ERDA 76-46

Survey Of United States Uranium Marketing Activity

April 1976

Energy Research & Development Administration
Division Of Nuclear Fuel Cycle & Production
Office Of Assistant Director For Raw Materials

Available from:

National Technical Information Service (NTIS)
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

Price: Printed Copy: $ 4.00
Microfiche: $ 2.25

ERDA 76-46
UC-51

Survey Of United States Uranium Marketing Activity

April 1976

Energy Research & Development Administration
Division Of Nuclear Fuel Cycle & Production
Office Of Assistant Director For Raw Materials

SURVEY OF UNITED STATES URANIUM MARKETING ACTIVITY

Introduction

As part of a continuing assessment of uranium supplies for operating and planned nuclear power plants in the United States, the Supply Evaluation Branch of the Division of Nuclear Fuel Cycle and Production of the U. S. Energy Research and Development Administration (ERDA) has completed a survey of uranium marketing activities in 1975. Annual reports on domestic uranium marketing have been published since 1968 by the Atomic Energy Commission (AEC) and its successor, ERDA.

Information for the present survey was received from 70 utilities with nuclear reactor projects, 33 present or potential uranium producers, and 5 reactor manufacturers. These companies represent virtually all the principal companies involved in uranium marketing activity. A list of participants is presented in Attachment A.

The 1976 survey requested data on uranium purchase commitments, uranium imports and exports, unfilled reactor fuel requirements, inventories of domestic and foreign uranium, and prices for existing contracts between domestic primary producers and domestic buyers. The report covers 210 nuclear power reactors in operation, under construction, or for which orders have been placed, having a total rated capacity of 207,000 megawatts electric (MWe) (see reactor list in Attachment B).

Domestic Uranium Purchase Commitments

As shown in Table I, new contract commitments in 1975 were 16,200 tons of U_3O_8. These were offset by a 1,700 tons reduction to January 1, 1975, commitments, resulting in a net increase in 1975 of 14,500 tons. After subtracting 1975 deliveries of 12,500 tons, January 1, 1976, forward commitments total 125,800 tons, or 2,000 tons above the figure of January 1, 1975. The new 1975 commitments of 16,200 tons compare to commitments of 17,600 tons made in 1974.

TABLE I

DOMESTIC COMMERCIAL URANIUM DELIVERIES AND COMMITMENTS[1/]
AS OF
JANUARY 1, 1975 AND JANUARY 1, 1976

	Tons U_3O_8
Past Deliveries Plus Forward Commitments (1/1/75)	191,300
Changes During 1974	
Total New Purchases	16,200
Reductions to 1/1/75 Commitments	(1,700)
Net Change	14,500
Past Deliveries Plus Forward Commitments (1/1/76)	205,800
Deliveries:	
Prior to 1975	(67,500)
During 1975	(12,500)
Forward Commitments (1/1/76)	125,800

1/ Commitments between primary producers and users; transfers between producers or between buyers are not included.

Reported annual uranium delivery commitments as of January 1, 1976, and January 1, 1975, are shown in Table II. Actual receipts reported for 1975 were 3,100 tons less than plans reported in the 1975 survey. Figure 1 graphically compares annual delivery commitments reported by domestic producers and buyers as of January 1, 1973, 1974, 1975, and 1976.

Uranium Prices

AEC/ERDA has conducted surveys of domestic uranium prices as of July 1 since 1973, in addition to the January marketing survey. The rapid increase in uranium prices has created a need for more frequent surveys of uranium prices. Therefore, a request for price data was included in this year's marketing survey and will be incorporated in future marketing surveys so that, in addition to the July price surveys, year-end information on prices will also be available.

Table III shows the average contract prices for uranium to be delivered under contracts in existence as of January 1, 1976, and the data as of July 1, 1975. The prices shown are in year-of-delivery dollars as estimated by the buyers using their interpretations of contract provisions, including escalation. The price data reported for most years cover over 80% of domestic uranium commitments, providing a good sample of prices. The percentage coverage reported for the January 1, 1976, survey, however, excludes uranium sold under "market price" contracts, that is, contracts in which the prices will be determined by actual market prices rather than by the terms of the contract alone. The percentage of procurement under market price contracts for the 1976 data is shown in Table III.

The $10.50 price for 1975 deliveries is a substantial increase over the $8.45 reported as of July 1975, due principally to higher prices for additional near term deliveries and to renegotiation and upward adjustments to prices in old contracts.

The 1981 and 1982 prices as reported in the current survey are below those in the July 1975 survey as a result of the exclusion of market price contract data from the present survey and reevaluation by buyers of the anticipated impact of escalation on their contracts. The market price type of contract has become more popular as indicated by the much larger proportion of such contracts in 1981 and later (Table III).

TABLE II

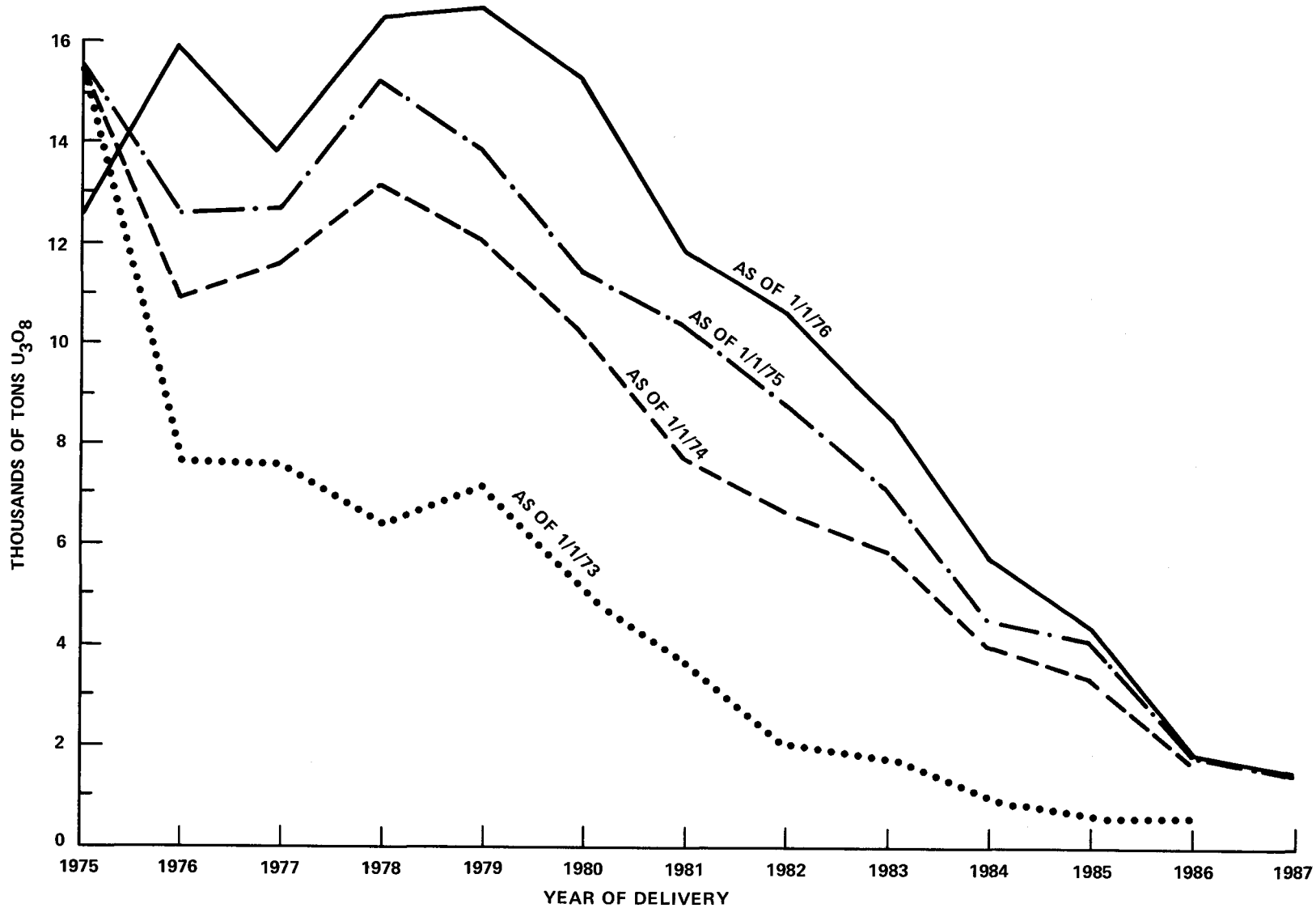
URANIUM DELIVERY COMMITMENTS
DOMESTIC PRODUCERS TO DOMESTIC BUYERS - TONS U_3O_8

Year of Delivery	Annual		Cumulative	
	As of 1/1/76	As of 1/1/75	As of 1/1/76	As of 1/1/75
1966-1974	---	---	---	67,500
1975	12,500	15,600	80,000	83,100
1976	15,900	12,600	95,900	95,700
1977	13,800	12,700	109,700	108,400
1978	16,400	15,300	126,100	123,700
1979	16,500	13,900	142,600	137,600
1980	15,200	11,600	157,800	149,200
1981	11,800	10,400	169,600	159,600
1982	10,500	8,800	180,100	168,400
1983	8,300	7,100	188,400	175,500
1984	5,700	4,500	194,100	180,000
1985	4,300	4,100	198,400	184,100
1986	1,900	1,900	200,300	186,000
1987	1,400	1,400	201,700	187,400
1988-1994	4,100 (<1,200/yr.)	3,900 (<1,200/yr.)	205,800	191,300

Figure 4

4/29/76

FIGURE 1
DOMESTIC URANIUM DELIVERY COMMITMENTS TO DOMESTIC BUYERS



COMPARISON OF PRICES IN 7/1/75 AND 1/1/76 SURVEYS

	January 1, 1976 Survey			July 1, 1975 Survey	
Year	Price Per Pound of U_3O_8	Percent of Commitments for Which Prices Were Reported[1/]	Percent of Commitments in Market Price Contracts[2/]	Price Per Pound of U_3O_8	Percent of Commitments For Which Prices Were Reported
1975	10.50	84	1	8.45	84
1976	10.70	86	3	10.20	86
1977	11.10	77	6	10.75	80
1978	12.20	88	4	12.05	85
1979	13.05	84	3	13.10	83
1980	14.35	79	3	13.80	86
1981	15.80	84	24	16.65	87
1982	16.35	87	32	19.20	89
1983	16.05	88	36	--	--
1984	15.45	85	16	--	--
1985	15.90	67	23	--	--

1/ $\frac{C}{T-M}$

2/ $\frac{M}{C+M}$

Where: T = Total commitments
C = Commitments reported to have "contract" prices
M = Commitments reported to have "market" prices

TABLE III

4/29/76

The lower average prices for the 1983-1985 period compared to 1982 are due to the small number of contracts made for deliveries in this period since the escalation in prices.

Figure 2 depicts the range of contract prices as reported in the July 1, 1974 and 1975, and the January 1, 1976, surveys. The large increase in maximum prices between the July 1974 and July 1975 surveys reflects the rapid price increase that occurred in that period. The increases during the last half of 1975 were much less. However, a significantly higher maximum price was reported in the current survey for the 1975-1977 period compared to the July 1, 1975, survey. This resulted from increased procurement in the latter part of 1975 involving near-term deliveries.

The reduction in maximum prices for the 1979-1982 period is the result of a reevaluation of contract escalation rates by purchasers and not from exclusion of the market price contracts. The narrower price ranges for the 1983-1985 period are also related to the fact that prices in these years largely relate to older contracts.

Uranium Import Commitments

In 1975 an additional 4,400 tons of foreign uranium was contracted for, bringing the total foreign procurement to 45,400 tons. Table IV shows the annual delivery schedule for foreign uranium under contract to domestic buyers. Five countries will provide these imports, with Canada supplying nearly 50 percent of the total. The forward delivery commitment, from 1976 through 1990, is 44,300 tons as of January 1, 1976, a 3,300 tons increase over the forward commitment last year.

Uranium Export Commitments

Commitments by domestic uranium producers to foreign buyers increased by 400 tons during 1975 (Table V). Five hundred tons of U_3O_8 were delivered to foreign buyers in 1975. The forward delivery commitment as of January 1, 1976, was 3,500 tons of U_3O_8.

RANGE OF REPORTED U_3O_8 PRICES, 7/1/74, 7/1/75, AND 1/1/76 SURVEYS

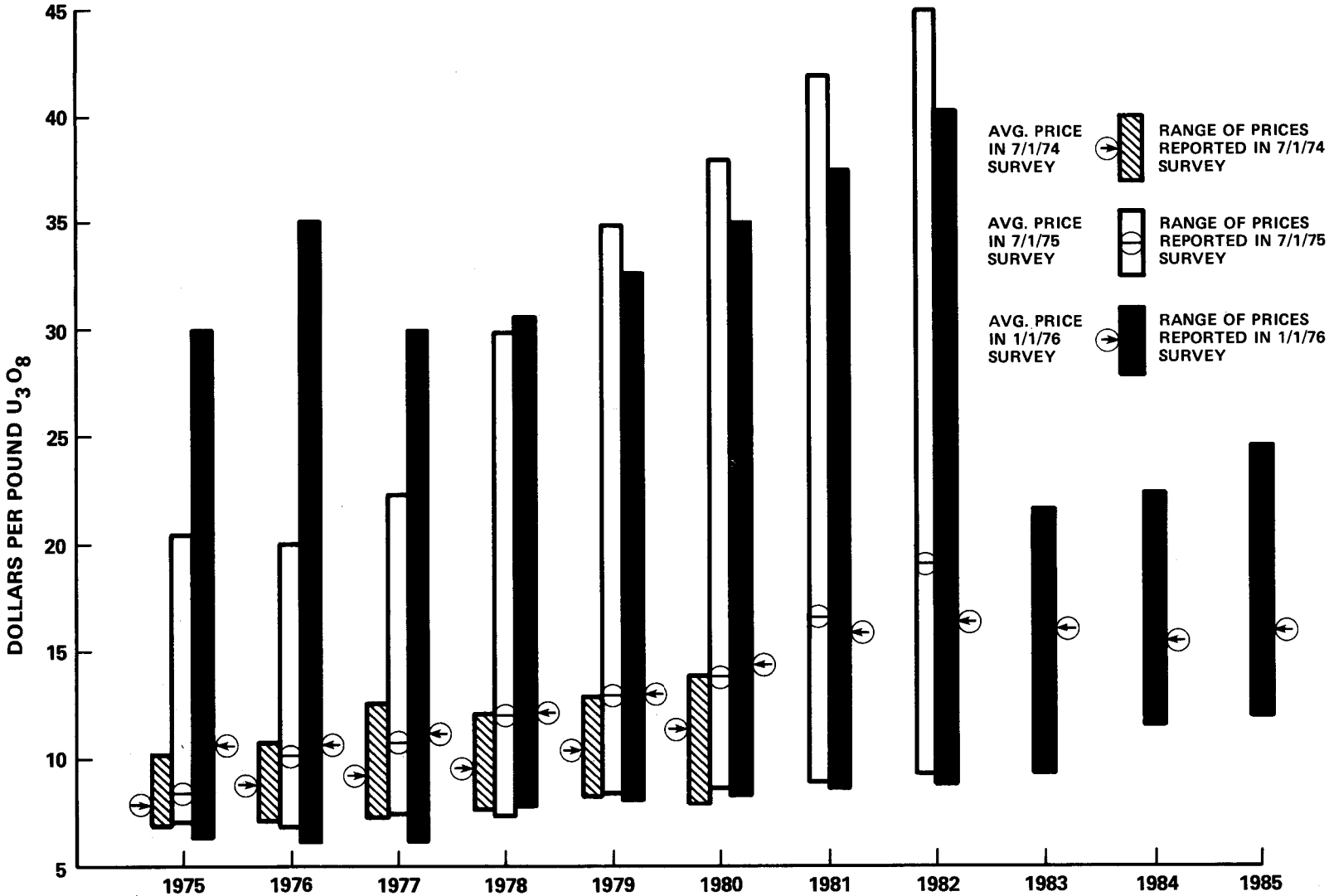


FIGURE 2

TABLE IV

URANIUM IMPORT COMMITMENTS
BY DOMESTIC BUYERS
(Tons of U_3O_8)
As of January 1, 1976

Year of U_3O_8 Delivery	Annual	Cumulative
1975	1,100	1,100
1976	2,800	3,900
1977	2,500	6,400
1978	3,300	9,700
1979	3,200	12,900
1980	4,100	17,000
1981	4,200	21,200
1982	3,900	25,100
1983	3,900	29,000
1984	3,700	32,700
1985	3,400	36,100
1986	2,400	38,500
1987-1990	<2,000/Yr.	45,400

TABLE V

URANIUM SALES COMMITMENTS TO FOREIGN BUYERS
BY DOMESTIC PRODUCERS

Tons of U_3O_8

As of January 1, 1976

Year of Delivery	Annual	Cumulative
1966-1974	---	7,000
1975	500	7,500
1976	1,000	8,500
1977	1,400	9,900
1978	800	10,700
1979	300	11,000
1980 and later	0	0

Uranium Requirements for Nuclear Power Growth

Table VI shows uranium requirements related to domestic ERDA toll enrichment contracts, assuming plutonium and uranium recycle.1/ The requirements reflect schedule revisions resulting from the "Open Season" which allowed customers with fixed-commitment contracts to reestablish separative work schedules and modify, subject to certain limitations, their feed-delivery schedules. Since some requirements are related to requirements-type contracts or fixed-commitment contracts for which schedules had not been settled, further adjustments are likely.

Unfilled Requirements

Table VII lists additional uranium requirements reported for the reactors in the survey, through 1985, over and above January 1, 1976, buyers' inventories and contracted domestic and foreign deliveries. Unfilled requirements for the 1976-1978 period decreased only from 9,000 tons to 8,400 tons U_3O_8, as some deliveries were rescheduled from later years into the period as can be seen for 1977. New procurement, reactor delays, and separative work contract adjustments reduced unfilled needs for the 1979-1981 period by 19,800 tons from the amount reported a year ago.

Table VIII indicates the potential domestic market for domestic suppliers assuming that the reported unfilled requirements are filled entirely by new contracts with domestic primary producers.

Inventories

Inventories continued to build in 1975. Utilities and reactor manufacturers reported year-end 1975 inventories of 22,600 tons of domestic U_3O_8, 2,400 tons greater than the 20,200 tons in inventory reported as of January 1, 1975. A 1,100 ton inventory of foreign U_3O_8 was also reported.

1/ CONF 751134, Uranium Enrichment Conference, Oak Ridge, Tennessee, November 11, 1975.

TABLE VI

URANIUM REQUIREMENTS [1/]

Tons U_3O_8

	ERDA Domestic Toll Enrichment Feed Contracts (208,000 MWe)	
Year	Annual	Cumulative
1976	10,700	10,700
1977	17,400	28,100
1978	21,100	49,200
1979	25,200	74,400
1980	31,400	105,800
1981	35,200	141,000
1982	35,800	176,800
1983	34,100	210,900
1984	34,900	245,800
1985	31,700	277,500
1986	32,800	310,300
1987	34,400	344,700
1988	33,000	377,700
1989	31,900	409,600
1990	31,800	441,400

1/ .20% Tails to 10/1/78 (delayed from 10/1/77)
.25% Tails to 10/1/79
.275% Tails to 10/1/81
.29% Tails thereafter

Uranium Recycle 1981
Plutonium Recycle 1983

TABLE VII

UNFILLED URANIUM REQUIREMENTS[1/]
As Reported 1/1/75 and 1/1/76

Tons U_3O_8

As of 1/1/76		As of 1/1/75	
1976	1,100	1976	1,000
1977	2,900	1977	1,400
1978	4,400	1978	6,600
1979	5,100	1979	11,500
1980	8,600	1980	18,800
1981	15,500	1981	18,700
1982	22,200	1982	22,500
1983	27,400	1983	NA
1984	29,200	1984	NA
1985	31,200	1985	NA

NA - Not available

1/ Assuming tails assays of:
0.20% Tails to 10/1/77
0.25% Tails to 10/1/79
0.275% Tails to 10/1/81
0.30% Tails thereafter
Recycle - respondents assumptions

TABLE VIII

POTENTIAL DOMESTIC PRODUCERS MARKET
AS OF 1/1/76

Tons U_3O_8

Calendar Year	1 Reported Unfilled Requirements	2 Committed Domestic Deliveries	3 Potential Domestic Deliveries 1 + 2
1976	1,100	15,900	17,000
1977	2,900	13,800	16,700
1978	4,400	16,400	20,800
1979	5,100	16,500	21,600
1980	8,600	15,200	23,800
1981	15,500	11,800	27,300
1982	22,200	10,500	32,700
1983	27,400	8,300	35,700
1984	29,200	5,700	34,900
1985	31,200	4,300	35,500

Inventories held by domestic primary uranium producers in January 1, 1976, totaled about 3,000 tons U_3O_8, a reduction from the 4,300 tons reported last year.

Figure 3 compares the growth in buyers' inventories, requirements, and uranium delivery commitments since 1973. The data indicate that inventories will continue to grow in 1976. As reported deliveries would be less than requirements for 1977 and in subsequent years, some draw down of inventories could occur.

Figure 4 compares the cumulative U. S. supply position, including domestic and foreign inventories and delivery commitments, with the ERDA enrichment contract uranium feed requirements (assuming uranium recycle in 1981 and plutonium recycle in 1983 and the step increases in the tails assays from .2 to 0.29). Cumulative requirements would equal the cumulative procurement in 1981, indicating that, on an industry-wide basis, uranium arrangements are equal to cumulative requirements through that time.

Reactor Fuel Coverage

Forward fuel supply arrangements for the 210 nuclear power reactors are summarized in Table IX. If the operating license had been granted, the plant was considered operating; if the construction permit had been issued, the plant was considered under construction; and if the nuclear steam system supply contract had been awarded, the plant was considered ordered. The status of each reactor is as listed in the ERDA report entitled "Status of Central Station Nuclear Power Reactors - Significant Milestones" (ERDA-30, 1/1/76).

Fewer than half the operating reactors have arrangements made for the uranium needed beyond the sixth reload. For reactors under construction, fewer than half have arranged for more than two reloads. For ordered reactors, arrangements have been made for first cores for half the reactors and for a smaller proportion of reloads. Fuel arrangements for reloads generally show a drop compared to last year.

The percentage of generating capacity for which first cores and reloads have been covered by various sources of supply is shown in Table X. Uranium has been arranged for first cores of plants due to commence operation after January 1, 1976, sufficient to cover 61 percent of the rated megawatt

FIGURE 3

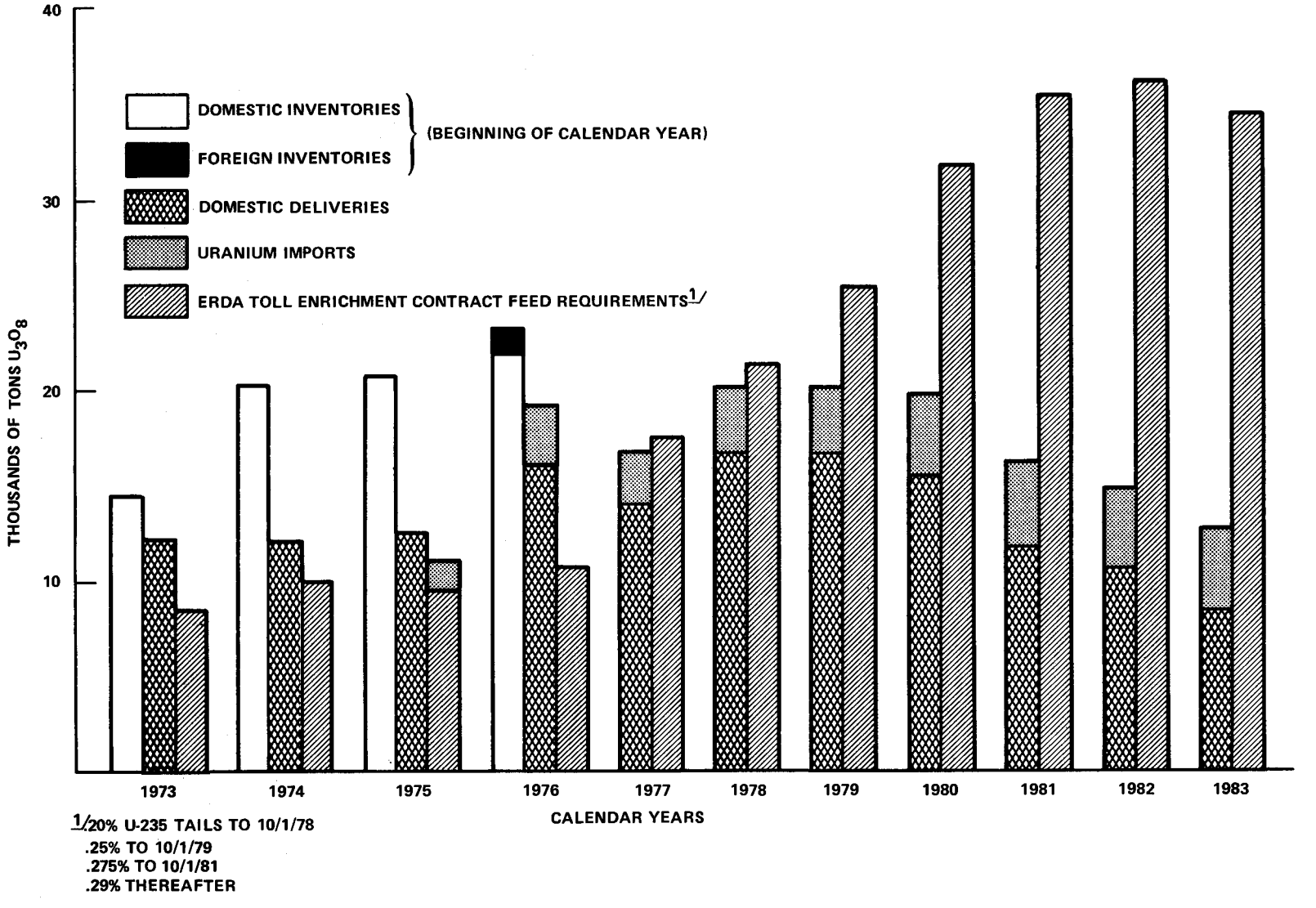

40
30
20
10
THOUSANDS OF TONS U_3O_8
DOMESTIC INVENTORIES
FOREIGN INVENTORIES
(BEGINNING OF CALENDAR YEAR)
DOMESTIC DELIVERIES
URANIUM IMPORTS
ERDA TOLL ENRICHMENT CONTRACT FEED REQUIREMENTS 1/
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
CALENDAR YEARS
1/ 20% U-235 TAILS TO 10/1/78
.25% TO 10/1/79
.275% TO 10/1/81
.29% THEREAFTER

FIGURE 4

CUMULATIVE DELIVERY COMMITMENTS PLUS INVENTORIES AND FEED REQUIREMENTS

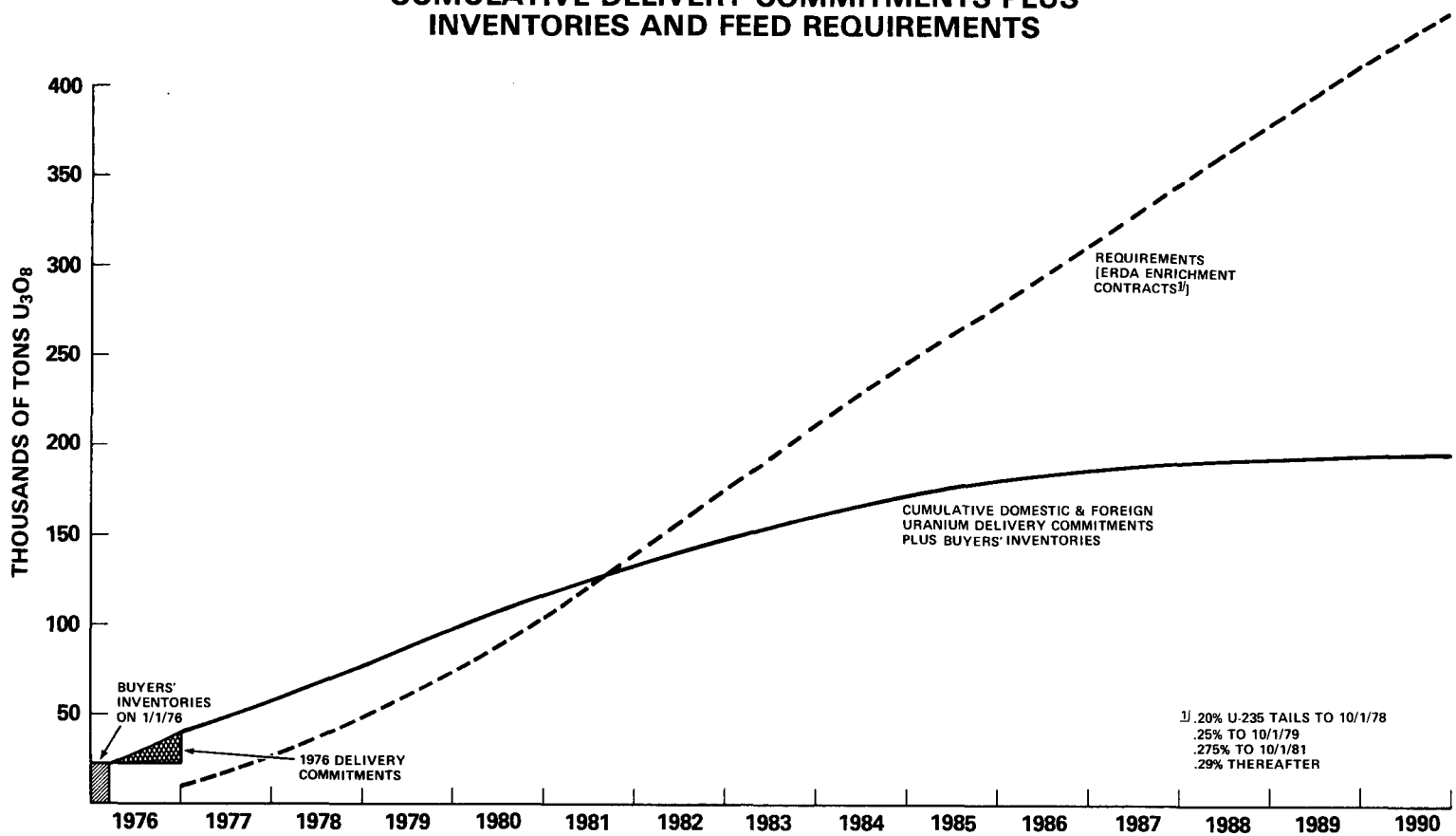


TABLE IX

FORWARD URANIUM SUPPLY ARRANGEMENTS
FOR REACTORS

	Number of Reactors					
	Operating (56)		Under Construction (69)		Ordered (85)	
	Arranged For	None	Arranged For	None	Arranged For	None
First Core	--	--	54	15	42	43
Reloads						
One	55	1	40	29	27	58
Two	50	6	34	35	18	67
Three	42	14	27	42	11	74
Four	43	13	18	51	6	79
Five	36	20	13	56	5	80
Six	20	36	7	62	1	84
Seven	14	42	6	63	1	84
Eight	8	48	6	63	1	84
Nine	6	50	5	64	1	84
Ten	6	50	5	64	1	84
Eleven	3	53	2	67	1	84
Twelve	3	53	2	67	1	84

TABLE X

URANIUM SUPPLY ARRANGEMENTS FOR FIRST CORES AND RELOADS BY SOURCES

Type of Uranium Supply Arrangements	Percentage of Generating Capacity Covered												
	First Cores	Reloads											
		1	2	3	4	5	6	7	8	9	10	11	12
a) Direct purchase of U_3O_8 from primary producers.	32	34	27	22	18	15	8	7	5	4	4	2	2
b) Purchase of uranium from reactor manufacturer, agent, and ERDA lease.	18	16	13	8	5	4	2	1	<.4	-	-	-	-
c) Imports of uranium	11	3	3	4	4	3	1	1	1	1	1	1	1
Total uranium supply arranged for.	61	53	43	34	27	22	11	9	6	5	5	3	3
No uranium supply arrangements.	39	47	57	66	73	78	89	91	94	95	95	97	97

capacity of the reactors under construction or on order. This percentage is unchanged from last year. About half of the first core uranium will be provided by purchases from primary uranium producers; about one third by purchases from reactor manufacturers, agents, and lease of fuel from ERDA; and the balance from uranium imports. The change in fuel supply arrangements since last year shows a growth in reliance on foreign uranium purchases and a decline in dependence on manufacturers and agents.

Table XI tabulates and Figure 5 illustrates the type of fuel supply arrangements for all reactors on an annual basis through 1987. The nuclear generating capacity in commercial operation, as listed in the report ERDA-30, 1/1/76, is shown with the proportion of this capacity covered. Fuel coverage rises to a peak in 1982 and declines thereafter. Dependence on foreign uranium reaches a peak in 1982 when about 20 percent of covered generating capacity would be using imported uranium.

The gap in reactor fuel coverage in the 1978-1981 period, which is not apparent from the comparison of industry-wide supply and demand shown in Figure 4, results from the uneven distribution of buyer uranium inventories. In Figure 5, excess uranium inventories held by some buyers is not considered available to fill needs of others.

Summary

Uranium supply arrangements for planned U. S. nuclear fuel capacity do not provide extensive coverage of future needs. Procurement efforts in 1974 and 1975 did not significantly improve the situation. In the years ahead, a substantial contracting effort by uranium producers and utilities will be needed.

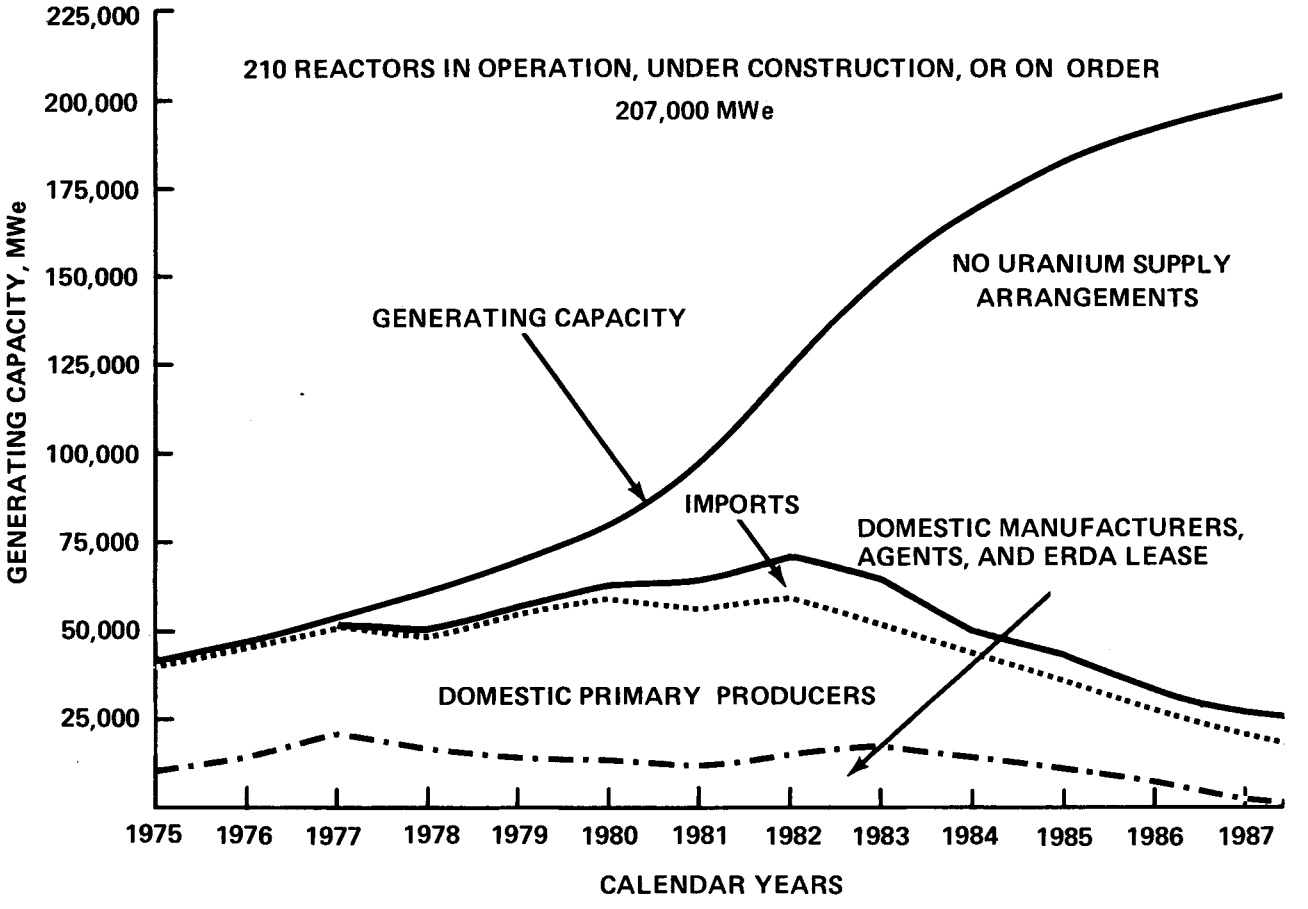
There are encouraging signs that the marketing situation is improving. Information available since January 1, 1976 indicates a substantial upturn in uranium procurement activity. This is considered a consequence of the higher uranium prices, an increasing ability of producers to make sales contracts, and an increased buyer effort to arrange for an assured future uranium supply.

TABLE XI

URANIUM SUPPLY ARRANGEMENTS FOR REACTORS BY SOURCE

End of Calendar Year	Scheduled Nuclear Generating Capacity, MWe	Capacity With Uranium Arranged For, MWe				
		Domestic Uranium				
		Direct Purchase From Primary Producer	Purchase From Manufacturer or Agent ERDA Lease	Subtotal	Foreign Uranium	No Fuel Arrangements (MWe)
1975	39,600	28,500	11,100	39,600	---	---
1976	46,200	31,800	14,100	45,900	---	300
1977	53,600	29,200	21,400	50,600	---	3,000
1978	60,200	31,900	17,000	48,900	1,300	10,000
1979	70,400	40,400	14,000	54,400	2,500	13,500
1980	79,700	45,800	14,000	59,800	2,800	17,000
1981	95,800	45,000	12,200	57,200	6,500	32,100
1982	123,100	43,700	15,400	59,100	12,200	51,800
1983	146,000	34,100	17,800	51,900	13,600	80,500
1984	166,000	29,800	14,700	43,600	6,000	116,400
1985	179,300	24,900	11,700	36,600	6,500	136,200
1986	189,900	19,900	7,600	27,500	5,800	156,600
1987	196,500	18,400	2,500	20,900	6,500	169,100

FIGURE 5
FUEL SUPPLY ARRANGEMENTS FOR
NUCLEAR POWER PLANTS



ATTACHMENT A

COMPANIES INCLUDED IN THE 1976 ERDA SURVEY
OF NUCLEAR INDUSTRY FUEL SUPPLY ARRANGEMENTS

Utilities

Alabama Power Company
American Electric Power Service Corporation
Arizona Public Service Company
Arkansas Power & Light Company
Baltimore Gas and Electric Company
Boston Edison Company
Carolina Power & Light Company
Central Maine Power Company
Central Power & Light Company
Cincinnati Gas & Electric Company
Cleveland Electric Illuminating Company
Commonwealth Edison Company
Consolidated Edison Company of New York, Inc.
Consumers Power Company
Detroit Edison Company
Duke Power Company
Duquesne Light Company
Florida Power Corporation
Florida Power & Light Company
General Public Utility Corporation
Georgia Power Company
Gulf States Utilities Company
Houston Lighting & Power Company
Illinois Power Company
Iowa Electric Light and Power Company
Iowa Power & Light Company
Jacksonville Electric Authority
Kansas Gas & Electric Company
Long Island Lighting Company
Department of Water and Power of the City of Los Angeles
Louisiana Power & Light Company
Maine Yankee Atomic Power Company
Mississippi Power & Light Company
Narragansett Electric Company
Nebraska Public Power District
New England Power Company
Niagara Mohawk Power Corporation
Northeast Utilities Service Company
Northern Indiana Public Service Company
Northern States Power Company
Ohio Edison Company

ATTACHMENT A (continued)

Utilities (continued)

Omaha Public Power District
Pacific Gas and Electric Company
Pennsylvania Power & Light Company
Philadelphia Electric Company
Portland General Electric Company
Potomac Electric Power Company
Power Authority of the State of New York
Public Service Company of Colorado
Public Service Electric and Gas Company
Public Service Company of Indiana
Public Service Company of New Hampshire
Public Service Company of Oklahoma
Puerto Rico Water Resources Authority
Puget Sound Power & Light Company
Rochester Gas and Electric Corporation
Sacramento Municipal Utility District
Southern California Edison Company
South Carolina Electric & Gas Company
Tennessee Valley Authority
Texas Utilities Services, Inc.
Toledo Edison Company
Union Electric Company
Vermont Yankee Nuclear Power Corporation
Virginia Electric and Power Company
Washington Public Power Supply System
Wisconsin Electric Power Company
Wisconsin Public Service Corporation
Yankee Atomic Electric Company

Reactor Manufacturers

Babcock & Wilcox Company
Combustion Engineering, Inc.
General Atomic Company
General Electric Company
Westinghouse Electric Corporation

Uranium Producing Companies

Anaconda Company
Atlantic Richfield Company
Atlas Corporation
Chevron Oil Company
Cleveland Cliffs Iron Company
Continental Oil Company
Cotter Corporation

ATTACHMENT A (continued)

Uranium Producing Companies (continued)

Dalco Oil Company
Dawn Mining Company
Exxon Nuclear Company, Inc.
Federal-American Partners
Freeport Minerals Company
Gardinier, Inc.
Getty Oil Company
Gulf Energy and Minerals Company
Homestake Mining Company
Inexco Oil Company
Kerr-McGee Corporation
Mobil Oil Corporation
Nuclear Dynamics
Pioneer Nuclear, Inc.
Ranchers Exploration and Development Corporation
Reserve Oil and Minerals Corporation
Rio Algom Mines Limited
Rocky Mountain Energy Company
Santa Fe Pacific Railroad Company
Sohio Petroleum Company
Solution Engineering
Susquehanna Corporation
Union Carbide Corporation
United Nuclear Corporation
Utah International, Inc.
Western Nuclear, Inc.

ATTACHMENT B
REACTORS INCLUDED IN SURVEY

SITE	PLANT NAME	CAPACITY (Net Kilowatts)	UTILITY	COMMERCIAL OPERATION
ALABAMA				
Decatur	Browns Ferry Nuclear Power Plant: Unit 1	1,067,000	Tennessee Valley Authority	1974
Decatur	Browns Ferry Nuclear Power Plant: Unit 2	1,067,000	Tennessee Valley Authority	1975
Decatur	Browns Ferry Nuclear Power Plant: Unit 3	1,067,000	Tennessee Valley Authority	1976
Dothan	Joseph M. Farley Nuclear Plant: Unit 1	829,000	Alabama Power Co.	1976
Dothan	Joseph M. Farley Nuclear Plant: Unit 2	829,000	Alabama Power Co.	1977
Clanton	Alan R. Barton Nuclear Plant: Unit 1	1,159,000	Alabama Power Co.	1985
Clanton	Alan R. Barton Nuclear Plant: Unit 2	1,159,000	Alabama Power Co.	1986
Scottsboro	Bellefonte Nuclear Plant: Unit 1	1,213,000	Tennessee Valley Authority	1980
Scottsboro	Bellefonte Nuclear Plant: Unit 2	1,213,000	Tennessee Valley Authority	1981
ARIZONA				
Wintersburg	Palo Verde Nuclear Generation Station: Unit 1	1,237,700	Arizona Public Service	1982
Wintersburg	Palo Verde Nuclear Generating Station: Unit 2	1,237,700	Arizona Public Service	1984
Wintersburg	Palo Verde Nuclear Generating Station: Unit 3	1,237,700	Arizona Public Service	1986
ARKANSAS				
Russellville	Arkansas Nuclear One: Unit 1	850,000	Arkansas Power & Light Co.	1974
Russellville	Arkansas Nuclear One: Unit 2	312,000	Arkansas Power & Light Co.	1977
CALIFORNIA				
Eureka	Humboldt Bay Power Plant: Unit 3	65,000	Pacific Gas and Electric Co.	1963
San Clemente	San Onofre Nuclear Generating Station: Unit 1	430,000	So. Calif. Ed. & San Diego Gas & El. Co.	1968
San Clemente	San Onofre Nuclear Generating Station: Unit 2	1,100,000	So. Calif. Ed. & San Diego Gas & El. Co.	1981
San Clemente	San Onofre Nuclear Generating Station: Unit 3	1,100,000	So. Calif. Ed. & San Diego Gas & El. Co.	1982
Diablo Canyon	Diablo Canyon Nuclear Power Plant: Unit 1	1,084,000	Pacific Gas and Electric Co.	1976
Diablo Canyon	Diablo Canyon Nuclear Power Plant: Unit 2	1,106,000	Pacific Gas and Electric Co.	1977
Clay Station	Rancho Seco Nuclear Generating Station	913,000	Sacramento Municipal Utility District	1975
"	–	1,128,000	Pacific Gas & Electric Co.	1981
"	–	1,128,000	Pacific Gas & Electric Co.	1982
Blythe	Sundesert Nuclear Plant: Unit 1	950,000	San Diego Gas & Electric Co.	1985
Blythe	Sundesert Nuclear Plant: Unit 2	950,000	San Diego Gas & Electric Co.	1987
COLORADO				
Platteville	Ft. St. Vrain Nuclear Generating Station	330,000	Public Service Co. of Colorado	1975
CONNECTICUT				
Haddam Neck	Haddam Neck Plant	575,000	Conn. Yankee Atomic Power Co.	1968
Waterford	Millstone Nuclear Power Station: Unit 1	652,100	Northeast Nuclear Energy Co.	1971
Waterford	Millstone Nuclear Power Station: Unit 2	828,000	Northeast Nuclear Energy Co.	1975
Waterford	Millstone Nuclear Power Station: Unit 3	1,156,000	Northeast Nuclear Energy Co.	1979
FLORIDA				
Florida City	Turkey Point Station: Unit 3	666,000	Florida Power & Light Co.	1972
Florida City	Turkey Point Station: Unit 4	666,000	Florida Power & Light Co.	1973
Red Level	Crystal River Plant: Unit 3	825,000	Florida Power Corp.	1976
Ft. Pierce	St. Lucie Plant: Unit 1	810,000	Florida Power & Light Co.	1975
Ft. Pierce	St. Lucie Plant: Unit 2	810,000	Florida Power & Light Co.	1980
South Dade	–	1,100,000	Florida Power & Light Co.	1983
South Dade	–	1,100,000	Florida Power & Light Co.	1985
GEORGIA				
Baxley	Edwin I. Hatch Nuclear Plant: Unit 1	786,000	Georgia Power Co.	1975
Baxley	Edwin I. Hatch Nuclear Plant: Unit 2	795,000	Georgia Power Co.	1978
Waynesboro	Alvin W. Vogtle, Jr. Plant: Unit 1	1,113,000	Georgia Power Co.	–
Waynesboro	Alvin W. Vogtle, Jr. Plant: Unit 2	1,113,000	Georgia Power Co.	–
ILLINOIS				
Morris	Dresden Nuclear Power Station: Unit 1	200,000	Commonwealth Edison Co.	1960
Morris	Dresden Nuclear Power Station: Unit 2	809,000	Commonwealth Edison Co.	1970
Morris	Dresden Nuclear Power Station: Unit 3	809,000	Commonwealth Edison Co.	1971
Zion	Zion Nuclear Plant: Unit 1	1,050,000	Commonwealth Edison Co.	1973
Zion	Zion Nuclear Plant: Unit 2	1,050,000	Commonwealth Edison Co.	1974
Cordova	Quad-Cities Station: Unit 1	800,000	Comm. Ed. Co.-Ia.-Ill. Gas & Elec. Co.	1972
Cordova	Quad-Cities Station: Unit 2	800,000	Comm. Ed. Co.-Ia.-Ill. Gas & Elec. Co.	1972
Seneca	LaSalle County Nuclear Station: Unit 1	1,078,000	Comm. Ed. Co.-Ia.	1978
Seneca	LaSalle County Nuclear Station: Unit 2	1,078,000	Comm. Ed. Co.-Ia.	1979
Bryon	Byron Station: Unit 1	1,120,000	Comm. Edison Co.	1980
Bryon	Byron Station: Unit 2	1,120,000	Comm. Edison Co.	1982
Braidwood	Braidwood: Unit 1	1,120,000	Comm. Edison Co.	1981
Braidwood	Braidwood: Unit 2	1,120,000	Comm. Edison Co.	1982
Clinton	Clinton Nuclear Power Plant: Unit 1	933,400	Illinois Power Co.	1981
Clinton	Clinton Nuclear Power Plant: Unit 2	933,400	Illinois Power Co.	1984
INDIANA				
Westchester	Bailly Generating Station	645,300	Northern Indiana Public Service Co.	–
Madison	Marble Hill Nuclear Power Station: Unit 1	1,130,000	Public Service Indiana	1982
Madison	Marble Hill Nuclear Power Station: Unit 2	1,130,000	Public Service Indiana	1984
IOWA				
Palo	Duane Arnold Energy Center: Unit 1	535,000	Iowa Electric Light and Power Co.	1975
KANSAS				
Burlington	Wolf Creek Generation Station: Unit 1	1,150,000	Kansas Gas & Electric–Kansas City P & L	1982
LOUISIANA				
Taft	Waterford Generating Station: Unit 3	1,113,000	Louisiana Power & Light Co.	1980
St. Francisville	River Bend Station: Unit 1	934,000	Gulf States Utilities Co.	1981
St. Francisville	River Bend Station: Unit 2	934,000	Gulf States Utilities Co.	1983
MAINE				
Wiscasset	Maine Yankee Atomic Power Plant	790,000	Maine Yankee Atomic Power Co.	1972
Sears Island		1,150,000	Maine Yankee Atomic Power Co.	–

ATTACHMENT B
REACTORS INCLUDED IN SURVEY (CONTINUED)

SITE	PLANT NAME	CAPACITY (Net Kilowatts)	UTILITY	COMMERCIAL OPERATION
MARYLAND				
Lusby	Calvert Cliffs Nuclear Power Plant: Unit 1	845,000	Baltimore Gas and Electric Co.	1975
Lusby	Calvert Cliffs Nuclear Power Plant: Unit 2	845,000	Baltimore Gas and Electric Co.	1977
Douglas Point	Douglas Point Project Nuclear Gen. Station: Unit 1	1,178,000	Potomac Electric Power Co.	1985
Douglas Point	Douglas Point Project Nuclear Gen. Station: Unit 2	1,178,000	Potomac Electric Power Co.	1987
MASSACHUSETTS				
Rowe	Yankee Nuclear Power Station	175,000	Yankee Atomic Electric Co.	1961
Plymouth	Pilgrim Station: Unit 1	670,000	Boston Edison Co.	1972
Plymouth	Pilgrim Station: Unit 2	1,180,000	Boston Edison Co.	1982
Montague	–	1,150,000	Northeast Utilities	–
Montague	–	1,150,000	Northeast Utilities	–
MICHIGAN				
Big Rock Point	Big Rock Point Nuclear Plant	75,000	Consumers Power Co.	1965
South Haven	Palisades Nuclear Power Station	700,000	Consumers Power Co.	1971
Lagoona Beach	Enrico Fermi Atomic Power Plant: Unit 2	1,093,000	Detroit Edison Co.	1980
Bridgman	Donald C. Cook Plant: Unit 1	1,060,000	Indiana & Michigan Electric Co.	1975
Bridgman	Donald C. Cook Plant: Unit 2	1,060,000	Indiana & Michigan Electric Co.	–
Midland	Midland Nuclear Power Plant: Unit 1	458,000	Consumers Power Co.	1982
Midland	Midland Nuclear Power Plant: Unit 2	808,000	Consumers Power Co.	1981
St. Clair County	Greenwood: Unit 2	1,200,000	Detroit Edison Co.	1984
St. Clair County	Greenwood: Unit 3	1,200,000	Detroit Edison Co.	1986
MINNESOTA				
Monticello	Monticello Nuclear Generating Plant	545,000	Northern States Power Co.	1971
Red Wing	Prairie Island Nuclear Generating Plant: Unit 1	530,000	Northern States Power Co.	1973
Red Wing	Prairie Island Nuclear Generating Plant: Unit 2	530,000	Northern States Power Co.	1975
MISSOURI				
Fulton	Callaway Plant: Unit 1	1,120,000	Union Electric Co.	1981
Fulton	Callaway Plant: Unit 2	1,120,000	Union Electric Co.	1983
MISSISSIPPI				
Port Gibson	Grand Gulf Nuclear Station: Unit 1	1,250,000	Mississippi Power & Light Co.	1979
Port Gibson	Grand Gulf Nuclear Station: Unit 2	1,250,000	Mississippi Power & Light Co.	1984
NEBRASKA				
Fort Calhoun	Ft. Calhoun Station: Unit 1	457,400	Omaha Public Power District	1973
Fort Calhoun	Ft. Calhoun Station: Unit 2	1,136,000	Omaha Public Power District	1983
Brownville	Cooper Nuclear Station	778,000	Nebraska Public Power District and Iowa Power and Light Co.	1974
NEW HAMPSHIRE				
Seabrook	Seabrook Nuclear Station: Unit 1	1,200,000	Public Service of N.H.	1980
Seabrook	Seabrook Nuclear Station: Unit 2	1,200,000	Public Service of N.H.	1982
NEW JERSEY				
Forked River	Oyster Creek Nuclear Power Plant: Unit 1	640,000	Jersey Central Power & Light Co.	1969
Forked River	Forked River Generating Station: Unit 1	1,070,000	Jersey Central Power & Light Co.	1982
Salem	Salem Nuclear Generating Station: Unit 1	1,090,000	Public Service Electric and Gas, N.J.	1976
Salem	Salem Nuclear Generating Station: Unit 2	1,115,000	Public Service Electric and Gas, N.J.	1979
Salem	Hope Creek Generating Station: Unit 1	1,067,000	Public Service Electric and Gas, N.J.	1982
Salem	Hope Creek Generating Station: Unit 2	1,067,000	Public Service Electric and Gas, N.J.	1984
Little Egg Inlet	Atlantic Generating Station: Unit 1	1,150,000	Public Service Electric and Gas, N.J.	1985
Little Egg Inlet	Atlantic Generating Station: Unit 2	1,150,000	Public Service Electric and Gas, N.J.	1987
*	–	1,150,000	Public Service Electric and Gas, N.J.	1990
*	–	1,150,000	Public Service Electric and Gas, N.J.	1992
NEW YORK				
Indian Point	Indian Point Station: Unit 1	265,000	Consolidated Edison Co.	1962
Indian Point	Indian Point Station: Unit 2	873,000	Consolidated Edison Co.	1973
Indian Point	Indian Point Station: Unit 3	965,000	Power Authority of State of N.Y.	1975
Scriba	Nine Mile Point Nuclear Station: Unit 1	610,000	Niagara Mohawk Power Co.	1969
Scriba	Nine Mile Point Nuclear Station: Unit 2	1,080,000	Niagara Mohawk Power Co.	1982
Ontario	R.E.Ginna Nuclear Power Plant: Unit 1	490,000	Rochester Gas & Electric Co.	1970
Brookhaven	Shoreham Nuclear Power Station	819,000	Long Island Lighting Co.	1978
Scriba	James A. FitzPatrick Nuclear Power Plant	821,000	Power Authority of State of N.Y.	1975
Cementon	Greene County Nuclear Power Plant	1,191,000	Power Authority of State of N.Y.	1983
Jamesport	Jamesport 1	1,150,000	Long Island Lighting Co.	1982
Jamesport	Jamesport 2	1,150,000	Long Island Lighting Co.	1984
Oswego	Sterling Nuclear: Unit 1	1,150,000	Rochester Gas & Electric Co.	1984
*	–	1,200,000	N.Y. State Electric & Gas	1986
NORTH CAROLINA				
Southport	Brunswick Steam Electric Plant: Unit 1	821,000	Carolina Power and Light Co.	1977
Southport	Brunswick Steam Electric Plant: Unit 2	821,000	Carolina Power and Light Co.	1975
Cowans Ford Dam	Wm. B. McGuire Nuclear Station: Unit 1	1,180,000	Duke Power Co.	1978
Cowans Ford Dam	Wm. B. McGuire Nuclear Station: Unit 2	1,180,000	Duke Power Co.	1979
Bonsal	Shearon Harris Plant: Unit 1	900,000	Carolina Power & Light Co.	1984
Bonsal	Shearon Harris Plant: Unit 2	900,000	Carolina Power & Light Co.	1986
Bonsal	Shearon Harris Plant: Unit 3	900,000	Carolina Power & Light Co.	1988
Bonsal	Shearon Harris Plant: Unit 4	900,000	Carolina Power & Light Co.	1990
Davie County	Perkins Nuclear Station: Unit 1	1,280,000	Duke Power Co.	1983
Davie County	Perkins Nuclear Station: Unit 2	1,280,000	Duke Power Co.	1985
Davie County	Perkins Nuclear Station: Unit 3	1,280,000	Duke Power Co.	1987
*	–	1,150,000	Carolina Power & Light Co.	–
*	–	1,150,000	Carolina Power & Light Co.	–
*	–	1,150,000	Carolina Power & Light Co.	–
OHIO				
Oak Harbor	Davis-Besse Nuclear Power Station: Unit 1	906,000	Toledo Edison-Cleveland El. Illum. Co.	1976
Oak Harbor	Davis-Besse Nuclear Power Station: Unit 2	906,000	Toledo Edison-Cleveland El. Illum. Co.	1983
Oak Harbor	Davis-Besse Nuclear Power Station: Unit 3	906,000	Toledo Edison-Cleveland El. Illum. Co.	1985
Perry	Perry Nuclear Power Plant: Unit 1	1,205,000	Cleveland Electric Illuminating Co.	1980
Perry	Perry Nuclear Power Plant: Unit 2	1,205,000	Cleveland Electric Illuminating Co.	1982
Moscow	Wm. H. Zimmer Nuclear Power Station: Unit 1	810,000	Cincinnati Gas & Electric Co.	1979
Moscow	Wm. H. Zimmer Nuclear Power Station: Unit 2	1,170,000	Cincinnati Gas & Electric Co.	1984

ATTACHMENT B
REACTORS INCLUDED IN SURVEY (CONTINUED)

SITE	PLANT NAME	CAPACITY (Net Kilowatts)	UTILITY	COMMERCIAL OPERATION
OKLAHOMA				
Inola	Black Fox Nuclear Station: Unit 1	1,150,000	Public Service of Oklahoma	1983
Inola	Black Fox Nuclear Station: Unit 2	1,150,000	Public Service of Oklahoma	1985
OREGON				
Prescott	Trojan Nuclear Plant: Unit 1	1,130,000	Portland General Electric Co.	1976
Arlington	Pebble Springs Nuclear Plant: Unit 1	1,260,000	Portland General Electric Co.	1983
Arlington	Pebble Springs Nuclear Plant: Unit 2	1,260,000	Portland General Electric Co.	1986
PENNSYLVANIA				
Peach Bottom	Peach Bottom Atomic Power Station: Unit 2	1,065,000	Philadelphia Electric Co.	1974
Peach Bottom	Peach Bottom Atomic Power Station: Unit 3	1,065,000	Philadelphia Electric Co.	1974
Pottstown	Limerick Generating Station: Unit 1	1,065,000	Philadelphia Electric Co.	1981
Pottstown	Limerick Generating Station: Unit 2	1,065,000	Philadelphia Electric Co.	1982
Shippingport	Beaver Valley Power Station: Unit 1	852,000	Duquesne Light Co.-Ohio Edison Co.	1975
Shippingport	Beaver Valley Power Station: Unit 2	852,000	Duquesne Light Co.-Ohio Edison Co.	1981
Goldsboro	Three Mile Island Nuclear Station: Unit 1	819,000	Metropolitan Edison Co.	1974
Goldsboro	Three Mile Island Nuclear Station: Unit 2	906,000	Jersey Central Power & Light Co.	1978
Berwick	Susquehanna Steam Electric Station: Unit 1	1,050,000	Pennsylvania Power and Light	1980
Berwick	Susquehanna Steam Electric Station: Unit 2	1,050,000	Pennsylvania Power and Light	1982
SOUTH CAROLINA				
Hartsville	H. B. Robinson S.E. Plant: Unit 2	700,000	Carolina Power & Light Co.	1971
Seneca	Oconee Nuclear Station: Unit 1	871,000	Duke Power Co.	1973
Seneca	Oconee Nuclear Station: Unit 2	871,000	Duke Power Co.	1974
Seneca	Oconee Nuclear Station: Unit 3	871,000	Duke Power Co.	1974
Broad River	Virgil C. Summer Nuclear Station: Unit 1	900,000	South Carolina Electric & Gas Co.	1979
Lake Wylie	Catawba Nuclear Station: Unit 1	1,153,000	Duke Power Co.	1981
Lake Wylie	Catawba Nuclear Station: Unit 2	1,153,000	Duke Power Co.	1982
Cherokee County	Cherokee Nuclear Station: Unit 1	1,280,000	Duke Power Co.	1984
Cherokee County	Cherokee Nuclear Station: Unit 2	1,280,000	Duke Power Co.	1986
Cherokee County	Cherokee Nuclear Station: Unit 3	1,280,000	Duke Power Co.	1988
TENNESSEE				
Daisy	Sequoyah Nuclear Power Plant: Unit 1	1,148,000	Tennessee Valley Authority	1977
Daisy	Sequoyah Nuclear Power Plant: Unit 2	1,148,000	Tennessee Valley Authority	1977
Spring City	Watts Bar Nuclear Plant: Unit 1	1,177,000	Tennessee Valley Authority	1978
Spring City	Watts Bar Nuclear Plant: Unit 2	1,177,000	Tennessee Valley Authority	1979
Hartsville	–	1,233,000	Tennessee Valley Authority	1980
Hartsville	–	1,233,000	Tennessee Valley Authority	1981
Hartsville	–	1,233,000	Tennessee Valley Authority	1981
Hartsville	–	1,233,000	Tennessee Valley Authority	1982
TEXAS				
Glen Rose	Commanche Peak Steam Electric Station: Unit 1	1,150,000	Texas Utilities Services Inc.	1980
Glen Rose	Commanche Peak Steam Electric Station: Unit 2	1,150,000	Texas Utilities Services Inc.	1982
Jasper	Blue Hills: Unit 1	918,000	Gulf States Utilities	1985
Jasper	Blue Hills: Unit 2	918,000	Gulf States Utilities	1987
Wallis	Allens Creek: Unit 1	1,150,000	Houston Lighting & Power Co.	–
Wallis	Allens Creek: Unit 2	1,150,000	Houston Lighting & Power Co.	–
Matagorda County	South Texas Project	1,250,000	Central Power & Lt.-Houston Lt. & Power	1981
Matagorda County	South Texas Project	1,250,000	Central Power & Lt.-Houston Lt. & Power	1981
VERMONT				
Vernon	Vermont Yankee Generating Station	513,900	Vermont Yankee Nuclear Power Corp.	1972
VIRGINIA				
Gravel Neck	Surry Power Station: Unit 1	788,000	Virginia Electric & Power Company	1972
Gravel Neck	Surry Power Station: Unit 2	788,000	Virginia Electric & Power Company	1973
Mineral	North Anna Power Station: Unit 1	898,000	Virginia Electric & Power Company	1977
Mineral	North Anna Power Station: Unit 2	898,000	Virginia Electric & Power Company	1977
Mineral	North Anna Power Station: Unit 3	907,000	Virginia Electric & Power Company	1980
Mineral	North Anna Power Station: Unit 4	907,000	Virginia Electric & Power Company	1981
Gravel Neck	Surry Power Station: Unit 3	859,000	Virginia Electric & Power Company	1983
Gravel Neck	Surry Power Station: Unit 4	859,000	Virginia Electric & Power Company	1984
WASHINGTON				
Richland	WPPSS No. 1	1,218,000	Washington Public Power Supply System	1980
Richland	WPPSS No. 2	1,103,000	Washington Public Power Supply System	1978
Satsop	WPPSS No. 3	1,242,000	Washington Public Power Supply System	1981
Richland	WPPSS No. 4	1,218,000	Washington Public Power Supply System	1982
Satsop	WPPSS No. 5	1,242,000	Washington Public Power Supply System	1983
Sedro Woolley	Skagit Nuclear Project: Unit 1	1,277,000	Puget Sound Power & Light	1982
Sedro Woolley	Skagit Nuclear Project: Unit 2	1,277,000	Puget Sound Power & Light	1985
WISCONSIN				
Two Creeks	Point Beach Nuclear Plant: Unit 1	497,000	Wisconsin Michigan Power Co.	1970
Two Creeks	Point Beach Nuclear Plant: Unit 2	497,000	Wisconsin Michigan Power Co.	1972
Carlton	Kewaunee Nuclear Power Plant: Unit 1	541,000	Wisconsin Public Service Corp.	1974
Ft. Aktinson	Koshkonong Nuclear Plant: Unit 1	900,000	Wisconsin Electric Power Co.	1983
Ft. Atkinson	Koshkonong Nuclear Plant: Unit 2	900,000	Wisconsin Electric Power Co.	1984
Durand	Tyrone Energy Park: Unit 1	1,150,000	Northern States Power Co.	1985
PUERTO RICO				
Arecibo	North Coast Power Plant	583,000	Puerto Rico Water Resources Authority	–
*	–	1,233,000	Tennessee Valley Authority	1982
*	–	1,300,000	Tennessee Valley Authority	1983
*	–	1,233,000	Tennessee Valley Authority	1983
*	–	1,300,000	Tennessee Valley Authority	1984
*	–	1,150,000	New England Electric System	1983
*	–	1,150,000	New England Electric System	1985

* Site not selected.