12/92)

Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
Survey Year 1992

Form Approved
OMB No. 1905-0160
Expires: 12/31/94

Data on this mandatory survey are collected under authority of Section 170B of the Atomic Energy Act of 1954, as amended (42 U.S.C. 790a), and the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b). Provisions regarding sanctions are described in Part IV, page i of the instructions. Provisions regarding the confidentiality of information submitted in response to this survey are set forth on page ix of the instructions for Schedules A and B.

The public reporting burden for this form is estimated to average 32.0 hours per response, including the time of reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Please send your comments about this burden estimate, suggestions for reducing this burden, or any other aspect of this collection of information to: the Energy Information Administration, Office of Statistical Standards, EI-73, 1000 Independence Avenue SW, Washington, DC 20585; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

RESPONDENT IDENTIFICATION

Company Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Respondent ID (For EIA Use Only)

Parent Company: _____

APPLICABILITY OF SCHEDULES A AND B

Check one box on each line under column (b) or (c). If Part II and Part III are applicable, give in column (d) the total number of properties and mills or plants reported. If Schedule B is applicable, give the total number of contracts (Item 1 of Schedule B) reported.

EIA-858 Schedule and Part (a)	Applies to This Company (b)	Does Not Apply to This Company (c)	Number Submitted (d)
A, Part I: Exploration and Development	☐	☐	
A, Part II: Reserves and Mine Production by Property	☐	☐	
A, Part III: Uranium Milling and Processing	☐	☐	
A, Part IV: Employment	☐	☐	
B: Uranium Marketing Activities	☐	☐	

CONTACT PERSONS

Schedule A: Name: _____ Phone: (_____) _____-_____

Schedule B: Name: _____ Phone: (_____) _____-_____

CERTIFICATION

I certify that the historical and estimated information provided hereon and appended hereto are true, complete, and accurate to the best of my knowledge, information, and belief.

Name (Please print): _____ Title: _____

Signature: _____ Date: _____

Phone: (_____) _____

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

EIA-858 (12/92)

Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
Survey Year 1992

FOR EIA USE ONLY

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

ITEM 1: JOINT VENTURE ARRANGEMENTS

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

1. _____ 4. _____

2. _____ 5. _____

3. _____ 6. _____

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

Exploration land acquired and rented:	Acres
Cost of all exploration land acquired and rented:	$
Total exploration land released:	Acres
Total exploration land held, December 31st of Survey Year:	Acres

ITEM 3: EXPLORATION AND DEVELOPMENT DRILLING BY STATE AND TOTAL COST

Survey Year Drilling:

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

Following Year:

						Projected Total Cost
Projected Estimates						$

ITEM 4: OTHER EXPLORATION AND DEVELOPMENT EXPENDITURES

All other expenditures: $ _____

ITEM 5: FOREIGN CONTRIBUTIONS TO EXPLORATION EXPENDITURES

Contribution by foreign-owned companies:

Survey Year: ___ %
Following Year (planned): ___ %

ITEM 6: EXPENDITURES FOR EXPLORATION IN FOREIGN COUNTRIES

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

EIA-858 (12/92)

Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
Survey Year 1992
SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES
Part II: Reserves and Mine Production by Property

FOR EIA USE ONLY

ITEM 7: PROPERTY INFORMATION

Identification:
Property Name: _____ State: _____
Other Name(s) Used: _____ County: _____

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

Ownership:

Name of Firm	Percent Ownership

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

Name: _____
Address: _____
City: _____ State: ___ Zip: _____
Phone: (____) ____ _____

Status (Check only one):
- ☐ Only assessment work being done
- ☐ Exploration continuing
- ☐ Exploration completed
- ☐ Development drilling complete
- ☐ Under development for production
- ☐ Mine in production
- ☐ Mined out
- ☐ Mine closed temporarily } ___/___ MM/YR
- ☐ Mine closed permanently }

Studies Completed (Check all that apply):
- ☐ Preliminary reserves estimate
- ☐ Final reserves estimate
- ☐ Preliminary feasibility study
- ☐ Final feasibility study
- ☐ Mining plan

ITEM 8: PROPERTY URANIUM RESERVES ESTIMATES

Mining Method	Reserves Component	Reserves Quantities by Cost Category ($ per pound U_3O_8) $15	$30	$50	$100	$	$
Openpit	Ore (1000 tons)						
	U_3O_8 (1000 lbs)						
	V_2O_5 (1000 lbs)						
Underground	Ore (1000 tons)						
	U_3O_8 (1000 lbs)						
	V_2O_5 (1000 lbs)						
In Situ Leach	Ore (Grade % or 1000 tons)						
	U_3O_8 (1000 lbs)						
Other (Specify)	Ore (Grade % or 1000 tons)						
	U_3O_8 (1000 lbs)						

Reserves estimation date: ___/___(MM/YY)

ITEM 9: OPERATING COSTS USED IN ESTIMATING RESERVES

Mining Method	Operating Cost ($ per Ton of Ore) Direct Mining	Haulage	Royalty	Direct Milling	Indirect Costs	Other[1]
Openpit	$	$	$	$	$	$
Underground	$	$	$	$	$	$
	$/Lb U_3O_8 Recovered					
In Situ Leach	$					
Other (Specify):	$					

[1]Define Other Costs: _____

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Uranium Industry Annual Survey
Survey Year 1992
Schedule A: URANIUM RAW MATERIAL ACTIVITIES
Part II: Reserves and Mine Production by Property *(Continued)*

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Property Name: _____

ITEM 10: CAPITAL COSTS BY MINING METHOD

Capital Costs for Development and Construction

Mining Method	Capital Costs	
	Mine or ISL Field	Mill or Plant
Openpit	$	$
Underground	$	$
In Situ Leach	$	$
Other[1]	$	$

[1] Other: (Specify method chosen) _____

ITEM 11: DRILLING AND RESERVES ESTIMATION PARAMETERS

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

During the Survey Year: _____ Holes. Prior to the Survey Year: _____ Holes.

Reserves Estimate Parameters	Openpit	Underground	*In Situ* Leach
Break-even cutoff grade (Percent U_3O_8)			
Grade x thickness (Feet Percent)			
Cutoff ore thickness			
Minimum mining height (Feet)			
Average area of influence per ore hole (Sq Ft)			
Tonnage factor (Cubic Feet per Ton)			
Mine Recovery factor (Percent)			
Mill or plant recovery (Percent)			
Average depth to ore (Feet)			
Average ore thickness (Feet)			
Average ore grade (Percent U_3O_8)			

ITEM 12: MINE PRODUCTION AND SHIPMENTS OF ORE OR PREGNANT SOLUTIONS

Uranium and Vanadium Mined

Mining Method	Ore (Tons)	Contained U_3O_8 (Pounds)	Contained V_2O_5 (Pounds)
Openpit			
Underground			
In Situ Leach	(Grade):		
Other[1]	(Tons or Grade):		

[1] Other, please specify: _____

Shipments of Ore or Pregnant Solutions

Shipment Destination		Ore (Tons)	Contained U_3O_8 (Pounds)	Contained V_2O_5 (Pounds)
Facility	Facility Name			
To Stockpile				
To Mill or Plant				
To Others				

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Survey Year 1992
SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES
Part III: Uranium Milling and Processing

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ITEM 13: MILL OR PLANT INFORMATION

Name and Location:
Facility Name: _____ State: ___
Other Name(s) Used: _____ County: _____

Type of Facility:
☐ Conventional mill
☐ Nonconventional plant
☐ Other (Specify): _____

Section(s)	Township N. or S.	Range E. or W.	Latitude N.	Longitude W.
			° ′ N	° ′ W
			° ′ N	° ′ W
			° ′ N	° ′ W

Ownership:

Name of Firm	Percent Ownership

Controllership:

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

Name: _____
Address: _____
City: _____ State: ___ Zip: _____
Phone: (____) ____-____

ITEM 14: RATED CAPACITY

Conventional mill (Tons ore per day)[1]	
Nonconventional plant (Lbs U_3O_8 per yr)[1]	

[1] See provisions regarding confidentiality of information in the instructions.

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

☐ Title transfer ☐ Contract ☐ Lease
☐ Other arrangement (Specify): _____

ITEM 15: OPERATING STATUS DURING SURVEY YEAR

Number of days operated in Survey Year. Nominal: _____ Days Actual: _____ Days
Was facility operated throughout Survey Year? ☐Yes ☐No If No, give closing date: ___/___ MM/YY
Was facility operating at end of Survey Year?[1] ☐Yes ☐No

If facility did not operate during Survey Year:

☐ Closed temporarily (Restart planned for Following Year)
☐ Closed indefinitely (Following Year restart not planned)
☐ Closed permanently (Will not be restarted)
☐ Reclaimed (Restoration in progress or completed)
☐ Other status (Please specify): _____

Holding (standby) cost per year	$
One-time cost to reopen	$
Months required to return plant to full production, if decided on December 31st of the Survey Year	months

[1] See provisions on confidentiality of information in the instructions.

ITEM 16: URANIUM CONCENTRATE PRODUCTION

Category		Conventional	Nonconventional
Ore Fed-to-Process	Tons Ore		
	Lbs U_3O_8		
Other Mill Feed[1] (Lbs U_3O_8)			
In-Process Inventories (Lbs U_3O_8) as of December 31st	Prior Year		
	Survey Year		
Possible Production: 100% Recovery (Lbs U_3O_8)			
Total Plant Feed[2] (Lbs U_3O_8)			
Concentrate Production (Lbs U_3O_8)			
Tailings and Unaccountable (Lbs U_3O_8)			
Recovery Percent			
Concentrate Inventories (Lbs U_3O_8) as of December 31st	Prior Year		
	Survey Year		
Concentrate Shipped (Lbs U_3O_8)			

[1] Other Mill Feed: (Check all sources)
☐ Mine water
☐ Heap leach
☐ Tailings water
☐ Other (Specify): _____

[2] Total Plant Feed: (Check all sources)
☐ *In situ* Leach
☐ Reclamation
☐ Byproduct recovery
☐ Other (Specify): _____

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Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
Survey Year 1992
SCHEDULE A: URANIUM RAW MATERIAL ACTIVITIES
Part IV: Employment

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ITEM 17: EMPLOYMENT BY STATE

States	Employment (Person-Years)			
	Exploration	Mining	Milling	Processing
Arizona				
Colorado				
Florida				
Nebraska				
New Mexico				
Texas				
Utah				
Washington				
Wyoming				
Other (Specify):				
Totals:				

COMMENTS FOR SCHEDULE A

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Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
Survey Year 1992
SCHEDULE B: URANIUM MARKETING ACTIVITIES

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ITEM 1: CONTRACT: Complete one copy of this page for each contract (market commitment and/or custody transaction) your firm had in place on December 31 of the Survey Year. ☐ **If not applicable, check box.**

A. Other Party Name: _____
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B. Date Contract Signed: ___ /___ /___
Date Contract Renegotiated: ___ /___ /___

C. 1. Transfer of Title: Mark all that apply.
☐Sale ☐Purchase ☐Exchange

	Lender	Borrower
Loan:	☐	☐
Loan Repayment:	☐	☐

☐Other Transfer of Title (Specify): _____
Does this transaction involve intracompany transfer of material? ☐Yes ☐No

2. Custody Transactions: (Involving foreign-owned uranium)
☐Storage/Holding Agreement
☐Other Custody Transaction (Specify): _____

D. Type of Material Covered Under this Contract: Mark box or boxes to show material sent and/or received.

	Uranium Ore	U_3O_8	Natural UF_6	Enriched UF_6
Sent:	☐	☐	☐	☐
Received:	☐	☐	☐	☐

E. Origin and Destination: Give country of origin and of destination for the material specified under Item D above.

Information Requested	U_3O_8 or Mined Ore		Natural UF_6 and Conversion Services		Enriched UF_6 and SWU	
	Actual	Future	Actual	Future	Actual	Future
Country where mined:						
Conversion service country:						
Enrichment service country:						
Country of destination:						

F. Importation and Exportation:
RECEIVERS: Does this commitment involve importation of uranium?
☐Yes: name country shipped from: _____
☐No.

SHIPPERS: Does this commitment involve exportation of uranium?
☐Yes: name country of end use: _____
☐No.

G. Pricing Mechanism:
☐1. Contract specified: ☐Fixed price ☐Base-price escalated
☐2. Market-price related:
a. Settlement mode: ☐External indicator ☐Negotiated
b. Floor type: ☐Fixed floor price ☐Escalated floor ☐Cost floor ☐No floor
c. Ceiling price: ☐Yes ☐No
☐3. Other (Explain pricing mechanism(s) under Comments on Page 9.)

I. Contract Options: At whose option can the following take place?

	Buyer's	Seller's
1. Optional quantities	☐	☐
2. Additional quantities	☐	☐
3. Cancel some or all deliveries	☐	☐
4. Substitution of material	☐	☐
5. Change in delivery date(s)	☐	☐

H. Status of Litigation: 1. In litigation on December 31, 1992: ☐Yes ☐No.

Year of Delivery	J. Quantity (Thousand pounds U_3O_8 equivalent)		Price ($ per pound U_3O_8)					
			K. Market-Price Procurement			L. Contract-Price Procurement		M. Other Procurement
			Settled Price	Floor (If Applicable)				
	Firm	Optional		Escalated	Non-Escalated	Escalated	Non-Escalated	
1992 Settled Price								
1992 Not Settled Price								
1993 Settled Price								
1993 Not Settled Price								
1994								
1995								
1996								
1997								
1998								
1999								
2000								
2001								
2002								
2003								
2004								
2005								
2006								
2007 and beyond.								

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EIA

Energy Information Administration
U.S. Department of Energy
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Survey Year 1992
SCHEDULE B: URANIUM MARKETING ACTIVITIES

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ITEM 2: PROJECTED UNCOMMITTED URANIUM AVAILABLE FOR SALE AT SPECIFIED PRICES

Year	Quantity of Uncommitted Uranium Available for Sale (1000 lbs U_3O_8 equivalent)					
	$10 or less	$20 or less	$30 or less	$40 or less	$50 or less	Unlimited Price
1993						
1994						
1995						
1996						
1997						
1998						
1999						
2000						
2001						
2002						

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

Type of Inventory	Quantity (1000 lbs of U_3O_8 Equivalent)			
	Domestic-Origin		Foreign-Origin	
	Year-end 1991	Year-end 1992	Year-end 1991	Year-end 1992
A. U_3O_8 on hand, in off-site storage, or at conversion plant				
B. Natural UF_6 on hand, in private off-site storage, or at conversion plants				
C1. Natural UF_6 at enrichment suppliers (Exclud amounts held under usage agreements)				
C2. Enriched UF_6 at enrichment suppliers				
D. Enriched UF_6 on hand, and/or in private storage				
E. Fabricated fuel not inserted into a reactor, on hand, and/or in private storage				
F. Natural UF_6 your company has delivered to DOE under usage agreements				
G. Totals of 3.A through 3.F				

ITEM 4: UTILITY URANIUM INVENTORY POLICY

Does your company have an inventory policy on any form of uranium? ☐Yes ☐No (If Yes, provide the following data)

Type of Inventory	Desired Inventory Levels	
	Months of forward coverage	Thousand pounds U_3O_8 equivalent
U_3O_8		
Natural UF_6		
Enriched UF_6		
Fabricated Fuel		

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Survey Year 1992
SCHEDULE B: URANIUM MARKETING ACTIVITIES

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ITEM 5: ACTUAL ENRICHMENT FEED DELIVERIES IN THE SURVEY YEAR

Classification of Material Shipped	Quantity (1000 lbs U_3O_8 Equivalent)	Enrichment Source Country
A. Shipment of U.S.-origin material to U.S. DOE enrichment plants		
B. Shipment of foreign-origin material to U.S. DOE enrichment plants:		
Source: Australia		
Source: Canada		
Source: South Africa		
Source: Other (Please Specify):		
C. Shipment of U.S.-origin material to non-U.S. enrichment suppliers (including secondary SWU purchased or received in exchange)		
D. Shipment of foreign-origin material to non-U.S. enrichment suppliers (including secondary SWU purchased or received in exchange)		
Source: (Please Specify):		
E. U_3O_8 Equivalent of secondary SWU purchased or received in exchange (for U.S. DOE enrichment only)		
F. Total (A + B + C + D + E)		

ITEM 6: PROJECTED ENRICHMENT FEED DELIVERIES AND UNFILLED MARKET REQUIREMENTS

Year	(1000 lbs U_3O_8 equivalent)	
	Projected shipments to enrichment suppliers	Unfilled market requirements
1993		
1994		
1995		
1996		
1997		
1998		
1999		
2000		
2001		
2002		

ITEM 7: URANIUM USED IN FUEL ASSEMBLIES IN THE SURVEY YEAR

Utilities Only: Report only the total of unirradiated uranium in fuel assemblies loaded into reactors during the Survey Year and during the prior year by origin. Do not include uranium removed from reactors that subsequently will be reloaded.	Quantity (1000 lbs of U_3O_8 Equivalent)			
	Domestic-Origin		Foreign-Origin	
	Year-end 1991	Year-end 1992	Year-end 1991	Year-end 1992
Unirradiated Uranium in Fuel Assemblies				

COMMENTS FOR SCHEDULE B

Form EIA-858 (12-92)

Form Approved
O.M.B No. 1905-0160
Expiration Date 12/31/94

Energy Information Administration
U.S. Department of Energy

Instructions for Uranium Industry Annual Survey Schedule C of Form EIA-858

Survey Year 1992

For assistance concerning the Schedule C Form EIA-858, contact the Survey Manager at (202) 254-5544.

I. Who Must Respond Your company must respond to Parts I, II, III, and IV of Schedule C if, in 1992, it was involved in resources ownership, exploration, development, mining, milling, or other beneficiation activities directed specifically toward the ultimate production of uranium from mineral deposits located in the United States to be offered for sale in the commercial marketplace, and if it meets any one of the following size criteria:

1. Your company held net investment in place in 1992 in the domestic uranium industry in excess of $5 million either as an operator or a non-operator equity partner;

2. Your company held domestic uranium inventories in excess of $5 million at the beginning of 1992;

3. Your company had future delivery commitments at year end 1992 in excess of $5 million.

Definition: The term *Company*, as used above, includes any corporation, operating subsidiary, unconsolidated affiliate, partnership, joint venture, privately-held company, or unincorporated business.

Companies that are involved in more than one venture that do not meet the reporting size criteria individually but do so in the aggregate are required to report. If the company is inactive or exited the industry in 1992 but satisfies the above general and size criteria at the beginning of the Survey Year, Schedule C must be completed.

If your company does not meet any of criteria 1 through 3 above and if no part of Schedule C for 1992 is applicable to your company, please follow the three steps below:

1. Briefly explain the current status of your involvement in the domestic uranium industry in the "Comments" space provided on pages 3 or 4.

2. Mark the *Not Applicable* box on page 1.

3. Read and sign the **Certification Statement** on page 1 and return the signed Schedule C in the franked envelope provided.

II. Sanctions The timely submission of EIA-858 by those required to report is mandatory under section 13(b) of the Federal Energy Administration Act of 1974 (FEAA) (Public Law 93-275), as amended. Failure to respond may result in a civil penalty of not more than $2,500 for each violation, or a fine of not more than $5,000 for each willful violation. The government may bring a civil action to prohibit reorting violations which may result in a temporary restraining order or a preliminary or permanent injunction without bond. In such civil action, the court may also issue mandatory injunctions commanding any person to comply with these reporting requirements.

III. Reporting Period All financial data should be based on the most recently completed accounting year. This is presumed to be December 31, 1992, unless otherwise stated.

IV. Reporting Conventions All dollar amounts should be recorded to the nearest thousand dollars. Use negative sign conventions (minus sign or brackets) if the amount being represented is the opposite of the normal expected balance. For example, liability and equity amounts should not be bracketed unless they are opposite of the normal expected positive amount. Other revenue and expense on item 68 should be bracketed only if it increases income. The tax expense item should be bracketed if it represents a benefit (a reduction of pretax loss).

V. Use of Exhibits The following information must be provided as exhibits to the completed survey:

Exhibit A: Background information on the reporting company's accounting and financial reporting policies including principles of consolidation and policies on capitalizing and expensing exploration and development expenditures.

Exhibit B: Explanation of the procedures used to allocate or assign consolidated financial data to the domestic uranium segment.

Exhibit C: A copy of the annual report and 10-K filed with the Securities and Exchange Commission for the reporting period. If the company is a subsidiary of a parent company, it must submit the parent's annual report and 10-K.

VI. Use of Generally Accepted Accounting Principles (GAAP) In completing Schedule C, reporting companies should follow the accounting principles they currently use to prepare financial statements. A brief explanation of these principles

should be prepared on a separate sheet of paper and attached as Exhibit A. The presumption is that your company's accounting principles are consistent with GAAP and, if available, may be copied directly for the company's financial reports. In this regard, a statement of cash flows prepared in a format consistent with GAAP for both Column A (Consolidated Level) and Column B (Uranium Sector) may be substituted in lieu of completing Part II of Schedule C.

VII. Consolidated Financial Data (Column A): Publicly-Held Companies In completing Column A (Consolidated Level), publicly-held companies have the option of taking information from the balance sheet, income statement, and statement of cash flows reported in their annual report (or 10-K), or taking the information from the accounting reports of their operating subsidiary in which the domestic uranium activities are conducted. However, if your involvement in the domestic uranium industry is not fully or proportionately consolidated or you are a partner or a joint venturer, follow the reporting requirements outlined for all other companies.

VIII. All Other Companies In completing Column A (Consolidated Level), unconsolidated affiliates, partnerships, joint ventures, and privately-held companies should use the balance sheet, income statement, and statement of cash flows of the company in which the domestic uranium business is conducted, taken as a whole, and not just report on the domestic uranium sector data only. Domestic uranium data should be reported in Column B (Uranium Sector Only). For example, if two or more companies are involved in the same venture, the general partner, operator, or controller of the venture should report the financial activities of the entire venture, not its percent interest only. If the venture involves domestic uranium activities only, Columns A and B would be the same except that Column B requires disaggregation of certain financial data. Equity, or non-operating interest, partners need report only the financial data in Column A and B consistent with their normal reporting practice in their annual report and 10-K filing.

IX. Domestic Uranium Sector Data (Column B) In this column, information should be specific to the domestic uranium segment only. Reasonable allocation methods for data elements may be used where they are not separately identifiable in your accounting records. Exhibit B should be used to explain allocation methods used. In addition, where a company reports items that are material to its financial position using accounting principles that are unusual or different from GAAP and industry practice, it should explain these differences in Exhibit B.

X. Item Explanations The desired amounts to be reported in each of the items on the attached Schedule C are considered self explanatory unless a specific instruction is given. Explanations intended for uranium sector data are separately identified as **"Column B Only"** instructions.

Schedule C: Uranium Industry Financial Status

Specific Instructions

Part I: Balance Sheet, Current Assets -

Item 1: Report total inventories of all items consistent with normal reporting practice. For Column B only, report the book value of domestic uranium raw materials and products, materials and supplies. In exhibit B, state the method used for valuing inventory (cost of market - lifo/fifo, etc.), and, if there have been any writedowns during the year, state the amount and the item number from Part IV where these writedown amounts have been included. Also, if the year-end uranium quantities reported in item 3 of Schedule B (Uranium Inventories) are not included in the calculation of inventory dollar values for Column B, please explain the differences in the box for comments on page 4. For example, a portion of the inventory value reported in this item might be attributable to materials and labor used for product that has not completed the mining and milling cycle, or the inventory value might exclude acquisitions from other domestic and foreign sources that are accounted for in item 3 of Schedule B.

Item 2: This is a residual amount which is all other current assets including cash, short-term securities, and receivables. For Column B only, report all other current assets that can be directly associated with the domestic uranium sector.

Item 3: This item is the sum of items 1 and 2.

Items 4 through 7: For Column A, report total investment in property, plant and equipment in item 7. For Column B, disaggregate the domestic uranium gross book value of capitalized investment into each of the four asset categories. In item 7, "All Other Property, Plant and Equipment" (PP&E), include uranium sector PP&E that cannot be otherwise classified in items 4 through 6.

Item 8: For Column B only, report the gross accumulated depletion, depreciation, and amortization (DD&A) amount taken on items 4 through 7. If this amount includes extra-ordinary writedowns, the amount of the writedowns, year, and asset category (i.e., items 4 through 7) should e disclosed in Exhibit B. Do not include any accumulated DD&A associated with Idle Facilities (item 10). Item 8 should be shown as a positive number.

Item 9: This item is the sum of items 4 through 7 minus item 8.

Item 10: For Column B only, report only net book value of idle facilities not otherwise reported in items 4 through 7. The amount should be net of any accumulated DD&A and extraordinary writedowns.

Item 11: For Column B only, report only the net investment in domestic uranium reserves and exploration, development, and production mining and milling operations, including partnerships and joint ventures. In Exhibit B, list the name of the unconsolidated operation or venture, percent interest, and net investment amount. If your normal practice is to report joint venture investments as proportional interest in property, plant, and equipment, and you have reported such amounts in items 4 through 7, it should be disclosed in Exhibit B.

Item 12: For Column B only, report only the net value of any other non-current assets that can be directly associated with domestic uranium reserves, exploration, development, production, or marketing commitments.

Item 13: This item is the sum of items 9 through 12.

Item 14: This item is the total of items 3 and 13.

Items 15 through 19: These items are, for the most part, self explanatory. Item 16 should include debt from external sources as well as parent and affiliated organizations. Item 17 is a residual category of all other deferred items. Item 18 is the total of items 16 and 17. Item 19 is the total of items 15 and 18. For Column B only, report current and total long-term and deferred liabilities that can be specifically identified with domestic uranium activities.

Items 20 through 23: Item 20 should include permanent capital contributions from investing stockholders, partners or ventures. Item 22 should include the cumulative balance of earnings and losses net of any distributions to stockholders, equity partners, or ventures. Item 21 is a residual category of cumulative adjustments to equity accounts. Item 23 is the sum of items 20 through 22. For Column B only, report only those items that can be specifically identified with domestic uranium activities on item 23.

Item 24: This item is the total of items 19 and 23. It also should be equal to item 14.

Item 25: Fill out as specified.

Part II: Sources and Uses of Funds -

Item 26: The amount reported here should agree with the reported amount on item 71 or 73 of the Income Statement. If the amount used for this item varies from either of these income statement items, please include an explanation in Exhibit B.

Item 27: The amount reported here should normally agree with item 63 on the income statement. If it does not, please include an explanation in Exhibit B.

Item 28: If the reported amount of deferred tax expense (benefit) is, in effect, a use of funds or negative source, please include an explanation in Exhibit B as to the circumstances creating the negative deferral.

Item 29: The amount reported here should be the total of all other items from the income statement that increase working capital from operations. For Column B only, the amount reported here should be the total of those items included in Column A that are specifically related to your company's domestic uranium operations. For example, there could be special writedowns of assets not reported in item 27.

Item 30: This item is the sum of items 26 through 29.

Item 31: The amount reported on this line should include only the net book value of dispositions upon sale or transfer of property, plant and equipment and not extraordinary retirements or writedowns. Gain or Loss on such transaction(s) normally flows through from the income statement and should be reflected in the net income (loss) reported in items 26 and 73. Where the reported amounts involve the total disposition of your company's interests in reserve properties, mines, and mills, please include in Exhibit B the name of the property, the net book value of the disposal, and the proceeds.

Item 32 and 33: For Column A only, report only new debt of your company including non-equity advances from parents and affiliates in item 32. Report proceeds from new equity offerings and any equity advances from parent and affiliated organizations and partners in item 33. For Column B only, report the combination of any debt and equity proceeds that can be specifically associated with your domestic uranium operations.

Item 34: This is a residual category which should include all other sources of funds. For Column B only, report any additional sources of funds specifically identified with the domestic uranium activities including contract advances from customers and other non-cash adjustments affecting the change in working capital. If the reported amount exceeds $5 million, please provide an explanation in Exhibit B.

Item 35: This item is the sum of items 30 through 34.

Items 36 through 40: Item 40 is the total additions made during the current year to property, plant and equipment. For Column B only, the amounts reported for items 36 through 39 should include only those current year expenditures which were capitalized. If the amount reported on item 39 exceeds 20 percent of item 40 and also exceeds $5 million, please include an explanation of the nature of the capitalized item in Exhibit B.

Items 41 and 42: For Column A only, item 41 should report any dividends or distributions of equity earnings to partners. Item 42 should report any debt reduction payments including amounts to parents and affiliated groups. For Column B only, report any amounts in Column A that can be specifically associated with your domestic uranium operations.

Item 43: This is a residual category that should include all other uses of funds. For Column B only, include any amounts that can be directly associated with the domestic uranium operation. If the amount reported in this column exceeds $5 million, please provide an explanation in Exhibit B.

Items 44 and 45: Item 44 is the sum of items 40 through 43.

Item 45 is the difference between items 35 and 44.

Part III: Planned Capital Expenditures for 1993 -

Items 46 through 50: For Column B only, report estimated amounts consistent with the classifications for items 36 through 40. Column A should be completed in total only.

Part IV: Income Statement -

Item 51: For Column B only, report uranium concentrate sales.

Item 52: For Column B only, report sales of uranium ore.

Item 53: For Column B only, report all revenues from mining and milling services.

Item 54: For Column B only, Report all other operating revenues not reported in items 51 through 53.

The amounts reported in items 51 through 54 should include intra-company transfers to foreign subsidiaries valued at market prices. If the amount of item 54 exceeds $5 million and is more than 20 percent of item 55 (Column B), please include an explanation of the source of this revenue. Include earnings (losses) from unconsolidated affiliates, partnerships, and/or joint ventures as a part of item 68. Operators of mines or mills should report the gross amount of partnership or joint venture activity in all items and use item 68 to offset earnings or losses attributable to non-operator interests. If it is the practice of the company to include them on a proportional or other basis, please describe the method used in Exhibit B. Also, use Exhibit B to explain variances between sales reported in item 51 of Schedule C and the sum of reported 1992 deliveries in Item 1 (Contract, or market commitment) of Schedule B, "Uranium Marketing Activities." Item 55 is the sum of items 52 through 54. For Column A, report total operating revenues only.

Item 56: Report the expenses incurred for exploratory drilling and for other expensed exploration costs. These include expenses incurred for drilling in search of new mineral deposits, or extensions to known ore deposits, and for drilling at the location of a discovery up to the time that the company decides that sufficient ore reserves are present to justify commercial exploitation. Also included are direct drilling expenses incident to exploratory drilling such as access roads, site preparation, geological and other technical support, and sampling and drill hole logging.

Capitalized portions of exploration and development costs related to unsuccessful efforts and written off during the current year should also be included in this item. However, major writedowns of property, plant, and equipment should not be included in this item, but reported in item 72, "Extraordinary Items." If any of the reported amounts include the company's share of such expenditures from joint venture activity, please include the name of the venture, your proportional share, and the amount.

Item 57: Report the production expenses for openpit mining, underground mining, and solution (*in situ*) mining. Include expenses for labor, extensions of mining facilities and equipment, back filling excavated areas, maintenance and repairs, operating supplies, expenditures for tracks, conveyers, electric cables, drainage, ventilation shafts, access roads (if expensed), and royalties and other payments out of production. Also include expenses for hauling uranium ore to the mill. Include the cost of uranium ore mined by others for your company's account and expenses incurred to mine uranium ore for the account of other companies. Fees earned for mining uranium for the account of others should be reported in item 53.

Item 58: Report the expenses incurred by the domestic uranium segment to process and treat uranium-bearing materials to produce U_3O_8. Include the expenses associated with the production of U_3O_8 concentrate from conventional milling, leaching of mill tailings, and U_3O_8 recovery from phosphoric acid, copper dumps, and other uranium-bearing materials. Include expenses for labor and materials received; processing of the material for treatment in the plant; treating, extracting, and recovering the uranium; and drying and packaging. Include the costs of milling done by others for your account and expenses incurred for toll milling (i.e., milling for the account of others).

Item 59: This item is the sum of items 57 and 58.

Item 60: Report purchases of uranium concentrate for resale. All other product purchases, including concentrate purchased for your company's own account or conversion, uranium hexafluoride, enriched uranium, nuclear fuel assemblies, and unspecified uranium-bearing materials should be included as a part of item 61.

Item 61: This amount should include selling expenses, inventory change including writedowns of inventory to market, taxes related to production and reserves, transportation, carrying costs of shut down or inactive mines and mills, and other expenses associated with production. Do not include loss reserves on future contract delivery commitments which should be reported in item 68.

Item 62: For Column A, report total operating expenses only. Column B is the total of item 56 plus the sum of items 59 through 61.

Item 63: For Column B only, this amount should include only current period DD&A. Major writedowns of PP&E should be reported in item 72.

Item 64: Report all other expenses entering into the determination of operating income (loss) not otherwise specified herein.

Item 65: This item is the sum of items 62 through 64.

Item 66: This item is the difference between items 55 nd 65.

Item 67: Report interest expense in Column A only. For Column B, no allocation or interest expense should be made.

Item 68: This item should include reserve contingencies, unusual items such as law suit settlements, or equity earnings (losses) from unconsolidated affiliates, cost basis dividends,

gain or loss on dispositions, minority interest income and other items of income and expense not accounted for in items 51 through 67. For Column B only, report the amounts that can be specifically associated with the domestic uranium activities. IF the reported amount exceeds $5 million, please include an explanation in Exhibit B as to the items and amounts making up the total. Please note also that if the amount reported in this item increases pretax income or reduces pretax loss, it should be bracketed.

Item 69: This item is the sum of items 66 through 68.

Item 70: Column A should be as provided for in the company's accounting records and financial reporting. For Column B only, this item should be calculated based on pretax income (item 69). Special tax provisions that cause this amount to vary from the statutory rate, such as investment tax credits, statutory depletion, capital gains, etc., should be reflected in the computed amount. If current year losses can be carried over or used to offset pretax income in other lines of business, the tax benefit accrued as a result should be allocated to this item. Tax reductions associated with major writedowns reported in item 72 should not be included here.

Item 71: This item is the net of items 69 and 70.

Item 72: For Column B only, this item should include any amount associated with domestic uranium operations which has been reported in Column A for this item. In addition, this item should include major writedowns of PP&E (net of taxes) and losses from discontinued operations if they have been reported elsewhere in the company's annual report and 10-K filing. Please include an explanation in Exhibit B if the amount reported in this item varies from your normal reporting practice.

Item 73: This item is the net of items 71 and 72.

PROVISIONS REGARDING CONFIDENTIALITY OF INFORMATION

The information contained on this form will be kept confidential and not disclosed to the public to the extent that it satisfies the criteria for exemption under the Freedom of Information Act (FOIA), 5 U.S.C. §552, the DOE regulations, 10 C.F.R. §1004.11, implementing the FOIA, and the Trade Secrets Act, 18 U.S.C. §1905.

Upon receipt of a request for this information under the FOIA, the DOE shall make a final determination whether the information is exempt from disclosure in accordance with the procedures and criteria provided in the regulations. To assist in this determination, respondents should demonstrate to the DOE that, for example, their information contains trade secrets or commercial or financial information whose release would be likely to cause substantial harm to their company's competitive position. A letter accompanying the submission that explains (on an element-by-element basis) the reasons why the information would be likely to cause the respondent substantial competitive harm if released to the public would aid in this determination. A new justification does not need to be provided each time information is submitted on the form, if the company has previously submitted a justification for that information and the justification has not changed.

The information contained on this form may be made available in response to an order of a Court of competent jurisdiction, or, upon request, to another component of the DOE, another Federal agency for official use, to any Committee of Congress, the General Accounting Office, or other Congressional agencies authorized by law to receive such information.

EIA-858 (12.92)

Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
SCHEDULE C
Survey Year 1992

Form Approved
OMB No. 1905-0160
Expires: 12/31/94

Data on this mandatory survey are collected under authority of Section 170B of the Atomic Energy Act of 1954, as amended (42 U.S.C. 790a), and the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b). Provisions regarding sanctions are described in Part II, page i of the instructions for Schedule C. Provisions regarding the confidentiality of information submitted in response to this survey are set forth on page v of the instructions for Schedules C.

The public reporting burden for this form is estimated to average 8.0 hours per response, including the time of reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and compiling and reviewing the collection of information. Please send your comments about this burden estimate, suggestions for reducing this burden, or any other aspect of this collection of information to: the Energy Information Administration, Office of Statistical Standards, EI-73, 1000 Independence Avenue SW, Washington, DC 20585; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

RESPONDENT IDENTIFICATION

Respondent ID (For EIA Use Only)

Company Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Parent Company: _____

APPLICABILITY OF SCHEDULE C

If no part of Schedule C is applicable to your company, please mark the Not Applicable box at right and complete the Certification Statement below.

NOT APPLICABLE ☐

CONTACT PERSON (If different from the person who signed theCertification Statement below)

Name: _____ Phone: (_____) _____-_____

CERTIFICATION

I certify that the historical and estimated information provided hereon and appended hereto are true, complete, and accurate to the best of my knowledge, information, and belief.

Name (Please print): _____ Title: _____

Signature: _____ Date: _____

Phone: (_____) _____

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

EIA-858 (12/92)

Energy Information Administration
U.S. Department of Energy
Uranium Industry Annual Survey
SCHEDULE C

FOR EIA USE ONLY

Schedule C: Uranium Industry Financial Status as of December 31, 1992

Part I: Balance Sheet

(Thousands of Dollars)

ASSETS	A. Consolidated Level	B. Uranium Sector Only
Current Assets		
1. Total Inventories		
2. All Other Current Assets		
3. Total Current Assets		
Noncurrent Assets--Property, Plant and Equipment		
4. Mining and Exploration Properties		
5. Deferred Intangible Development Mining Costs		
6. Mining and Milling--Property, Plant and Equipment		
7. All other Property, Plant and Equipment		
8. Less Accumulated Depletion, Depreciation, and Amortization		
9. Net Property, Plant and Equipment		
10. Idle Facilities (Net)		
11. Investments and Advances--Unconsolidated Subsidiaries		
12. All Other Noncurrent Assets		
13. Total Noncurrent Assets		
14. Total Assets		
LIABILITIES AND EQUITY	**A. Consolidated Level**	**B. Uranium Sector Only**
Liabilities		
15. Total Current Liabilities		
Deferred Liabilities		
16. Long-Term Debt and Advances		
17. Other Deferred Items		
18. Total Long-Term and Deferred Liabilities		
19. Total Liabilities		
Equity		
20. Capital Contribution		
21. Other Equity		
22. Retained or Undistributed Earnings		
23. Total Equity		
24. Total Liabilities and Equity		

25. Please include an estimate of domestic uranium mine and mill tailings reclamation and equipment disposal costs as of the balance sheet date, including any amount already accrued in Item 18 B above.

$_____

Schedule C: Uranium Industry Financial Status as of December 31, 1992 (continued)

Part II: Sources and Uses of Funds

(Thousands of Dollars)

SOURCES	A. Consolidated Level	B. Uranium Sector Only
26. Net Income (Loss)		
27. Depletion, Depreciation and Amortization		
28. Deferred Income Taxes		
29. Other Funds from Operations		
30. Total Funds from Operations		
31. Disposition of Property, Plant and Equipment (Book Value)		
32. New Long-Term Debt		
33. New Equity Offerings and Contributions		
34. Other Sources of Funds		
35. Total Sources		
USES	**A. Consolidated Level**	**B. Uranium Sector Only**
36. Capitalized Exploration Activity		
37. Milling Plant and Equipment		
38. Mining Plant and Equipment		
39. Other Property, Plant and Equipment		
40. Total Additions to Property, Plant and Equipment		
41. Dividends and Earnings Distributions		
42. Debt Reduction and Advance Payments		
43. All Other Uses		
44. Total Uses		
45. Increase (Decrease) in Working Capital		

Part III: Planned Capital Expenditures--1992

	A. Consolidated Level	B. Uranium Sector Only
46. Exploration Activity		
47. Milling Plant and Equipment		
48. Mining Plant and Equipment		
49. Other Property, Plant and Equipment		
50. Total Additions to Property, Plant and Equipment		

Comments:

Schedule C: Uranium Industry Financial Status as of December 31, 1992 (continued)

Part IV: Income Statement

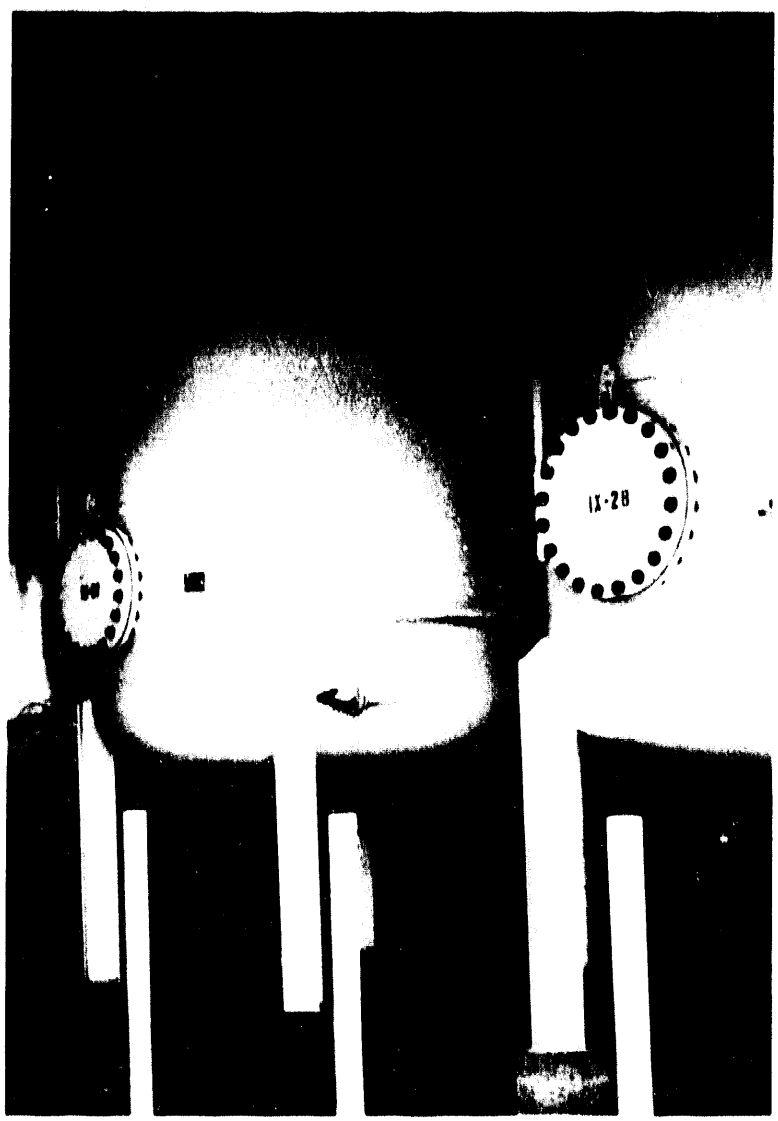
(Thousands of Dollars)

OPERATING REVENUES	A. Consolidated Level	B. Uranium Sector Only
51. Uranium Concentrate Sales		
52. Uranium Ore Sales		
53. Mining and Milling Services		
54. Other Operating Revenues		
55. Total Operating Revenues		
Operating Expenses		
56. Exploration		
57. Production--Mining		
58. Production--Milling		
59. Total Production Expenses		
60. Purchases for Resale--Concentrate		
61. Other Operating Expenses		
62. Total Operating Expenses		
63. Depletion, Depreciation and Amortization		
64. General and Administrative Expenses		
65. Total General and Operating Expenses		
66. Operating Income (Loss)		
Other Items of Income and Expense		
67. Interest Expense		
68. Other Revenues and Expenses		
69. Pretax Income (Loss)		
70. Income Tax Expense		
71. Net Income (Loss) from Continuing Operations		
72. Extraordinary Items and Cumulative Effects of Accounting Changes		
73. Net Income (Loss)		

Comments:

Appendix E

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



Ion exchange resin-bead tanks at an in situ *leach plant. Resin beads in these tanks selectively adsorb uranium from well-field solutions by the process of ion exchange, in which uranium-bearing anions are captured at positive ionic sites on the resin beads to concentrate uranium from relatively dilute well-field solutions.*

Appendix E

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

Standard Factors for interconversion between U.S. customary units and the International System of Units (SI) are shown in Table E1. These factors are provided as a coherent and consistent set of units for the convenience of the reader in making conversions between U.S. and metric units of measure for data published in this report. Conversion factors are provided only for the U.S. units of measurement quoted in this report.

Table E1. Conversion Factors for U.S. Customary Units and SI Metric Units of Measurement

To convert from:	To:	Multiply by:[a]
	Area	
acre	meter^2 (m^2)	4,047
	Length	
foot (ft)	meter (m)	0.3048*
yard (yd)	meter (m)	0.9144*
	Mass	
pound—avoirdupois (lb avdp)	kilogram (kg)	0.4536
pound—avoirdupois U_3O_8[b]	kilogram U	0.3847
ton, short (2,000 lb)	metric ton (t)	0.9072

[a]An asterisk after the last digit of the factor indicates that the conversion factor is exact and that all subsequent digits are zero. All other conversion factors are rounded to four significant digits.

[b]The factor of 1 pound U_3O_8 = 0.8480 pounds U was used in this conversion.

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

Forward Cost and Average Price Conversions

The forward-cost categories of $US20 through $US260 per pound U shown on Table E3 to report uranium reserves quantities were converted from units of "$ per pound U_3O_8" to "$ per kilogram U" by multiplying by the standard factor of 2.6 and rounding the results to the nearest multiple of $US10. The "Averages of Reported Prices" shown on Tables E7 and E9 were derived by applying that same factor to convert to "dollars per kilogram U." These averages were calculated from data reported in Item 1, "Contract," of Schedule B, "Uranium Marketing Activities," Form EIA-858, for the survey year.

Selected Tables Converted to SI Metric Values

Nine principal tables of data from the Uranium Industry Annual 1991 (UIA) converted to equivalent metric values are shown on the following pages. The crosswalk given below shows the correlation between the tables of metric values and their corresponding tables in U.S. customary units in the main body of the UIA.

Appendix E Table Number	UIA Chapter and Table Number
E2	Chapter 1, Table 3
E3	Chapter 1, Table 9
E4	Chapter 1, Table 13
E5	Chapter 1, Table 18
E6	Chapter 2, Table 24
E7	Chapter 2, Table 29
E8	Chapter 2, Table 30
E9	Chapter 2, Table 35
E10	Chapter 2, Table 40

Table E2. Exploration and Development Drilling Activities, 1966-1992

Year(s)	Exploration Drilling[a]				Development Drilling[b]			
	Number of Holes Drilled[c]	Million Meters[c]	Cost (million dollars)[c,d]	Average Cost (dollars per meters)[c]	Number of Holes Drilled[c]	Million Meters[c]	Cost (million dollars)[c,d]	Average Cost (dollars per meters)[c]
1966-1973	226,721	27.36	124.52	4.55	124,393	8.46	26.66	3.15
1974	27,400	4.49	34.95	7.79	12,300	2.08	9.81	4.71
1975	34,285	4.78	51.92	10.86	21,601	2.97	21.89	7.39
1976	40,409	6.21	70.70	11.39	27,231	4.40	38.30	8.70
1977	62,597	8.52	99.40	11.66	30,855	5.37	55.60	10.35
1978	75,068	8.82	113.30	12.84	29,285	5.84	56.40	9.66
1979	60,457	8.56	119.60	13.98	30,191	3.97	43.40	10.95
1980	39,607	5.97	94.80	15.87	20,188	2.62	30.90	11.80
1981	17,751	3.31	56.43	17.03	8,673	1.02	11.47	11.23
1982	6,965	1.29	20.94	16.24	3,002	0.34	6.90	[e]20.03
1983	4,287	0.64	10.60	16.64	3,011	0.33	3.84	11.57
1984	4,798	0.69	10.53	15.29	723	0.09	1.32	14.93
1985	2,877	0.43	5.14	11.88	772	0.10	0.39	3.76
1986	1,985	0.34	6.40	19.09	1,846	0.30	1.35	4.57
1987	1,820	0.34	5.90	17.44	1,994	0.26	1.06	4.04
1988	2,029	0.39	6.44	16.51	3,176	0.53	3.26	6.18
1989	2,087	0.44	5.82	13.35	1,753	0.24	3.12	12.80
1990	1,507	0.27	3.21	12.11	1,908	0.25	5.95	24.10
1991	1,624	0.30	2.83	9.57	1,573	0.26	8.11	30.58
1992	935	0.17	1.27	7.44	833	0.15	1.16	7.61

[a]Includes drilling in search of new ore deposits or extensions of known deposits and drilling at the location of a discovery up to the time the company decides sufficient ore reserves are present to justify commercial exploitation. Costs shown are in nominal U.S. dollars.

[b]Includes all drilling of an ore deposit to determine more precisely size, grade, and configuration subsequent to the time that commercial exploitation is deemed feasible. Costs shown are in nominal U.S. dollars.

[c]Number of holes for 1981 and prior years and data for meters drilled, total cost, and average cost for 1982 and prior years based on *Statistical Data of the Uranium Industry*, GJO-100(83)(January 1, 1983). Costs shown are in nominal U.S. dollars.

[d]Does not include the costs for 0.632 million meters of exploration drilling and 0.16 million meters of development drilling for 1966-1971 for which drilling costs were reported as "other exploration expenditures." Does not include costs for 3.038 million meters of exploration and development drilling reported together at a cost of $13.7 million, 1966-1972.

[e]This high value is attributable primarily to the large percentage of the total expenditures for development drilling in 1982 attributable to one company.

Note: Average cost per meter shown here may not equal quotients obtained with independently rounded numerator and denominator.

Sources: **1966-1970**—U.S. Department of Energy, Grand Junction Projects Office, Press Release No. 582 (August 12, 1971). **1971-1980**—U.S. Department of Energy, Grand Junction Projects Office, *Uranium Exploration Expenditures in 1980 and Plans for 1981-1982* (May 1981). **1981-1983**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983* (July 1984). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table E3. U.S. Uranium Reserves at the End of the Year, 1991-1992
(Thousand Metric Tons U)

Year	Forward-Cost Category in Nominal Dollars		
	$US80 per kilogram U	$US130 per kilogram U	$US260 per kilogram U
1991	117	375	593
1992	113	369	586

Note: 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. Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in these reserves.

Sources: **1991-1992**—Estimated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Projects Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey."

Table E4. Mine Production of Uranium by Mining Method, 1978-1992

Mining Method	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Underground Mines															
Thousand Metric Tons U	7.1	4.8	7.4	6.5	4.8	(a)	1.9	1.7	2.5	1.9	2.1	2.0	W	W	W
Percent of Total	45.5	30.4	43.2	46.4	53.4	--	49.0	52.3	77.8	81.7	56.8	54.4	W	W	W
Openpit Mines															
Thousand Metric Tons U	7.4	7.2	8.0	5.4	2.9	(a)	1.1	0.8	W	W	W	W	0.7	1.0	W
Percent of Total	47.5	45.4	46.8	38.3	32.2	--	29.0	23.3	W	W	W	W	32.0	48.8	W
Other Methods[b]															
Thousand Metric Tons U	1.1	3.8	1.7	2.2	1.3	1.9	0.8	0.8	0.7	0.4	1.6	1.7	1.5	1.0	0.4
Percent of Total	6.9	24.2	9.9	15.3	14.4	20.9	22.0	24.4	22.2	18.3	43.2	45.6	68.0	51.2	100.0
Total Production															
Thousand Metric Tons U	15.5	15.9	17.1	14.1	9.1	9.0	3.8	3.3	3.2	2.3	3.7	3.7	2.3	2.0	0.4
Percent of Change Prior Year	--	2.5	7.2	-17.6	-35.6	-0.4	-57.4	-14.0	-3.5	-27.7	58.3	2.1	-39.2	-11.8	-80.7

[a]For 1983, openpit plus underground mine production was 7.2 thousand metric tons U, or 79.1 percent.

[b]For 1978-1984, the "Other" category includes production from *in situ* leach, heap leach, mine water, and low-grade stockpiles. For 1985 the "Other" includes production from *in situ* leach, mine water, and water-treatment plant solutions. For 1986 through 1989, the "Other" includes production from openpit, *in situ* leach, heap leach, mine water, and water-treatment plant solutions. For 1990 and 1991, the "Other" includes production from underground, *in situ* leach, heap leach (1990), mine water, water-treatment plant solutions (1990), and restoration. For 1992, the "other" includes production from underground and *in situ* leach mines, uranium bearing water from mine workings and tailings ponds, and restoration.

-- = Not applicable.

W = Withheld to avoid disclosure of company-specific data. The data are included in the total for "Other."

Notes: Totals may not equal sum of components because of independent rounding. Percentages were calculated using unrounded data.

Sources: **1978-1982**—U.S. Department of Energy, Grand Junction Projects Office, *Statistical Data of the Uranium Industry* (January 1983). **1983**—Estimated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table E5. Uranium Processing Operations, 1981-1992

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Ore Fed to Process[a]												
Thousand Metric Tons Ore	13,196	7,939	5,375	3,915	1,628	1,187	1,307	1,101	1,120	655	580	232
Percent U_3O_8 (weighted average grade)	0.115	0.119	0.128	0.112	0.161	0.336	0.264	0.288	0.323	0.293	0.198	0.229
Thousand Metric Tons U	12.841	7.986	5.839	3.705	2.225	3.378	3.151	2.692	3.068	1.626	0.973	0.450
Other Mill Feed[b] (thousand metric tons U)	0.261	0.252	0.220	0.206	0.288	0.100	0.182	0.195	0.165	0.186	0.069	0.070
Total Mill Feed (thousand metric tons U	13.102	8.237	6.059	3.911	2.514	3.478	3.333	2.887	3.233	1.812	1.042	0.520
Change in-Process Inventory (thousand metric tons U)	0.003	-0.110	-0.108	0.018	0.079	-0.025	-0.081	0.052	-0.090	-0.094	-0.047	0.010
Production (thousand metric tons U)												
Theoretical Production at 100-Percent Recovery	13.099	8.348	6.167	3.892	2.434	3.503	3.413	2.834	3.323	1.906	1.089	0.530
Conventional Concentrate Production	12.307	8.036	5.969	3.703	2.340	3.405	3.263	2.706	3.144	1.788	1.003	0.523
U_3O_8 Tailings Less Unaccountables	0.792	0.311	0.198	0.190	0.094	0.098	0.130	0.129	0.179	0.119	0.085	0.007
Recovery from Mill Feed (percent)	94.0	96.3	96.8	95.1	96.1	97.2	96.2	95.5	94.6	93.8	92.2	98.7
Other Concentrate Production[c]	2.491	2.298	2.169	2.022	2.012	1.790	1.714	2.345	2.178	1.630	2.056	1.649
Total Concentrate Production	14.798	10.335	8.138	[d]5.724	[d]4.352	[d]5.195	[d]4.997	5.050	5.322	3.418	3.059	2.171
Concentrate Shipments (thousand metric tons U)	13.520	10.185	7.599	5.956	4.523	4.093	4.446	4.920	5.696	4.984	3.245	2.636

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

[b]Includes uranium recovered from low-grade ore, mine water, tailings water, and heap leaching, except as footnoted below.

[c]Concentrate production from *in situ* leaching and as a byproduct of other processing. The totals for 1986, 1987, and 1988 include uranium recovered from mine water at some mills that did not report processing of uranium ore in 1986.

[d]Total does not include uranium concentrate production from pilot projects or other research project sources.

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

Sources: 1980-1983—Calculated by staff of the Analysis and Systems Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Projects Office data files. 1984-1991—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). 1992—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table E6. Commitments for Delivery of Uranium from Domestic Suppliers to U.S. Utilities, 1992-2000 and Later

(Thousand Metric Tons U)

Year of Delivery	As of December 31, 1991				As of December 31, 1992				Change in Total from December 31, 1991 to December 31, 1992	
	Firm	Optional	Total	Cumulative	Firm	Optional	Total	Cumulative	Total	Cumulative
1992[a]	4.0	0.3	4.3	4.3	9.0	0	9.0	9.0	4.7	4.7
1993	4.2	0.5	4.7	9.0	6.6	0.3	6.9	15.9	2.2	6.9
1994	3.2	0.5	3.7	12.6	5.1	1.2	6.3	22.2	2.6	9.5
1995	3.1	0.8	4.0	16.6	5.0	1.3	6.3	28.5	2.3	11.9
1996	2.2	0.7	2.9	19.5	2.4	1.3	3.7	32.2	0.8	12.7
1997	2.0	0.4	2.4	21.9	1.7	0.6	2.4	34.5	-0.1	12.6
1998	0.9	0.5	1.4	23.3	1.2	0.5	1.7	36.2	0.3	13.0
1999	0.5	0.3	0.8	24.0	0.7	0.2	0.9	37.1	0.1	13.1
2000 and Later	0.7	0.2	0.9	24.9	1.6	0.1	1.7	38.8	0.8	13.8
Total	**20.9**	**4.1**	**24.9**	--	**33.2**	**5.6**	**38.8**	--	--	--

[a]Actual deliveries.
-- = 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" (1992).

Table E7. Average of Prices Paid for Purchases by U.S. Utilities from Domestic Suppliers, 1982-1992

Contract Type	Year of Delivery										
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Contract Price											
Averages of Reported Prices (dollars per kilogram U)	91.94	103.74	87.36	90.32	84.71	75.82	73.32	54.26	46.64	36.24	34.22
Amount of Uranium for Which Price Was Reported (thousand metric tons U)	3.2	3.7	2.8	3.4	2.3	3.9	2.8	3.7	4.6	6.7	5.1
Market Price											
No Floor											
Averages of Reported Price (dollars per kilogram U)	55.90	62.53	43.86	40.20	44.02	45.58	41.91	29.85	23.87	23.50	22.49
Amount of Uranium for Which Price Was Reported (thousand metric tons U)	1.1	1.7	1.6	1.1	1.3	1.0	0.9	0.7	2.0	1.3	1.5
Price and Cost Floor											
Averages of Reported Prices (dollars per kilogram U)	132.55	131.74	116.25	92.61	106.76	89.28	87.15	58.50	50.44	56.78	47.71
Amount of Uranium for Which Price Was Reported (thousand metric tons U)	2.2	1.4	1.8	1.5	1.0	0.5	0.4	0.4	0.6	0.5	1.8
Total											
Averages of Reported Prices (dollars per kilogram U)	107.30	94.07	82.89	70.59	71.21	59.41	56.13	40.09	30.29	32.81	36.10
Amount of Uranium for Which Price Was Reported (thousand metric tons U)	3.3	3.0	3.4	2.7	2.3	1.5	1.3	1.2	2.6	1.9	3.3
Contract & Market											
Averages of Reported Prices (dollars per kilogram U)	99.76	99.35	84.89	81.72	78.03	71.16	R67.99	50.86	40.82	35.52	34.96
Amount of Uranium for Which Price Was Reported (thousand metric tons U)	6.4	6.7	6.2	6.1	4.7	5.4	4.2	4.8	7.2	6.5	8.4

R = Revised data.

Notes: Price excludes uranium delivery under litigation settlements. Prices shown are quantity-weighted averages per kilogram U in nominal U.S. dollars.

Sources: **1982-1983**—Energy Information Administration, Form EIA-491, "Survey of United States Uranium Marketing Activity" (1982, 1983). **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1992* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table E8. Deliveries and Commitments of Uranium Imports and Exports by Transactions Type, 1967 to 2000 and Later

(Thousand Metric Tons U)

Year of Delivery	Imports by Transaction Type[a]					Exports by Transaction Type[a]				
	Purchases[b]	Loans	Exchanges	Other	Total	Sales[c]	Loans	Exchanges	Other	Total
Actual Deliveries										
1967	0	NA	NA	NA	0	0.5	NA	NA	NA	0.5
1968	0	NA	NA	NA	0	0.6	NA	NA	NA	0.6
1969	0	NA	NA	NA	0	0.4	NA	NA	NA	0.4
1970	0	NA	NA	NA	0	1.6	NA	NA	NA	1.6
1971	0	NA	NA	NA	0	0.2	NA	NA	NA	0.2
1972	0	NA	NA	NA	0	0.1	NA	NA	NA	0.1
1973	0	NA	NA	NA	0	0.5	NA	NA	NA	0.5
1974	0	NA	NA	NA	0	1.2	NA	NA	NA	1.2
1975	0.5	NA	NA	NA	0.5	0.4	NA	NA	NA	0.4
1976	1.4	NA	NA	NA	1.4	0.5	NA	NA	NA	0.5
1977	2.2	NA	NA	NA	2.2	1.5	NA	NA	NA	1.5
1978	2.0	NA	NA	NA	2.0	2.6	NA	NA	NA	2.6
1979	1.2	NA	NA	NA	1.2	2.4	NA	NA	NA	2.4
1980	1.4	NA	NA	NA	1.4	2.2	NA	NA	NA	2.2
1981	2.5	NA	NA	NA	2.5	1.7	NA	NA	NA	1.7
1982	6.6	NA	NA	NA	6.6	2.4	NA	NA	NA	2.4
1983	3.2	NA	NA	NA	3.2	1.3	NA	NA	NA	1.3
1984	4.8	NA	NA	NA	4.8	0.9	NA	NA	NA	0.9
1985	4.5	0	0	NA	4.5	2.0	0	0	NA	2.0
1986	5.2	0	0.3	NA	5.5	0.6	0	0	NA	0.6
1987	5.8	0.3	0	NA	6.1	0.4	0	0	NA	0.4
1988	6.1	0	0.5	NA	6.5	1.3	0	0.4	NA	1.7
1989	5.0	0.1	0.1	NA	5.3	0.8	0	0.1	NA	1.0
1990	9.1	<0.1	1.1	NA	10.2	0.8	0.1	0	NA	0.9
1991	6.3	2.2	0.4	NA	8.9	1.4	0	0	NA	1.4
1992	9.0	0.9	0.3	7.2	17.5	1.1	0	0	7.0	8.0
Commitments										
1993	6.8	W	0	W	7.2	1.1	0	0	0	1.1
1994	6.1	W	0	W	6.2	0.8	0	0	0	0.8
1995	5.8	W	0	W	5.9	0.7	0	0	0	0.7
1996	5.2	0	0	0	5.2	0.6	0	0	0	0.6
1997	4.8	0	0	0	4.8	0.5	0	0	0	0.5
1998	3.2	0	0	0	3.2	0.4	0	0	0	0.4
1999	2.2	0	0	0	2.2	0.4	0	0	0	0.4
2000 and Later	3.6	0	0	0	3.6	0	0	0	0	0

[a]1967-1991—Does not include transactions involving the delivery of uranium materials imported for custody/storage siting, conversion, enrichment, and/or fuel fabrication at U.S. facilities and subsequently exported or uranium materials exported for conversion, fuel fabrication, and/or enrichment at foreign facilities. 1992—"Other" imports include uranium shipped under transactions involving custody/storage siting, conversion, enrichment, and/or fuel fabrication at U.S. facilities. "Other" exports include uranium shipped from conversion, enrichment, and/or fuel fabrication facilities in the United States.

[b]1975-1981, Annual total represents direct purchase of foreign-origin uranium by U.S. companies.

[c]1967-1981, Annual total represents exports by U.S. uranium producers only.

NA = Not available.

W = Withheld to avoid disclosure of company data.

Notes: Totals may not equal sum of components because of independent rounding. For 1985-1992, domestic utility, supplier, and trader/broker purchase, loan, exchange transactions, and custody storage reported on Form EIA-858 as imports of uranium materials into the United States. For 1985-1992, domestic utility, supplier, and trader/broker sale, loan, and exchange transactions reported on Form EIA-858 as exports of uranium materials from the United States.

Sources: 1967-1983—Purchases and Sales, Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983* (August 1984). 1984-1991—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). 1992—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table E9. Average of Prices Paid for Imported Uranium Delivered to Domestic Utilities and Suppliers, 1983-1992

Item	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Averages of Reported Prices (dollars per kilogram U)	68.02	56.84	52.21	52.18	49.76	49.48	43.55	32.63	40.43	29.48
Amount of U_3O_8 for Which Price Data Were Reported[a] (thousand metric tons U)	3.2	4.3	4.1	4.9	5.0	5.8	5.0	9.0	6.1	8.6
Amount of U_3O_8 Delivered[a] (thousand metric tons U)	3.2	4.8	4.5	5.2	5.7	6.1	5.0	9.1	6.3	9.0
Percentage of Total Imports Delivered with Reported Prices	100	89	91	95	87	96	100	99	98	96

[a]The figure shown includes domestic utility, suppliers, and trader/broker purchases reported on Form EIA-858 as imports of uranium materials into the United States. Uranium materials reported as imports under loan and exchange transactions are excluded. Total loan and exchange imports for 1983-1992 are shown on Table 30.

Note: Prices shown are quantity-weighted averages per kilogram uranium equivalent in nominal U.S. dollars. Materials quantities are thousands of metric tons uranium equivalent.

Sources: **1983**—*Energy Information Administration Survey, United States Uranium Marketing Activity 1983 (August 1984).* **1984-1991**—Energy Information Administration, *Uranium Industry Annual 1991* (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992).

Table E10. Commercial and U.S. Government Inventories of Natural and Enriched Uranium as of End of Year, 1990-1992

(Thousand Metric Tons U Equivalent)

Item	Inventories at the End of the Year		
	1990	1991	1992
Utility Stocks			
Natural Uranium	23.7	R27.3	25.6
Enriched Uranium	15.8	R10.4	9.6
Domestic Supplier Stocks			
Natural Uranium	8.5	R7.2	7.5
Enriched Uranium	1.7	R0.8	2.3
Total Commercial Stocks	49.6	R45.7	45.1
Government-Owned Stocks[a]			
Natural Uranium	23.0	18.0	17.6
Enriched Uranium	12.6	14.1	8.9

[a]Government-owned stocks were reported as of September 30 of each year.

R = Revised data.

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

Sources: **1990-1991**—Energy Information Administration, Uranium Industries Annual 1991 (October 1992). **1992**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1992). **1990-1992, Government-owned uranium only**—Office of the Deputy Assistant Secretary for Uranium Enrichment, U.S. Department of Energy.

Glossary

A mobil tank trailer used for transporting a slurry of uranium concentrate from an in situ *plant to a final processing plant.*

Glossary

Average Delivered Price: The weighted average of all contract-price commitments and market-price settlements in a delivery year.

Breccia: A coarse-grained clastic rock, composed of angular broken rock fragments held together by a mineral cement or in a fine-grained matrix.

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

Cost Model for Economic Undiscovered Resources: A computerized method in which the estimated uranium endowment and cost factors are used to develop random variables describing the undiscovered resources ultimately expected to be discovered and produced at current-dollar cost of less than $30-, $50-, and $100-per-pound of U_3O_8.

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

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

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; or acquisition and management of uranium materials for use in commercial nuclear power plants.

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.

Enrichment Feed Deliveries: Uranium materials made available under contract to an enrichment-services supplier for processing into enriched-uranium product that is destined for use as fuel in a nuclear reactor.

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.

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

Forward Costs: The operating and capital costs still to be incurred in the production of uranium from estimated reserves; such costs are used in assigning the uranium reserves to chosen cost categories. These costs include labor, materials, power and fuel, royalties, payroll and production taxes, insurance, and applicable general and administrative costs. They exclude expenditures prior to reserve estimates—e.g., for property acquisition, exploration, mine development, and mill construction from the forward cost determinations, as well as income taxes, profit, and the cost of money. Forward costs are neither the full costs of production nor the market price at which the uranium will be sold.

***In Situ* Mining:** The recovery, by chemical leaching, of the valuable components of a mineral deposit without physical extraction of the mineralized rock from the ground (also referred to as "solution mining").

Long-term Purchase: A purchase contract under which at least one delivery of material is scheduled to occur during the second calendar year after the contract-signing year. Deliveries also can occur during the contract-signing year, during the first calendar year thereafter, or during any subsequent calendar year.

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

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

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

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

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

Net Imports: The uranium imports minus exports in a given delivery period.

Nuclear Reactor: An apparatus in which the nuclear fission chain can be initiated, maintained, and controlled so that energy is released at a specific rate. The reactor includes fissionable material (fuel), such as uranium or plutonium; fertile material; moderating material (unless it is a fast reactor); a heavy-walled pressure vessel; shielding to protect personnel; provision for heat removal; and control elements and instrumentation.

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

Processing of Uranium: The recovery of uranium obtained by nonconventional methods, such as *in situ* mining or as a byproduct of copper or phosphate mining.

Property: A specific piece of land with uranium ore reserves that may be developed for production, or undeveloped that is held for the ultimate purpose of economically recovering the uranium.

Purchase-Contract Imports of Uranium: The amount of foreign-origin uranium material that enters the United States during a survey year as reported on the "Uranium Industry Annual Survey" (UIAS), Form EIA-858, as purchases of either uranium ore, U_3O_8, natural UF_6, or enriched UF_6. The amount of foreign-origin uranium material that enters the country during a survey year under other types of contracts reported on the UIAS, i.e., loans and exchanges, is excluded.

Short-Term Purchase: A purchase contract under which all deliveries of materials are scheduled to be completed by the end of the first calendar year following the contract-signing year. Deliveries can be made during the contract year, but deliveries are not scheduled to occur beyond the first calendar year thereafter.

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

Spot-Market Price: A transaction price concluded "on the spot," that is, on a one-time, prompt basis; usually the transaction 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 uranium-235 and uranium-238. Uranium-235 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. Uranium-238 is also important because it absorbs neutrons to produce a radioactive isotope that subsequently decays to plutonium-239, an isotope that also is fissionable by thermal neutrons.

- Concentrate: A yellow or brown powder produced from naturally occurring uranium minerals as a

result of milling uranium ore or processing uranium-bearing solutions. Synonymous with yellowcake, U_3O_8, or uranium oxide.

- Enriched Uranium: Uranium enriched in the isotope U-235.

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

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

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

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

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

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

Uranium Resources Categories: Three classes of uranium resources reflecting different levels of confidence in the categories reported. These classes are reasonable assured resources (RAR), estimated additional resources (EAR), and speculative resources (SR). They are described below:

- **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 laws 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 amount of uranium in ore that could be exploited within the forward cost levels are estimated according to conventional engineering practices, utilizing available engineering, geologic, and economic data.

- **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 Reserve 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. As the term implies, the existence and size of such deposits are speculative. The estimates in this category are less reliable than estimates of EAR. The category of SR corresponds to DOE's Possible Potential Resources plus Speculative Potential Resources categories.

Usage Agreements: Agreements under which the Department of Energy previously accepted natural UF_6 delivered early by its enrichment customers as a result of deferrals of enriched UF_6 deliveries.