



U.S. Uranium Reserves Estimates

Data for: 2008

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Summary

The U.S. Energy Information Administration (EIA) has updated its estimates of uranium reserves for year-end 2008. This represents the first revision of the estimates since 2004. The update is based on analysis of company annual reports, any additional information reported by companies at conferences and in news releases, personal contacts, and expert judgment.

At the end of 2008, U.S. uranium reserves totaled 1,227 million pounds of U_3O_8 at a maximum forward cost (MFC) of up to \$100 per pound U_3O_8 ([Table 1](#)). At up to \$50 per pound U_3O_8 , estimated reserves were 539 million pounds of U_3O_8 . Based on average 1999-2008 consumption levels (uranium in fuel assemblies loaded into nuclear reactors), uranium reserves available at up to \$100 per pound of U_3O_8 represented approximately 23 years worth of demand, while uranium reserves at up to \$50 per pound of U_3O_8 represented about 10 years worth of demand. Domestic U.S. uranium production, however, supplies only about 10 percent, on average, of U.S. requirements for nuclear fuel, so the effective years' supply of domestic uranium reserves is actually much higher, under current market conditions.

In 2008, Wyoming led the Nation in total uranium reserves, in both the \$50 and \$100 per pound U_3O_8 categories, with New Mexico second. Taken together, these two States constituted about two-thirds of the estimated reserves in the country available at up to \$100 per pound U_3O_8 , and three-quarters of the reserves available at less than \$50 per pound U_3O_8 . By mining method, uranium reserves in underground mines constituted just under half of the available product at up to \$100 per pound U_3O_8 ([Table 2](#)). At up to \$50 per pound U_3O_8 , however, uranium available through [in-situ leaching](#) (ISL) was about 40 percent of total reserves, somewhat higher than uranium in underground mines in that cost category. ISL is the dominant mining method for U.S. production today. See [Table 3](#) for more estimates from 1993 through 2003 and 2008.

Methodology

The U.S. uranium ore reserves reported by EIA for specific MFC categories represent the sums of quantities estimated to occur in known deposits on properties where data about the ore grade, configuration, and depth indicate that the quantities estimated could be recovered at or less than the stated costs given current mining and milling technology and regulations. The reserves estimates for year-end 2008 are based on historical data for uranium properties evaluated under prior Federal uranium resource assessment programs, data reported for 1984-2003 by mining companies for domestic uranium properties, and recent analysis of updated company data and personal contacts, together covering about 450 individual properties. Data for current mining costs are not available for most of the uranium reserves properties included in the year-end 2008 estimates, and the reserves quantities reported for the stated MFC categories should be viewed as the upper limits of quantities recoverable under the most favorable conditions. The initial uranium property reserves estimates were based on bore hole radiometric data validated by chemical analysis of samples from cores and drill cuttings. The thickness of mineralized rock, mineral grades and their spatial distribution, host-rock depth, proposed mining method, ore haulage distance, and reclamation method were considered in the reserves evaluation. Ore cut-off grades reflect operating costs only, and the estimates include only ore with an average grade expected to allow recovery of the forward costs.

Only forward operating and capital costs were included to estimate reserves. Past capital costs were considered "sunk" costs and mining of the individual deposits may or may not return such costs to investors. Sunk costs for such items as exploration and land acquisition were excluded as were the costs for income taxes, profit, and the cost of money. Forward costs include the costs for power and fuel, labor, materials, insurance, severance and ad valorem taxes, and applicable administrative costs. The forward costs used to estimate U.S. uranium ore reserves are independent of the price at which uranium produced from the estimated reserves might be sold in the commercial market.

The estimates do not reflect a predetermined profit margin above the basic costs, since the rate of return can differ considerably among individual mining companies. Therefore, the estimates could include some reserves across the MFC categories that might not be exploitable if the profit margin ceases to be attractive to the operator. Reserves quantities reported by EIA have been adjusted to reflect effects of mining dilution and milling and processing recovery factors.

Between 1994 and 2004, reserves were estimated each year primarily by depleting reserves associated with uranium production for that year. For 2008, a more comprehensive update was made by revising individual property estimates in those cases where properties were no longer active, where there was significant depletion of the reserves, and where properties were undergoing or had completed reclamation. In addition, because of higher costs, significant quantities of reserves are now estimated to be in higher cost categories compared to earlier estimates, or to be no longer economical at less than \$100 per pound of U₃O₈. Because of the relatively small quantity of reserves estimated to be available at less than \$30 per pound of U₃O₈, EIA is now showing reserves for the \$50 and \$100 per pound categories only, by State and mining method, but is showing the \$30 category for national reserves.

Note that the definition of “reserves” for these estimates is based on the definition in the EIA glossary, which is “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. . .” This definition corresponds, in general, to the category of “Reasonably Assured Resources,” often used in international summaries of uranium reserves and resources, such as the biennial report Uranium: Resources, Production and Demand (known as the “Red Book”), prepared jointly by the Nuclear Energy Agency of the Organization for Economic Cooperation and Development, and the International Atomic Energy Administration. “Reserves,” as reported here, do not necessarily imply compliance with U.S. or Canadian government definitions for purposes of investment disclosure.

Table 1. U.S. Forward-Cost Uranium Reserves by State, Year-End 2008

State	\$50/lb			\$100/lb		
	Ore (million tons)	Grade ^a (%)	U ₃ O ₈ (million lbs)	Ore (million tons)	Grade ^a (%)	U ₃ O ₈ (million lbs)
Wyoming	145	0.076%	220	398	0.056%	446
New Mexico	64	0.140%	179	186	0.105%	390
Arizona, Colorado, Utah	22	0.145%	63	117	0.084%	198
Texas	15	0.089%	27	32	0.062%	40
Other ^b	28	0.090%	50	95	0.081%	154
Total	275	0.098%	539	828	0.074%	1,227

^a Average percent U₃O₈ per ton of ore.

^b Includes Alaska, California, Idaho, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Virginia and Washington.

Notes: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in this table. Reserves values in forward-cost categories are cumulative; that is, the quantity at \$100 per pound U₃O₈ includes all reserves available up to and including that cost. Totals may not equal sum of components because of independent rounding. See EIA Glossary for definition of reserves. “Reserves,” as reported here, do not necessarily imply compliance with U.S. or Canadian government definitions for purposes of investment disclosure.

Sources: Estimated by Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on company reports, industry conferences, and U.S. Department of Energy, Grand Junction Office, files.

Table 2. U.S. Forward-Cost Uranium Reserves by Mining Method, Year-End 2008

Mining Method	\$50 per pound			\$100 per pound		
	Ore (million tons)	Grade ^a (percent U ₃ O ₈)	U ₃ O ₈ (million pounds)	Ore (million tons)	Grade ^a (percent U ₃ O ₈)	U ₃ O ₈ (million pounds)
Underground	76	0.142%	215	323	0.094%	608
Openpit	54	0.086%	93	260	0.063%	325
In Situ Leaching	145	0.080%	230	241	0.060%	289
Other	<0.5	0.152%	1	4	0.064%	5
Total	275	0.098%	539	828	0.074%	1,227

^aAverage percent U₃O₈ per ton of ore.

Notes: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in this table. Reserves values in forward-cost categories are cumulative: that is, the quantity at \$100 per pound U₃O₈ includes all reserves up to and including that cost. Totals may not equal sum of components because of independent rounding. See EIA Glossary for definition of reserves. "Reserves," as reported here, do not necessarily imply compliance with U.S. or Canadian government definitions for purposes of investment disclosure. Sources: Estimated by Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on company reports, industry conferences, and U.S. Department of Energy, Grand Junction Office, files.

Historical Estimates of Reserves, 1993 through 2003, and 2008

Table 3. U.S. Uranium Reserves by Forward-Cost Category, Year-End 1993-2008 (Million Pounds U₃O₈) -- Forward-Cost Category

Year	Up to \$30 per pound	Up to \$50 per pound	Up to \$100 per pound
1993	292	952	1,511
1994	294	953	1,501
1995	290	947	1,493
1996	285	939	1,480
1997	281	931	1,466
1998	276	923	1,452
1999	274	908	1,432
2000	271	904	1,430
2001	268	899	1,422
2002	266	896	1,418
2003	265	890	1,414
2008	102	539	1,227

Note: Uranium reserves that could be recovered as a byproduct of phosphate and copper mining are not included in these reserves. Reserves values in forward-cost categories are cumulative; that is, the quantity at each level of forward cost includes all reserves at the lower costs. No estimates were made for 2004-2007. See EIA Glossary for definition of reserves. "Reserves," as reported here, do not necessarily imply compliance with U.S. or Canadian government definitions for purposes of investment disclosure.

Sources: Estimated by Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, based on company reports; industry conferences; U.S. Department of Energy, Grand Junction Office, files; and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey," Schedule A, Uranium Raw Material Activities (1984-2002) and Form EIA-851A, "Domestic Uranium Production Report" (2003). For 2008, a comprehensive revision was undertaken, with significant changes made due to depletion, reclamation, and higher extraction costs.

Major U.S. Uranium Reserves



Sources: Based on U.S. Department of Energy, Grand Junction Project Office (GJPO). National Uranium Resources evaluation. Interim report (June 1979) Figure 3.2; and GJPO data files.

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