STATISTICAL DATA of the **URANIUM INDUSTRY**

January 1, 1974

U. S. ATOMIC ENERGY COMMISSION

GRAND JUNCTION OFFICE

MASTER

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STATISTICAL DATA
OF
THE URANIUM INDUSTRY
January 1, 1974

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F O R E W O R D

The "Statistical Data of the Uranium Industry" is a compilation of historical facts and figures through 1973.

These statistics have been compiled annually since January 1, 1968, for the use of Government and industry.

U. S. Atomic Energy Commission
Grand Junction Office
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Grand Junction, Colorado 81501

STATISTICAL DATA OF THE URANIUM INDUSTRY

January 1, 1974

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URANIUM ORE PURCHASES BY AEC

Fiscal Years 1949 - 1962

FY	At Buying Stations		Under Special Arrangements		Total	
	Tons of Ore	Pounds of U ₃ O ₈	Tons of Ore	Pounds of U ₃ O ₈	Tons of Ore	Pounds of U ₃ O ₈
1949	28,742	126,302	-	-	28,742	126,302
1950	65,602	351,152	-	-	65,602	351,152
1951	55,904	263,663	-	-	55,904	263,663
1952	87,191	445,725	1,300	4,713	88,491	450,438
1953	121,015	707,581	48,960	232,191	169,975	939,772
1954	267,510	1,601,241	110,515	698,248	378,025	2,299,489
1955	480,232	2,922,826	126,853	962,490	607,085	3,885,316
1956	753,595	4,347,465	52,303	280,677	805,898	4,628,142
1957	587,495	3,778,372	17,016	97,921	604,511	3,876,293
1958	220,649	1,163,049	1,507	5,934	222,156	1,168,983
1959	138,596	1,531,374	734	3,806	139,330	1,535,180
1960	113,345	1,099,928	31,634	148,236	144,979	1,248,164
1961	41,465	453,773	179,966	922,201	221,431	1,375,974
1962	30,408	265,601	60,351	332,210	90,759	597,811
Total	2,991,749	19,058,052	631,139	3,688,627	3,622,888	22,746,679

Note: First and second columns represent ore purchased at 11 different ore-buying stations operated for varying lengths of time in the west by AEC between 1948 and 1962. The third and fourth columns show ore bought under special arrangements with mills and the AEC ore-buying agent to purchase ore in certain areas for a limited time, and usually while mills were under construction. All of the 3,622,888 tons of ore bought during this period gradually was sold back to the mills, and at the end of December 1966, the AEC had no ore stockpiles. The 11 AEC ore-buying stations were at Marysville, White Canyon, Moab, and Monticello, Utah; Shiprock and Grants, New Mexico; Globe and Tuba City, Arizona; Edgemont, South Dakota; and Riverton and Crooks Gap, Wyoming. The last AEC station at Monticello, Utah, was closed on March 31, 1962, with the termination of Domestic Uranium Program Circular 5, Revised.

URANIUM ORE SHIPMENTS TO MILLS - 1948 THROUGH 1973

By State

<u>State</u>	<u>Tons of Ore</u>	<u>%U₃O₈</u>	<u>Contained Tons</u> <u>U₃O₈ **</u>
New Mexico	46,259,210	0.22	101,749
Utah	13,724,324	0.31	42,506
Wyoming	24,565,698	0.21	52,584
Colorado	14,954,423	0.25	37,623
Arizona	2,965,900	0.30	8,950
Others *	<u>7,376,690</u>	<u>0.19</u>	<u>14,090</u>
Total	109,846,245	0.23	257,502

* Includes Alaska, California, Idaho, Montana, Nevada, New Jersey, North Dakota, Oklahoma, Oregon, South Dakota, Texas, and Washington.

** Includes miscellaneous minor, non-ore sources.

URANIUM ORE RECEIPTS AT BUYING STATIONS AND MILLS
WESTERN UNITED STATES

<u>Calendar</u> <u>Year</u>	<u>Total Receipts*</u> <u>Tons Ore</u>	<u>Tons U₃O₈</u>	<u>Open Pit Production</u> <u>Tons Ore</u>	<u>Tons U₃O₈</u>	<u>Underground Production</u> <u>Tons Ore</u>	<u>Tons U₃O₈</u>
1948	37,727	83	494	1	37,233	82
1949	173,103	502	1,004	3	172,099	499
1950	251,100	810	22,878	98	228,222	712
1951	347,418	1,088	28,535	177	318,883	911
1952	435,425	1,289	64,836	271	370,589	1,018
1953	734,204	2,315	179,087	574	555,117	1,741
1954	1,106,438	3,541	265,799	934	840,639	2,607
1955	1,524,180	4,425	373,616	855	1,150,564	3,570
1956	3,004,569	8,433	1,247,015	3,195	1,757,554	5,238
1957	3,695,320	9,843	1,613,613	3,373	2,081,707	6,470
1958	5,178,264	14,004	2,358,555	5,401	2,819,709	8,603
1959	6,934,951	17,377	2,206,460	4,379	4,728,491	12,998
1960	7,970,178	18,844	2,393,382	5,368	5,576,796	13,476
1961	8,041,007	18,513	2,482,498	5,255	5,558,509	13,258
1962	7,052,856	17,085	1,781,531	4,334	5,271,325	12,751
1963	5,947,549	14,722	1,879,038	4,411	4,068,511	10,311
1964	5,297,416	13,889	1,536,840	3,368	3,760,576	10,521
1965	4,376,497	10,438	1,243,569	3,014	3,132,938	7,424
1966	4,328,720	9,906	1,332,448	3,113	2,996,272	6,793
1967	5,271,900	10,657	1,593,274	3,183	3,678,626	7,474
1968	6,448,400	12,570	2,366,489	4,619	4,081,911	7,951
1969	5,903,940	12,281	2,172,922	5,201	3,731,018	7,080
1970	6,323,736	12,768	2,801,082	5,857	3,522,654	6,911
1971	6,279,242	12,907	3,284,093	6,983	2,995,149	5,924
1972	6,417,741	13,667	3,887,348	8,079	2,530,393	5,588
1973	6,537,289	13,588	4,544,336	8,614	1,992,953	4,974

*Mined ore - does not include 199 tons miscellaneous sources.

AEC DOMESTIC URANIUM CONCENTRATE PURCHASES^{1/}

Fiscal Years 1948-1971

Fiscal Year	Tons U ₃ O ₈	Cost to AEC (000's of Dollars)	Average Price Per Lb. U ₃ O ₈ (Dollars)
1948	116	\$ 1,656	\$ 7.14
1949	115	1,967	8.53
1950	323	5,887	9.11
1951	639	12,907	10.10
1952	824	18,579	11.28
1953	968	23,904	12.35
1954	1,435	35,233	12.27
1955	2,125	52,082	12.25
1956	4,179	96,170	11.51
1957	7,505	157,375	10.49
1958	10,078	190,480	9.45
1959	15,029	274,111	9.12
1960	16,394	286,980	8.75
1961	17,646	299,838	8.50
1962	17,244	280,980	8.15
1963	15,752	246,247	7.82
1964	12,607	201,743	8.00
1965	11,240	179,835	8.00
*1966	10,178	162,828	8.00
*1967	8,902	142,434	8.00
*1968	7,937	126,993	8.00
*1969	7,124	99,579	6.99
*1970	4,010	46,046	5.74
*1971 thru Dec. 1970	<u>1,295</u>	<u>14,341</u>	<u>5.54</u>
FY 1948-1971	173,665	\$2,958,195	\$ 8.52

*Production, tons U₃O₈ in concentrates FY 1966 - 10,310; FY 1967 - 10,743; FY 1968 - 12,062; FY 1969 - 11,795; FY 1970 - 12,490; First 1/2 1971 - 6,347

^{1/}Purchases are shown for the year in which the concentrate was received in accordance with contract provisions. Uranium recorded as a byproduct from the processing of phosphates, euxenites, etc., is not included.

AEC CONCENTRATE PURCHASES BY STATES

In Tons of U₃O₈

<u>Calendar Year</u>	<u>Colorado</u>	<u>New Mexico</u>	<u>Utah</u>	<u>Wyoming</u>	<u>Others^{1/}</u>	<u>Total</u>
1947	67	-	-	-	-	67
1948	102	-	-	-	-	102
1949	175	-	-	-	2	177
1950	452	-	-	-	7	459
1951	620	-	146	-	-	766
1952	743	-	131	-	-	874
1953	940	-	214	-	9	1,163
1954	1,239	-	280	-	181	1,700
1955	1,483	847	454	-	-	2,784
1956	1,726	2,891	1,222	-	119	5,958
1957	1,966	2,534	3,291	-	691	8,482
1958	2,917	3,604	3,822	1,247	847	12,437
1959	3,278	6,772	3,535	1,675	979	16,239
1960	3,117	7,760	3,034	2,770	956	17,637
1961	2,951	7,750	2,954	2,823	870	17,348
1962	2,652	7,293	3,188	3,055	820	17,008
1963	2,134	5,512	3,080	2,566	925	14,217
1964	1,800	4,747	2,063	2,216	1,020	11,846
1965	1,290	4,591	1,510	2,097	954	10,442
1966	1,258	4,393	-	1,944	1,893	9,488
1967	840	4,698	-	1,705	1,182	8,425
1968	782	4,300	-	1,567	688	7,337
1969	-	4,104	-	1,115	965	6,184
1970	-	833	-	628	1,059	2,520

Note: Uranium recorded as a byproduct from the processing of phosphates, euxenites, etc., is not included.

^{1/} Data included in "Others" category when only one company is operating in a state for sales to AEC.

AEC CONCENTRATE PURCHASES BY STATES

In (000's omitted) Dollars

<u>Calendar Year</u>	<u>Colorado</u>	<u>New Mexico</u>	<u>Utah</u>	<u>Wyoming</u>	<u>Others</u> ^{1/}	<u>Total</u>
1947	966	-	-	-	-	966
1948	1,531	-	-	-	-	1,531
1949	3,063	-	-	-	43	3,106
1950	7,992	-	-	-	1,890	9,882
1951	13,513	-	2,275	-	-	15,788
1952	17,163	-	3,556	-	-	20,719
1953	22,149	-	6,139	-	271	28,559
1954	29,404	-	7,331	-	5,536	42,271
1955	34,341	19,978	12,166	-	-	66,485
1956	40,969	64,633	23,698	-	2,994	132,294
1957	45,105	50,920	57,980	-	12,501	166,506
1958	58,514	66,462	67,374	23,764	17,491	233,605
1959	62,572	112,770	63,853	28,587	19,981	287,763
1960	61,257	125,146	54,641	44,799	18,874	304,717
1961	52,245	123,794	51,376	45,361	17,001	289,777
1962	43,058	110,373	52,174	48,942	13,458	268,005
1963	34,126	85,892	49,348	41,045	14,810	225,221
1964	28,803	75,975	33,007	35,461	16,317	189,563
1965	20,631	73,464	24,164	33,551	15,259	167,069
1966	20,118	70,285	-	31,094	30,276	151,773
1967	13,442	75,147	-	27,275	18,921	134,785
1968	12,514	68,801	-	24,990	11,012	117,317
1969	-	47,150	-	12,531	12,777	72,458
1970	-	7,875	-	6,346	13,814	28,035

Note: Uranium recovered as a byproduct from the processing of phosphates, euxenites, etc., is not included.

^{1/} Data included in "Others" category when only one company is operating in a state for sales to AEC.

TONS OF U₃O₈
40,000

USAEC URANIUM PURCHASES

TONS U₃O₈ - MILLIONS OF DOLLARS

NOTE: Uranium recorded as a byproduct from the processing of phosphates, euxenites, etc., is not included.

Section II - Uranium Resources:

Ore Production, Ore Reserves, and Potential Resources

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GENERAL DESCRIPTION OF AEC RESERVE ESTIMATES

Estimates of United States uranium ore reserves represent the amount of uranium that could be exploited at maximum forward costs of \$8, \$10, \$15, and \$30 per pound U_3O_8 respectively. Such reserves, computed by consistent methods for uniformity, are derived from data provided by the private uranium companies. The fact that the reserves may be considered by the AEC as exploitable at a stated maximum forward cost does not imply a judgment or a prediction by AEC that such reserves would necessarily be available at a similar market price.

Briefly, the ore reserve estimating process consists of the following steps:

1. Determination of the "cutoff," to define the lowest grade (in percent U_3O_8) of material that can be mined from a deposit at a minimum thickness where the total operating cost per pound of recoverable U_3O_8 in such material is equal to the chosen maximum forward cost per pound. The cutoff grade is determined by the following formula:

$$\text{Cutoff grade} = \frac{\text{Cost of mining, hauling, royalty \& milling/ton of ore}}{\text{Maximum forward cost/lb. } U_3O_8 \times \text{mill recovery} \times 20}$$

2. Estimation of the mineralized material in the deposit that meets or exceeds the cutoff grade and thickness criteria, expressed in tons and average grade of U_3O_8 .
3. Application of all forward costs, operating and capital, to the mineralized material derived in Step 2.
4. If the cost per pound U_3O_8 derived in Step 3 is less than the chosen maximum forward cost per pound, then the material is considered to be a reserve.

Property acquisition costs, finding costs, and other past capital costs are considered sunk costs. Sunk costs, cost of money, money accumulation for replacing the ore reserve, and a profit are not used in AEC cutoff determination or in the economic evaluation of an ore reserve. These factors must be considered by each company individually and are integrated into their negotiated prices for uranium.

The computed ore reserves at \$8, \$10, \$15 and \$30 per pound U_3O_8 each successively include all the reserves in the lesser cost categories.

URANIUM ORE RESERVES AND PRODUCTION

1947 Through 1973

Year End	Tons U ₃ O ₈ in Ore			
	Shipment To Mills <u>1/</u>	Cumulative Production	Reserve Estimation <u>2/</u>	Sum of Cumulative Production and Reserves
1947	-	-	2,200	2,200
1948	83	83	2,200	2,283
1949	502	585	2,200	2,785
1950	810	1,395	3,000	4,395
1951	1,088	2,483	5,800	8,283
1952	1,288	3,771	7,346	11,117
1953	2,315	6,086	15,203	21,289
1954	3,539	9,625	27,582	37,207
1955	4,425	14,050	67,595	81,645
1956	8,434	22,484	120,240	142,724
1957	9,837	32,321	166,300	198,621
1958	14,003	46,324	181,800	228,124
1959	17,377	63,701	197,100	260,801
1960	18,842	82,543	187,100	270,443
1961	18,513	101,056	174,200	275,256
1962	17,085	118,141	166,200	284,341
1963	14,721	132,862	160,231	293,093
1964	13,888	146,750	150,927	297,677
1965	10,578	157,328	144,702	302,030
1966	10,051	167,379	140,835	308,214
1967	10,866	178,245	147,741	325,986
1968	12,850	191,095	160,819	351,914
1969	12,595	203,690	204,080	407,770
1970	13,073	216,763	246,100	462,863
1971	13,089	229,852	273,200	503,052
1972	13,863	243,715	273,200	516,915
1973	13,787	257,502	276,700	534,202

1/ Includes miscellaneous U₃O₈ receipts from mine waters, heap leach, in-situ, and refining residues.

2/ The reserve estimates since 1961 are based on a maximum forward cost of \$8 per pound of U₃O₈ in concentrate. Estimates for the period 1952 to 1961, inclusive, are based on the AEC Domestic Uranium Program Circular 5 (Revised). For the period prior to 1952, the basis is arbitrary thickness and grade cut-offs.

The reserve estimates for 1956 to 1962 do not coincide with estimates published in previous years. During 1972 the reserve estimates for 1956 to 1962 were adjusted to more nearly reflect yearly additions during this period based on the redefinition of reserves in 1962.

URANIUM ORE PRODUCTION BY STATES

1963 THROUGH 1973

DRILLING, RESERVES & PRODUCTION IN ORE COMPARED TO VARIOUS HISTORICAL FACTORS

RELATIONSHIP OF TOTAL \$8.00 RESERVES TO PRODUCTION WESTERN UNITED STATES

CHANGES IN ORE RESERVES
DURING 1973

	<u>\$8</u>	<u>\$10</u>
January 1, 1973 Reserve	273,189	336,540
New Properties	13,396	16,223
Reevaluation - Additions	9,036	10,460
Reevaluation - Subtractions	(5,903)	(8,926)
Depletion - Production	<u>(13,015)</u>	<u>(14,511)</u>
January 1, 1974 Reserve	276,703	339,786

ESTIMATES OF RESERVES IN CONVENTIONAL DEPOSITS
EXPLOITABLE AT A MAXIMUM FORWARD COST OF
\$10.00 PER POUND U₃O₈ IN CONCENTRATE
(These reserves include the \$8.00
Per Pound U₃O₈ Reserves)

<u>As Of</u>	<u>Tons U₃O₈</u>
1/1/65	175,000
1/1/66	195,000
1/1/67	200,000
1/1/68	190,000
1/1/69	200,000
1/1/70	250,000
1/1/71	300,000
1/1/72	333,000
1/1/73	337,000
1/1/74	340,000

Distribution of 1973 U₃O₈ Production in Ore by Resource Region

<u>Resource Region</u>	<u>Tons U₃O₈</u>	<u>% Total Tons U₃O₈</u>
Colorado Plateau	6,421	46.57
Wyoming Basins	5,357	38.86
Others: Alaska, Northern Rockies, Gulf Coastal Plains, Colorado & Southern Rockies	2,009	14.57
Total	<u>13,787</u>	<u>100.00</u>

NOTE Includes miscellaneous receipts

Distribution of 1973 U₃O₈ Production in Ore by State

State	Tons of Ore	Tons U ₃ O ₈	% of Total U ₃ O ₈
New Mexico	2,159,029	4,984	36.15
Wyoming	2,926,911	5,357	38.86
Colorado	303,473	1,023	7.42
Utah	439,499	1,064	7.72
Others: Alaska, Texas, and Washington	939,310	1,359	9.85
Totals	6,768,222	13,787	100.00

Distribution of 1973 U_3O_8 Production in Ore
by Open Pit vs. Underground Mine

<u>Source</u>	<u>Tons U_3O_8</u>	<u>% of Total</u>
Underground Mines	4,974	36.08
Open Pit Mines	8,614	62.48
Others: Heap Leach, Mine Water In-Situ, Low Grade Stockpiles	199	1.44
Totals	13,787	100.00

Distribution of Production Sources 1973

<u>Source</u>	<u>No.</u>	<u>% Total</u>
Underground	122	69.71
Open Pit	33	18.86
Others	20	11.43
Totals	175	100.00

Distribution of 1973 U_3O_8 Production in Ore by Depth of Ore

FEET	TONS	PERCENT of TOTAL	NO. of SOURCES
1-50 0	67	0.49	17
50-100	1,206	8.75 5	28
100-150	343	2.49	15
150-200	4,889	35.46	30
200-250	59	0.43	7
250-300	154	1.12	10
300-350	2,369	17.18 8	7
350-400	88	0.64	5
400-450	31	0.22	3
450-500	59	0.43	4
500-550	547	3.97	4
550-600	317	2.30	3
600-650	291	2.11	6
650-700	473	3.43	3
700-750	60	0.43	3
750-800	385	2.79	2
800-2600	2,250	16.32	8
Others**	199	1.44	20
Totals	13,787	100.00 0	175

* Includes 155 mines

** Not included in graph

Distribution of 1973 U_3O_8 Production in Ore by Geologic Age

ERA	PERIOD	PERCENT	NO. OF SOURCES*
Cenozoic	Tertiary	45.66	36
Mesozoic	Jurassic	39.30	112
	Triassic	6.54	21
Precambrian		6.93	3
Miscellaneous	Cretaceous, Permian - Pennsylvanian - Mississippian	1.57	3
Totals		100.00	175

Distribution of 1973 Production Source by Annual Production Rate

*Includes 175 operating mines and miscellaneous shipments

DERIVATION OF AEC POTENTIAL RESOURCES OF URANIUM

The potential uranium resources as estimated by the AEC are restricted to "conventional" uranium deposits and include uranium surmised to occur in (1) unexplored extensions of known deposits, (2) postulated deposits within known uranium areas, or (3) postulated deposits in other areas known to be geologically favorable for uranium. The deposits are expected to be discoverable and exploitable within a given cost. The location of potential deposits may be definable only within broad limits. Providing this qualitative nature of potential is recognized and taken into account, reserves plus potential provide a more useful base for long range predictions of domestic supply than reserves alone. It should be kept in mind that a large expenditure will be required to convert potential resources to reserves. The average cost for the 1966-1973 period was about \$0.72 per pound of additions to \$8 reserves. Estimates are that this average cost would be \$1.00 per pound or more in the future; however, depending on the degree of success achieved in exploration, the unit cost for an individual company can range widely.

These estimates of potential should not be interpreted as a delimiting of the uranium resources; instead, they are appraisals of the amount of undiscovered uranium that is presumed to be present on the basis of rational geological evidence and/or exploration experience on hand at the time of estimation. These estimates should not be regarded as being the "ultimate" potential, because there are still chances of finding deposits, for which there are currently few or no tangible manifestations. Furthermore, the estimates are for "conventional" type deposits, that is, deposits in sandstone or veins. The economics assumed for the \$8 and \$10 potential estimates are similar to the economics of the ore reserve estimates at \$8 and \$10 respectively.

The reliability of individual potential estimates varies greatly. It is least in those areas where favorability must be inferred solely from geological reconnaissance of formation outcrops. It is best in well mapped areas where mines have been developed and extensive drilling has defined the ore habits, the detailed nature and lateral and vertical extents of the favorable host rocks.

In general, estimates of potential involve:

1. Study of the results of past and current exploration and mining, geologic investigations, and the district by district analysis of production and ore reserve data for use as measures for estimating the magnitude and grade of potential deposits.

2. Projections of established or inferred trends of mineralization.
3. Research of the available geological knowledge of the area being appraised and the recognition of features that constitute favorable geologic environment; knowledge of uranium ore controls, ore habits, and patterns of mineralization.
4. Analysis of the degree to which the geologically favorable parts of mining districts and other prospective uranium areas remain insufficiently explored.

AEC POTENTIAL ESTIMATES - WESTERN UNITED STATES

By Years

<u>Year</u> <u>End</u>	<u>Estimated Potential, Tons U₃O₈</u>	
	<u>\$8 *</u>	<u>\$10 *</u>
1965		325,000
1967	245,000	350,000
1969	385,000	600,000
1970	490,000	680,000
1971	460,000	650,000
1972	450,000	700,000
1973 **	450,000	700,000

DISTRIBUTION OF 1/1/74 POTENTIAL RESOURCES

<u>Region</u>	<u>Estimated Potential, Tons U₃O₈</u>	
	<u>\$8 *</u>	<u>\$10 *</u>
Colorado Plateau	250,000	360,000
Wyoming Basins	90,000	160,000
Others	<u>110,000</u>	<u>180,000</u>
Total	450,000	700,000

* Forward costs.

** 1973 \$8 and \$10 potential remained the same as in 1972.

Section III - Distribution of Deposits

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DISTRIBUTION OF 1948-1973 PRODUCTION & 1/1/74 RESERVES BY RESOURCE REGION

Region	Tons U_3O_8	% of Total
Colorado Plateau	335,257	62.76
Wyoming Basins	148,225	27.74
Northern Rockies	12,397	2.32
Colorado & Southern Rockies	8,160	1.53
Northern Plains	4,433	0.83
Others Sierra Nevada Range, Alaska, Northern & Central Basin & Range, Coastal U.S., Columbia Plateaus, Southeastern Basin & Range, Southern Basin & Range, Gulf Coastal Plains, & Southern Plains	25,744	4.82
Totals	534,216	100.00

Distribution of 1/1/74 Ore Reserves by Size of Deposits \$8.00 Reserves

Tons Range	Tons Ore	Grade	Tons U ₃ O ₈	Total Tons U ₃ O ₈	No. Deposits
Less than 100	2,249	0.371%	8	0.00	32
100-500	33,165	0.248%	82	0.03	112
500-1,000	58,010	0.250%	145	0.05	76
1,000-5,000	449,312	0.252%	1,133	0.41	182
5,000-10,000	388,106	0.231%	895	0.32	52
10,000-25,000	889,255	0.219%	1,945	0.70	55
25,000-50,000	1,551,832	0.207%	3,206	1.16	42
50,000-100,000	2,821,087	0.236%	6,654	2.40	39
100,000-250,000	9,381,169	0.206%	19,355	7.00	55
250,000-500,000	14,504,908	0.224	32,546	11.76	40
500,000-1,000,000	17,399,144	0.202%	35,168	12.71	24
1,000,000-2,500,000	27,996,495	0.212%	59,257	21.42	17
2,500,000-5,000,000	36,019,067	0.264%	95,241	34.42	10
5,000,000- or more	17,316,176	0.122%	21,065	7.62	2
Totals	128,809,975	0.215%	276,700*	100.00	738

* Rounded

Distribution of 1/1/74 Ore Reserves by Depth of Ore \$8.00 Reserves

Distribution of 1/1/74 Ore Reserves by Geologic Age
\$8.00 Reserves

Geologic Age	Tons Ore	Grade	Tons U ₃ O ₈	% Total Tons U ₃ O ₈	No. Deposits
Late Tertiary	10,167,754	0.146%	14,854	5.37	37
Early Tertiary	62,761,674	0.169%	106,141	38.35	210
Cretaceous	323,715	0.157%	508	.18	28
Jurassic	52,560,049	0.276%	145,088	52.43	405
Triassic	1,405,030	0.405%	5,694	2.06	47
Permian - Penn.	128,130	0.294%	376	.14	4
Miss. - Cambrian	1,294	0.830%	11	.01	2
Precambrian	1,462,329	0.276%	4,031	1.46	5
Totals	128,809,975	0.215%	276,700*	100.00	738

* Rounded

Distribution of 1/1/74 Ore Reserves by Type of Host \$8.00 Reserves

Host Type	Tons Ore	Grade	Tons U ₃ O ₈	% Total Tons U ₃ O ₈	No. Deposits
Coarse Clastics	126,825,687	0.214%	271,208	98.01	666
Fine Clastics	93,084	0.154%	143	0.05	12
Lignitic Material	224,115	0.221%	495	0.18	44
Limestone	102,437	0.401%	411	0.15	6
Fine Crystalline	820,929	0.382%	3,133	1.13	4
Igneous & Meta-Igneous	743,723	0.176%	1,312	0.48	6
Totals	128,809,975	0.215%	276,700*	100.00	738

* Rounded

Distribution of 1/1/74 Ore Reserves by Mining Method
\$8.00 Reserves

<u>Mining Method</u>	<u>Tons Ore</u>	<u>Grade</u>	<u>Tons U₃O₈</u>	<u>Total Tons U₃O₈</u>
Open Pit Mines	68,988,044	0.167%	115,141	41.61
Underground Mines	58,695,203	0.272%	159,723	57.72
Others	1,126,728	0.163%	1,839	0.67
Totals	128,809,975	0.215	276,700*	100.00

* Rounded

Distribution of 1/1/74 Ore Reserves by State
\$8.00 Reserves

State	Tons Ore	Grade	Tons U ₃ O ₈	% Total Tons U ₃ O ₈	No. Deposits
New Mexico	49,397,638	0.277%	136,958	49.50	78
Wyoming	55,740,431	0.174%	96,936	35.03	139
Utah	2,438,771	0.322%	7,854	2.84	127
Colorado	2,606,336	0.324%	8,432	3.05	248
Others: Arizona Montana, Calif., North Dakota, Washington, Oregon, South Dakota, Alaska, & Texas	18,626,799	0.142%	26,524	9.58	146
Totals	128,809,975	0.215%	276,700*	100.00	738

* Rounded

Distribution of 1/1/74 Ore Reserves by Resource Region
\$8.00 Reserves

<u>Resource Region</u>	<u>Tons Ore</u>	<u>Grade</u>	<u>Tons U₃O₈</u>	<u>Total Tons U₃O₈</u>	<u>No. Deposits</u>
Colorado Plateau	53,905,688	0.279%	150,633	54.44	454
Wyoming Basins	55,582,156	0.174%	96,718	34.95	135
Northern Rockies	7,141,509	0.119%	8,500	3.07	3
Northern Plains	436,400	0.194%	845	0.31	69
Others: Colorado & Southern Rockies, Northern & Central Basin & Range, Alaska & Gulf Coastal Plains	11,744,222	0.170%	20,007	7.23	77
Totals	128,809,975	0.215%	276,700*	100.00	738

*Rounded

Distribution of 1/1/74 Ore Reserves by Thickness of Ore \$8.00 Reserves

COUNTIES WITH URANIUM DEPOSITS
IN OTHER THAN SEDIMENTARY HOST ROCKS

COUNTIES WITH URANIUM DEPOSITS
IN SEDIMENTARY HOST ROCKS

SURFACE DRILLING ACTIVITIES DURING 1973

Drilling information for this section is acquired monthly for the first 10 months of a calendar year, chiefly at the field level, from the numerous companies, partnerships, and individuals engaged in drilling programs. To satisfy year-end reporting requirements, it is necessary to estimate the last 2 month's activities based on company estimates and knowledge of company plans. This preliminary year-end figure is detailed by project name, location, number of holes, and total footage of exploration and development drilling. The statistics thus obtained are used as a gauge of exploration progress during the year, and form the basis for the analyses of drilling shown in this section.

The drilling estimates derived from preliminary monthly data differ from the drilling estimate shown in Section V, which is compiled at the close of each year from questionnaires mailed by the AEC to the uranium industry for data on exploration expenditures, activities, and plans (see page 46). The information obtained is limited generally to the overall costs and footages of exploratory and development drilling done by individual companies. In 1973, the preliminary annual total compiled from monthly estimates was 16.4 million feet, and the total derived from the annual survey by questionnaire was 17.0 million feet.

The total footage drilled was about six percent greater than the 15,424,000 feet drilled in 1972. The uranium industry has completed 210,651,000 feet of surface drilling since 1948 when the AEC began to record industry drilling figures.

The surface drilling figures for 1973 are:

<u>Calendar Quarter</u>	<u>Drilling</u>		<u>Total Surface</u>
	<u>Exploration</u>	<u>Development</u>	
First	1,774,000	939,000	2,713,000
Second	2,867,000	1,261,000	4,128,000
Third	2,996,000	1,843,000	4,839,000
Fourth	<u>3,194,000</u>	<u>1,547,000</u>	<u>4,742,000</u>
Total	10,831,000	5,590,000	16,421,000

The total drilling figures do not include mining claim validation drilling for claims staked or underground longhole and diamond drilling. Underground drilling totaled approximately 1,000,000 feet in 1973.

Of the 16,421,000 feet reported monthly in 1973, 4,358,000 feet or 27% were drilled in areas more than 50 miles from existing production centers, compared with 32% in 1972. Exploration drilling in search for new ore deposits or extensions to known deposits was 66% of industry's 1973 drilling effort; in 1972 it was 78% of the total. Development drilling which defines shape, size and grade of deposits, and provides information needed for mine planning, accounted for the remaining 34% of the total, compared with 22% in 1972.

Distribution of the 1973 Drilling by States

<u>State</u>	<u>Drilling (Feet)</u>	<u>% of Total</u>
Wyoming	8,308,000	50.6
New Mexico	3,891,000	23.7
Texas	2,753,000	16.8
Colorado	473,000	2.9
Utah	255,000	1.6
Others *	741,000	4.4
Total	16,421,000	100.0

*Includes Montana, South Dakota, North Dakota, Arizona, California, Nevada, Washington, and Idaho.

Surface drilling in 1948 was 210,000 feet and increased steadily to a peak in 1957 when 9,200,000 feet were reported. Thereafter, the drilling effort diminished to approximately 2,000,000 feet per year in the mid-1960's. From 1966 through 1968 the annual drilling rate more than doubled each year, reaching the all time high of nearly 30,000,000 feet in 1969.

A comparison of the number and average depth of holes drilled in the last seven years is given in the following table:

<u>Year</u>	<u>Number of Holes</u>	<u>Average Depth (Feet)</u>
1966	18,900	220
1967	29,700	360
1968	58,000	410
1969	75,900	390
1970	58,900	400
1971	38,900	400
1972	36,600	420
1973	34,300	480

The 34,300 surface holes completed in 1973 were drilled by approximately 210 rigs.

DRILLING STATISTICS FOR WESTERN UNITED STATES

Surface Drilling - Millions of Feet

Surface Drilling

Year	Exploration		Development		Total Surface Drilling		Number of Holes			Average Depth - Feet		
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Exploration	Development	Total Surface	Exploration	Development	Total Surface
1948	.170	.170	.040	.040	.210	.210	-	-	-	-	-	-
1949	.360	.530	.053	.093	.413	.623	-	-	-	-	-	-
1950	.570	1.100	.208	.301	.778	1.401	-	-	-	-	-	-
1951	1.080	2.180	.348	.649	1.428	2.829	-	-	-	-	-	-
1952	1.362	3.542	.300	.949	1.662	4.491	-	-	-	-	-	-
1953	3.648	7.190	.367	1.316	4.015	8.506	-	-	-	-	-	-
1954	4.057	11.247	.553	1.869	4.610	13.116	-	-	-	-	-	-
1955	5.267	16.514	.762	2.631	6.029	19.145	-	-	-	-	-	-
1956	7.287	23.801	1.503	4.134	8.790	27.935	-	-	-	-	-	-
1957	7.352	31.153	1.848	5.982	9.200	37.135	-	-	-	-	-	-
1958	3.759	34.912	3.494	9.476	7.253	44.388	25,321	22,932	48,253	148	152	150
1959	2.368	37.280	3.282	12.758	5.650	50.038	16,253	19,585	35,838	146	168	158
1960	1.399	38.679	4.211	16.969	5.610	55.648	7,335	24,395	31,730	191	173	177
1961	1.319	39.998	3.190	20.159	4.509	60.157	8,256	19,314	27,570	160	165	164
1962	1.483	41.481	2.431	22.590	3.914	64.071	6,439	12,870	19,309	230	189	203
1963	.880	42.361	1.977	24.567	2.857	66.928	8,472	13,534	22,006	104	146	130
1964	.967	43.328	1.245	25.812	2.212	69.140	5,972	9,909	15,881	162	126	139
1965	1.164	44.492	.949	26.761	2.113	71.253	6,231	7,331	13,562	187	129	156
1966	1.800	46.292	2.400	29.161	4.200	75.453	5,751	13,179	18,930	313	182	222
1967	5.435	51.727	5.329	34.490	10.764	86.217	12,788	16,947	29,735	425	314	362
1968	16.227	67.954	7.527	42.017	23.754	109.971	38,470	19,531	58,001	422	385	410
1969	20.470	88.424	9.385	51.402	29.855	139.826	47,850	28,012	75,862	428	335	394
1970	17.981	106.405	5.547	56.949	23.528	163.354	43,980	14,874	58,854	409	373	400
1971	11.400	117.805	4.052	61.001	15.452	178.806	28,416	10,440	38,856	401	388	398
1972	11.815	129.620	3.609	64.610	15.424	194.230	26,909	9,706	36,615	439	371	421
1973	10.831	140.451	5.590	70.200	16.421	210.651	22,557	11,704	34,261	480	478	480

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Drilling for Uranium — Western United States

PRIVATE DRILLING SUMMARY BY RESOURCE REGION

Calendar Year 1973

<u>Area</u>	<u>Footage</u>			<u>% of Total</u>
	<u>Exploration</u>	<u>Development</u>	<u>Total Surface</u>	
Alaska, Sierra Nevada, Coastal U.S., Columbia Plateaus & Basin & Range	65,000	13,000	78,000	0.47
Colorado Plateau	2,402,000	2,000,000	4,402,000	26.81
Wyoming Basins	5,062,000	3,337,000	8,399,000	51.15
Colorado & Southern Rockies	87,000	13,000	100,000	0.61
Northern Rockies, Northern & Southern Plains	654,000	51,000	705,000	4.30
Gulf Coastal Plains	<u>2,560,000</u>	<u>177,000</u>	<u>2,737,000</u>	<u>16.66</u>
Grand Total	10,830,000	5,591,000	16,421,000	100.00

Percent of surface drilling by selected depth ranges.

Section V - Uranium Exploration Expenditures

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History and Forecast of Surface Drilling, Western U. S., 1948-1975	48
Profile Showing Cumulative Percentage of Surface Drilling with Respect to Cost Per Foot of Surface Drilling	49

URANIUM EXPLORATION EXPENDITURES

Information presented in this section is a summary of a report entitled, "Uranium Exploration Expenditures in 1973 and Plans from 1974-75, GJO-103 (74)" issued May 3, 1974. Data received for 87 companies accounted for 17.0 million feet of drilling.

Table 1

SUMMARY OF EXPLORATION EXPENDITURES

<u>Land</u>	<u>1973</u>	<u>1966-1973</u>
Acquired	2,870,000 Acres <u>1/</u>	24,020,000 Acres <u>1/</u>
Held 12/31/73	6,900,000 Acres	
<u>Surface Drilling</u>		
Exploration <u>3/</u>	11,760,000 feet	91,860,000 feet
Development <u>4/</u>	5,250,000 feet	28,280,000 feet
Expl. & Dev. Reported Together		12,570,000 feet <u>2/</u>
Total	17,010,000 feet	132,710,000 feet
<u>Expenditures</u>		
Land Acquisition	7,670,000	75,070,000
Surface Drilling	19,500,000	124,500,000
Expl.		
Development	5,800,000	26,700,000
Expl. & Dev. Reported Together		13,700,000
Other Expen- ditures <u>5/</u>	<u>16,500,000</u>	<u>94,400,000</u>
Total	\$ 49,470,000	\$ 334,370,000

1/ Includes 50,000 acres in 1973 and 610,000 acres in 1966-1973 for which no costs were reported.

2/ Includes 2,074,000 feet of exploration drilling and 530,000 feet of development drilling for which no costs were reported (1966-1971).

- 3/ Drilling done in search for new ore deposits or extensions to known deposits, and 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.
- 4/ Includes all drilling of an ore deposit to more precisely determine size, grade, and configuration subsequent to the time that determination is made that the deposit can be commercially exploited.
- 5/ Includes all other costs (exclusive of land acquisition and drilling programs) directly associated with a company's uranium exploration effort. Included are items such as geological and geophysical investigations and costs incurred by field personnel in the course of exploration effort, expenditures for geological research, and overhead and administrative charges directly associated with supervising and supporting field and exploration activities. The overhead and administrative charges reported do not include internal corporate charges, such as directors' salaries, that are not directly associated with a company's exploration effort.

Table II

ESTIMATES OF PLANNED EXPLORATION EXPENDITURES

<u>Calendar Year</u>	<u>Drilling</u> <u>Millions of feet</u>		<u>Total</u>	<u>Total Exploration Costs</u>
	<u>Exploration</u>	<u>Development</u>		
1974	18.2	10.9	29.1	\$72,500,000
1975	20.8	12.9	33.7	\$77,780,000

Table III

FOREIGN URANIUM EXPLORATION EXPENDITURES

<u>Year</u>	<u>Australia</u>	<u>Others</u>
1966-72	\$ 4,500,000	\$ 12,590,000
1973	2,780,000	560,000
1974 (Est.)	2,210,000	1,330,000
1975 (Est.)	1,630,000	1,620,000

Curve showing cumulative percentage of surface drilling with respect to cost per foot of drilling.

Section VI - Land Holdings for Uranium Mining and Exploration

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FOOTNOTE TO LAND TABLES AND GRAPH

The acreages shown in these tables and in the accompanying graph were obtained from the public records. They include lands held for exploration, lands held for production and auxiliary purposes, leases and claims held by individuals and brokers in anticipation of exploration interest, and lands which may have been relinquished although control is still indicated in the public records. This note is included to clarify possible questions on differences between these figures and those reported from the exploration surveys conducted in 1972, 1973, and 1974. A summary of the 1974 survey appears elsewhere in this report.

ACRES HELD FOR URANIUM MINING AND EXPLORATION
(in thousands of acres)

DISTRIBUTION BY STATES

State	1/1/66	1/1/71	1/1/72	1/1/73	10/1/73	1/1/74
Arizona	2	221	231	486	486	754
California	6	436	450	491	528	587
Colorado	213	1,959	1,315	1,123	1,188	1,291
Idaho		21	24	34	34	34
Montana		386	349	324	319	380
Nevada		250	250	250	263	264
New Mexico	137	4,717	4,119	3,109	3,133	3,158
North Dakota						100
Oregon			5	30	31	31
South Dakota		276	237	224	224	81
Texas	34	1,079	899	641	630	641
Utah	113	3,640	2,420	2,602	2,787	2,783
Washington		398	133	88	72	72
Wyoming	226	11,023	8,575	8,275	8,557	8,598
Total	731	24,406	19,007	17,677	18,252	18,774

ACRES HELD FOR URANIUM MINING AND EXPLORATION
(in thousands of acres)

DISTRIBUTION BY LAND CATEGORY

	<u>1/1/71</u>	<u>1/1/72</u>	<u>1/1/73</u>	<u>10/1/73</u>	<u>1/1/74</u>
Fee	5,712	5,250	5,219	5,243	5,580
Claims	11,471	8,755	9,679	10,159	10,290
State	5,835	3,995	1,859	1,896	1,945
Indian	674	469	603	646	646
Acquired	555	363	206	146	145
Railroad	159	175	111	162	168
Total	24,406	19,007	17,677	18,252	18,774

Acres Held by Uranium Industry

Section VII - Employment

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EMPLOYMENT IN THE URANIUM MINING INDUSTRY 1/1/74

	<u>Mining Underground</u>		<u>Mining Open Pit</u>		<u>Technical</u>	<u>Clerical</u>	<u>Supervisory</u>	<u>Totals</u>
	<u>Miners</u>	<u>Serv. & Support</u>	<u>Miners</u>	<u>Serv. & Support</u>				
<u>Mining</u>								
Colorado	160	46			16	10	37	269
New Mexico	647	353	142	147	105	62	182	1,638
Wyoming	89	111	418	246	94	103	112	1,173
Utah	113	33	5	1	8	14	17	191
Other	--	--	112	96	9	18	10	245
Totals	1,009	543	677	490	232	207	358	3,516
	<u>Operations</u>		<u>Maintenance</u>	<u>Technical</u>		<u>Other</u>	<u>Supervisory</u>	<u>Totals</u>
<u>Milling</u>								
Colo., Utah	143		97	44	32	68		384
New Mexico	255		161	42	52	68		578
Wyo., Texas,	167		108	50	67	48		440
Wash.	56		25	10	12	17		120
Totals	621		391	146	163	201		1,522
	<u>Geol. & Eng.</u>	<u>Drilling Services</u>	<u>Logging Services</u>	<u>Aerial Services</u>	<u>Others:</u>		<u>Non-Technical</u>	<u>Totals</u>
<u>Exploration</u>					<u>Landsmen,</u>	<u>Surveyors,</u>	<u>Prospectors</u>	
					<u>Draftsmen</u>			
Colo., E. Utah	71	68	11	1	42	12		205
Wyo., N. & S.								
Dak., E. Montana	148	161	43	6	133	5		496
New Mex., Ariz	87	235	29	2	167	7		527
Texas, Okla., Ark.,								
Louisiana	57	110	16	1	46	--		230
Far West, North-								
west, Alaska	43	18	4	1	23	10		99
Totals	406	592	103	11	411	34		1,557

Section VIII - Commercial U₃O₈ Sales and Requirements

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Forecast of U. S. Commercial Requirements	59
Commercial Shipments, Domestic and Foreign, 1966-1973	60

COMMERCIAL DELIVERY COMMITMENTS

An industry survey as of January 1, 1974 indicated that U. S. uranium producers had made commercial sales contracts with domestic buyers for approximately 175,600 tons U_3O_8 in concentrates, for delivery on the following schedule:

<u>Year of Delivery</u>	<u>Tons U_3O_8 Annual</u>	<u>Tons U_3O_8 Cumulative</u>
1966-73		55,600
1974	13,700	69,300
1975	15,500	84,800
1976	10,900	95,700
1977	11,600	107,300
1978	13,200	120,500
1979	12,100	132,600
1980	10,200	142,800
1981	7,700	150,500
1982	6,600	157,100
1983	5,900	163,000
1984-1994 Total	12,600	175,600

This is an increase of 45,800 tons from a survey made in early 1973. In addition, 6,900 tons have been sold for export, of which 5,700 tons were delivered prior to 1974.

FORECAST OF U. S. COMMERCIAL REQUIREMENTS

<u>Year</u>	<u>Short Tons of U₃O₈ in Concentrate</u>		
	<u>Isotopic Composition of Enrichment Plant Tails</u>		
	<u>0.20% U₂₃₅</u>	<u>0.25% U₂₃₅</u>	<u>0.30% U₂₃₅</u>
1974	9,700	10,600	11,600
1975	11,700	12,800	14,100
1976	12,600	13,700	15,200
1977	16,000	17,500	19,400
1978	19,800	21,600	23,900
1979	25,200	27,500	30,400
1980	31,500	34,300	37,900
1981	35,000	38,200	42,200
1982	34,300	37,500	41,500
1983	34,400	37,800	41,900
1984	41,500	45,500	50,500
1985	<u>49,800</u>	<u>54,000</u>	<u>60,400</u>
TOTALS	321,500	351,000	389,000

Section IX - Processing Mills

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Uranium Concentrate Production	66
Grade of Uranium Ore Processed	67
Recovery from Ore Processed	67

U. S. URANIUM ORE PROCESSING MILLS

Operating or on Standby
(at Yearend)

<u>Company</u>	<u>Location</u>	<u>Nominal Capacity (tons ore per day)</u>
Anaconda Company	Grants, New Mexico	3,000
Atlas Corporation	Moab, Utah ^{1/}	1,500
Conoco & Pioneer Nuclear, Inc.	Falls City, Texas	1,750
Cotter Corporation	Canon City, Colorado	450
Dawn Mining Company	Ford, Washington	400
Federal-American Partners	Gas Hills, Wyoming	950
Exxon Company	Powder River Basin, Wyo.	2,000
Kerr-McGee Nuclear Corp.	Grants, New Mexico	7,000
Petrotomics Company	Shirley Basin, Wyoming	1,500
Rio Algom Corporation	La Sal, Utah	500
Union Carbide Corporation	Uravan, Colorado	1,300
Union Carbide Corporation	Natrona County, Wyoming	1,000
United Nuclear-Homestake Partners	Grants, New Mexico	3,500
Utah International, Inc.	Gas Hills, Wyoming	1,200
Utah International, Inc.	Shirley Basin, Wyoming	1,200
Western Nuclear, Inc.	Jeffrey City, Wyoming	1,200
Total		28,450

^{1/} Uranium production facility on standby at end of 1973.

URANIUM MILLING OPERATIONS IN WESTERN UNITED STATES
In 1973

Number of Mills in Operation 18
Average Tons Treated per Operating Day 22,500

	<u>Thousands of Tons</u>	<u>% U₃O₈</u>	<u>Tons U₃O₈</u>
Ore stockpiles 1/1/73	104	0.26	271
Ore receipts	6,768	0.20	13,558
Ore fed to process	6,816	0.20	13,716
Ore stockpiles 1/1/74	56	0.20	113
Other millfeed*			199
Recycled tailings & clean-up			61
Total millfeed			13,976
In process 1/1/73			468
In process 1/1/74			328
Actual production			13,235
Tailing losses			881
Recovery - 93%			
Concentrate inventory 1/1/73			3,701
Shipments**			11,698
Concentrate inventory 1/1/74			5,238

* Mine water, residues, etc.

** Generally representing physical transfers from millsites. Not to be closely compared with figures on page 60, because of in-transit inventories, variations in point of title transfer, etc.

URANIUM CONCENTRATE PRODUCTION BY STATE

In Tons of U₃O₈

<u>Calendar Year</u>	<u>Colorado</u>	<u>New Mexico</u>	<u>Wyoming</u>	<u>Others</u> ^{<u>1/</u>}	<u>Total</u>
1966	1,423	5,076	2,248	1,842	10,589
1967	1,340	5,933	2,667	1,313	11,253
1968	1,614	6,192	2,873	1,689	12,368
1969	1,678	5,943	3,063	925	11,609
1970	<u>1/</u>	5,771	3,654	3,480	12,905
1971	<u>1/</u>	5,305	3,487	3,481	12,273
1972	<u>1/</u>	5,464	4,216	3,220	12,900
1973	<u>1/</u>	4,634	5,159	3,442	13,235

^{1/} Data included in "Others" category when state production is from less than three companies. States included in this category for one or more years are: Arizona, Colorado, South Dakota, Texas, Utah and Washington.

URANIUM ORE PROCESSING

The graphs on the following pages show the trends in uranium ore processing during the decade from January 1, 1964 through December 31, 1973 for mills in the United States.

In 1973 the uranium ore processing rate and the uranium concentrate production were their highest in the last decade, but the 1973 values were exceeded in several years of the early 1960s.

Uranium recovery continued to be low as more mills turned to lean ore for their millfeed. Uranium recovery will probably improve during 1974, but millfeed grade will remain at 0.20 percent U_3O_8 or lower.