Installed nuclear generating capacity to 2035*
(MWe net)

2008	2009	2010		2015	
		Low	*High*	*Low*	*High*
11 000	10 900	10 600	10 600	4 800	4 800

2020		2025		2030		2035	
Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
3 700	4 800	NA	NA	NA	NA	NA	NA

Annual reactor-related uranium requirements to 2035 (excluding MOX)*
(tonnes U)

2008	2009	2010		2015	
		Low	*High*	*Low*	*High*
1 071	NA	1 860	2 150	980	1 140

2020		2025		2030		2035	
Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
450	520	350	405	350	405	NA	NA

* *Nuclear Energy Data*, OECD, Paris, 2009.

• United States of America •

URANIUM EXPLORATION

Historical review

See the 2007 Red Book for a brief historical review of exploration in the United States (U.S.).

Recent and ongoing uranium exploration and mine development activities

In the U.S., expenditures for uranium surface drilling during 2008 were USD 81.9 million, up USD 14.4 million from expenditures in 2007 of USD 67.5 million. This continued upward trend in investment – a 673% increase since 2004 – indicates a significant turnaround for the industry from the steady decline in drilling expenditures experienced between 1997 and 2003.

The number of exploration and development holes drilled was 9 355 in 2008 and 9 347 in 2007. The number of holes drilled in these years represent a significant increase from the number of holes drilled in 2006 (4 903) and 2005 (3 143). There were also significant increases in the total drilling

length. In 2008, 1 552 656 m were drilled which is a slight decrease from the 1 568 501 m drilled in 2007. However, the 2007 total was a 90% increase from the 826 923 m drilled in 2006. The total lengths drilled in 2008 and 2007 were the largest for any two years since before 1990.

U.S. uranium drilling activities, 2003-2008

Year	Exploration drilling		Development drilling		Exploration and development drilling	
	Number of holes	Meters (thousand)	Number of holes	Meters (thousand)	Number of holes	Meters (thousand)
2003	NA	NA	NA	NA	W	W
2004	W	W	W	W	2 185	381
2005	W	W	W	W	3 143	508
2006	1 473	250	3 430	577	4 903	827
2007	4 351	671	4 996	898	9 347	1 569
2008	5 198	775	4 157	778	9 355	1 553

NA = Not available.

W = Data withheld to avoid disclosure of individual company data.

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

Source: Energy Information Administration: Form EIA-851A, "Domestic Uranium Production Report" (2003-2008).

In 2008, private industry expenditures for uranium exploration and mine development activities in the United States totalled USD 246.4 million, a slight increase from the USD 245.7 million spent in 2007.

In 2008, expenditures on U.S. uranium production, including facility expenses, amounted to USD 221 million, significantly higher – by 145% – than those in 2007. Expenditures for land were USD 65 million, a 16% decrease compared to 2007.

The total expenditures for land, exploration, drilling, production and reclamation were USD 468 million in 2008, 39% more than in 2007.

In 2007 and 2008, there were no exploration expenditures for uranium in the United States or abroad by the U.S. Government. Data on industry exploration expenses abroad are not available.

Much of the recent increase in development and production expenditures is due to the general rise in uranium (and vanadium) prices since 2004. As a result, there is renewed interest in leasing activity for historical uranium reserve properties in several western States. This interest led to the purchase of uranium mineral rights on these tracts and the formation of new joint ventures to explore and develop prospective new deposits. Encompassed in this activity are thousands of acres located principally in the following western States: Arizona, California, Colorado, Montana, Nebraska, Nevada, New Mexico, Oregon, South Dakota, Texas, Utah, and Wyoming.

U.S. Uranium Expenditures, 2003-2008
(Million Dollars)

Year	Drilling	Production	Land and other				Total expenditures
			Total land and other	Land	Exploration	Reclamation	
2003	W	W	31.3	NA	NA	NA	W
2004	10.6	27.8	48.4	NA	NA	NA	86.9
2005	18.1	58.2	59.7	NA	NA	NA	136.0
2006	40.1	65.9	115.2	41.0	23.3	50.9	221.2
2007	67.5	90.4	178.2	77.7	50.3	50.2	336.2
2008	81.9	221.2	164.4	65.2	50.2	49.1	467.6

Drilling: All expenditures directly associated with exploration and development drilling.

Production: All expenditures for mining, milling, processing of uranium, and facility expense.

Land and other: All expenditures for: land; geological research; geochemical, and geophysical surveys; costs incurred by field personnel in the course of exploration, reclamation and restoration work; and overhead and administrative charges directly associated with supervising and supporting field activities.

NA = Not available.

W = Data withheld to avoid disclosure of individual company data.

Notes: Expenditures are in nominal U.S. dollars. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration: Form EIA-851A, "Domestic Uranium Production Report" (2003-2008).

Titles to most of the uranium properties and claim blocks with reserves and resources identified by drilling during the 1970s and early 1980s have been acquired through three options: re-staking, acquisition from previous owners, and mergers. Areas surrounding many properties are being considered for further evaluation. Most of the companies involved are following up acquisitions with in-house evaluations of old drill holes and geochemical data acquired with the property, new drilling to verify reserves, and external expert technical reports to meet financial reporting standards for mining properties. In addition, the uranium industry is assessing the potential of areas bordering many mined-out properties.

The U.S. Department of Energy (DOE) has 31 active lease tracts and one inactive lease tract in the Uravan Mineral Belt of western Colorado with six different leaseholders. Leaseholders can conduct ongoing uranium production on these tracts. As leases become inactive and are returned to the DOE, they are not leased again under the current programme. The DOE is responsible for ensuring that any abandoned uranium production sites on these tracts comply with environmental laws and regulations. After reclamation, the land associated with the DOE lease tracts is eligible for return to the public domain under the administrative jurisdiction of the Bureau of Land Management, U.S. Department of the Interior.

Work on these leases continues but with just enough effort to meet lease requirements. One company has filed an exploration plan for its lease. These leases have been held by DOE and its predecessor agencies since 1948 when these properties were set aside to provide uranium for weapons. Past production from these leases totalled 3 000 tU (7.8 million lbs U_3O_8) and about 4-5 times that of

vanadium. DOE estimates that 770 tU (2.0 million lbs U_3O_8) could be generated annually from the 38 tracts in future years. Production from these properties will rely on either open-pit or underground mining with conventional milling.

The western Colorado Plateau ores can be exploited only by conventional mining and milling methods as the ores are often above the water table or are not readily soluble using current U.S. *in-situ* leach (ISL) technology which is designed to limit ground-water contamination. Breccia-pipe uranium mineralisation in north western Arizona has attracted much attention as these deposits are among the highest grade in the U.S. (averaging 0.60% U_3O_8, or 0.51% U, during past production). Drilling projects are ongoing at several pipes north of the Grand Canyon in north western Arizona. Ore from the breccia-pipe deposits in Arizona and U-V (uranium-vanadium) sandstone deposits in eastern Utah and western Colorado will most likely be shipped to the White Mesa and Shootaring Canyon mills in south eastern Utah. Uranium mining in these areas will however be limited by milling capacity and by the transportation costs. The White Mesa Mill presently processes “alternate feed material” (uranium-contaminated soils and other materials). The Shootaring Canyon Mill now has a reclamation license. Converting this license to an operating license is a lengthy process that might take several years.

The San Juan Basin of north western New Mexico contains nearly 40% of U.S. uranium reserves with some ores amenable to ISL recovery, but future development is being influenced by Native American concerns. In 2005, the Navajo Nation banned uranium exploration, mining, and processing in “Indian Country.” The term “Indian Country” as used by the Navajo includes tribal lands and non-tribal lands where mining activities may have an impact on nearby tribal lands or may impact predominately Native American communities on non-tribal lands. Community ground water supplies are of particular concern. A Federal appeals court decision recognised the term “Indian country” as legitimate and granted the U.S. Environmental Protection Agency (USEPA) regulatory control over injection of lixiviant into ground water for recovery of uranium at the proposed Church Rock ISL mine (formerly the “Section 8” mine). The State of New Mexico had already issued a permit for this activity, but the permit was challenged and blocked. The company must reapply to USEPA.

URANIUM RESOURCES

Identified Conventional Resources (RAR & Inferred)

The U.S. has updated its RAR estimates for the first time since 2003. The estimate of RAR for the <USD 80/kgU category as of 1 January 2009 was 39 064 tU, down from the 2003 estimate of 102 000 tU. The estimated RAR in the <USD 130/kgU category at the end of 2009 was 207 435 tU, a decrease from the 2003 estimate of 342 000 tU. For the <USD 260 kg/U category, estimated RAR amounts to 472 056 tU. Differences from the 2003 estimates for the <USD 80/kg U are based on a revised examination of major U.S. properties, taking into account increases in mining costs, published re-assessments of current resources, newly assessed properties, and mine depletion. In general, higher mining costs over the past several years have resulted in resources being shifted from lower-cost to higher-cost categories.

The U.S. does not report resources for the Inferred category separately.

Undiscovered Conventional Resources (Prognosticated & SR)

For the United States, the estimates of resources for the Prognosticated (formerly Estimated Additional Resources, or EAR) and Speculative categories are unchanged from the prior-reported estimates as of 1994.

Unconventional Resources and Other Materials

Not available.

URANIUM PRODUCTION

Historical review

See the 2007 Red Book for a summary of the early history of uranium production in the U.S.

Uranium mine production from all sources in 2008 was 1 492 tU. Although 2008 production was 15% less than 2007 production (1 746 tU) and 17% less than 2006 production (1 805 tU), it is a significant increase (58%) from the 2004 production 943 tU.

In 2008, uranium concentrate production (yellowcake) was obtained from facilities in the States of Colorado, Nebraska, Texas, Utah, and Wyoming. Yellowcake was produced from one U.S. mill (White Mesa), and six *in situ* leach production centres (Crow Butte, Alta Mesa Project, Rosita, Smith Ranch-Highland Uranium Project, Kingsville Dome, and Vasquez).

Although the production level dropped from 2007 to 2008, the amount of uranium shipped from these facilities has steadily increased over the past several years. In 2008, 1 589 tU were shipped from these facilities. This shipment level is 2% more than the 1 558 tU shipped in 2007. For perspective, in 2004, 877 tU were shipped. Thus, 2008 shipments represent an increase of more than 81% over 4 years.

Status of production capability

Exploration, assessment, and development of uranium properties and milling operations in the U.S. intensified in 2007 as the spot price reached USD 356/kg U_3O_8 (USD 137/lb U_3O_8) in June 2007. Many in ISL license applications, exploration permit requests, toll milling agreements, and preliminary plans for new conventional mill construction were filed during the year with Federal and State regulatory agencies.

At the end of 2008, there were 17 ISL production facilities, with a combined production capability of 6 524 tU, either in operation (six totalling 3 964 tU), on standby (four), licensed (three), pending a license award (one), or under development (three).

At the end of 2008, there were five conventional uranium production centres in the U.S. either in operation or under consideration for operation. One mill was producing and four were being considered for restoration.

Several uranium companies are in pre-licensing negotiations with State and Federal regulatory agencies for both conventional and ISL uranium mining in Wyoming, Colorado, Utah, New Mexico, and Texas. Existing and new ISL properties are most likely to be the largest contributors to expanded U.S. production in the near term. New ISL mining operations have relatively short lead times due to simpler regulatory requirements, lower capital costs, and shorter construction schedules than new conventional mills.

Ownership structure of the uranium industry

Seven facilities produced uranium in 2008. Ownership of these facilities included public and privately held firms with both foreign and domestic participation.

Uranium production centre technical details
(as of January 2009)

	Centre #1	Centre #2	Centre #3	Centre #4	Centre #5	Centre #6	Centre #7	Centre #8
Name of production centre	Canon City	Crow Butte	Kingsville Dome	Smith Ranch Highland	Sweetwater	White Mesa Mill	Vasquez	Hobson Mill
Production centre classification	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing
Start-up date	1979	1991	1988	1988	1981	1980	2004	1979
Source of ore:								
• Deposit name	Various	Crow Butte & North Trend	Kingsville Dome	Smith Ranch Highland	Various	Various	Vasquez	supplied with concentrate from the La Palangana
• Deposit type	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	
• Reserves (tU)	W	W	W	W	W	W	W	W
• Grade (% U)	W	W	W	W	W	W	W	W
Mining operation:								ISL
• Type (OP/UG/ISL)	UG	ISL	ISL	ISL	OP	UG	ISL	NA
• Size (t ore/day)	NA	NA	NA	NA	NA	NA	NA	NA
• Average mining recovery (%)	NA	NA	NA	NA	NA	NA	NA	
Processing plant (acid/alkaline):								
• Acid/Alkaline	Acid&Alkaline				Acid	Acid	Alkaline	Alkaline
• Type (IX/SX)	SX	IX	IX	IX	SX	SX	IX	IX
• Size (t ore/day) For ISL (mega or kilolitre/day or litre/hour, specify)		NA	NA	NA	2 721 TPD	NA	NA	NA
• Average process recovery (%)	NA	NA	NA	NA	NA	NA	NA	NA
Nominal production capacity (tU/year)	210	385	385	2 116	350	1 200	308	385
Plans for expansion	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Other remarks	Standby	Operating	Producing	Operating	Standby	Operating	Restoration	Licensed

NA Not available.

Uranium production centre technical details (contd.)
(as of January 2009)

	Centre #9	Centre #10	Centre #11	Centre #12	Centre #13	Centre #14	Centre #15	Centre #16
Name of production centre	Rosita	Alta Mesa	Church Rock	Crown Point	Irigaray Ranch	Christensen Ranch	Shootaring Canyon Uranium Mill	Lost Creek
Production centre classification	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Development
Start-up date	1990	2005	1967	NA	NA	NA	1982	2010
Source of ore:								
• Deposit name	Rosita (Rogers)	Alta Mesa	Church Rock	Crown Point	Irigaray	Christensen	Various	Lost Creek
• Deposit type	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone
• Reserves (tU)	W	W	W	W	NA	NA	NA	NA
• Grade (% U)	W	W	W	W	NA	NA	NA	NA
Mining operation:	W							
• Type (OP/UG/ISL)		ISL	ISL	ISL	ISL	ISL	UG	ISL
• Size (t ore/day)	ISL	NA	NA	NA	NA	NA	NA	NA
• Average mining recovery (%)	NA	NA	NA	NA	NA	NA	NA	NA
Processing plant (acid/alkaline):	NA							
• Acid/Alkaline		Alkaline	Alkaline	Alkaline	Alkaline	Alkaline	Acid&Alkaline	Alkaline
• Type (IX/SX)	Alkaline	IX	IX	IX	IX	IX	SX	IX
• Size (t ore/day)	IX	NA	NA	NA	NA	NA	680 TPD	NA
For ISL (mega or kilolitre/day or litre/hour, specify)	NA						NA	
• Average process recovery (%)		NA	NA	NA	NA	NA	NA	NA
Nominal production capacity (tU/year)	NA	385	385	385	NA	250	NA	770
Plans for expansion	385	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Development
Other remarks	Unknown	Producing	Licensed	Operating	Standby	Standby	Operational	Developing

NA Not available.

Uranium production centre technical details (contd.)
(as of January 2009)

	Centre #17	Centre #18	Centre #19	Centre #20	Centre 21	Centre #22	Centre #23
Name of production centre	Nichols Ranch ISL Project	Goliad Uranium Project	Jab and Antelope	Moore Ranch	La Palangana	Piñon Ridge Mill	Nichols Project
Production centre classification	Development	Development	Development	Development	Development	Development	Development
Start-up date	NA	NA	NA	2010	NA	2010	NA
Source of ore:							
• Deposit name	Nichols Ranch and Hank	Various	Various	Various	Various	Piñon Ridge Mill	Various
• Deposit type	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone	Sandstone
• Reserves (tU)	NA	NA	NA	NA	NA	NA	NA
• Grade (% U)	NA	NA	NA	NA	NA	NA	NA
Mining operation:							
• Type (OP/UG/ISL)	ISL	ISL	ISL	ISL	ISL	UG	ISL
• Size (t ore/day)	NA	NA	NA	NA	NA	NA	NA
• Average mining recovery (%)	NA	NA	NA	NA	NA	NA	NA
Processing plant (acid/alkaline):							
• Acid/Alkaline	Alkaline	Alkaline	Alkaline	Alkaline	Alkaline	Acid&Alkaline	Alkaline
• Type (IX/SX)	IX	IX	IX	IX	IX	SX	IX
• Size (t ore/day) For ISL (mega or kilolitre/day or litre/hour, specify)	NA	NA	NA	NA	NA	907 TPD	NA
• Average process recovery (%)	NA	NA	NA	NA	NA	NA	NA
Nominal production capacity (tU/year)	NA	NA	770	770	385	NA	NA
Plans for expansion	Development	Development	Development	Development	Development	Development	Development
Other remarks	Developing	Partially permitted and licensed	Developing	Developing	Licensed	Developing	Developing

NA Not available.

Employment in the uranium industry

Employment in the raw materials sector (exploration, mining, milling, and processing) of the United States uranium industry has generally declined each year during the period 1998-2003, but has been increasing since 2004.

In 2008, total employment in the U.S. uranium production industry was 1 563 person-years, an increase of 27% from the 2007 total. Mining employment increased 48%, which was the highest level among the uranium employment sectors. In 2008, uranium exploration, milling and processing employment rose 22%, while reclamation employment had little change from 2007. Eight States (Arizona, Colorado, Nebraska, New Mexico, Texas, Utah, Washington, and Wyoming) accounted for 97% of total employment in the U.S. uranium production industry.

Future production centres

There are a number of production centres that are either in process of permitting and licensing or under development. One is a conventional uranium mill (Pinion Ridge) and nine are ISL plants (Church Rock, Crown Point, Lost Creek Project, La Palangana, Nichols Ranch ISR Project, Goliad ISR Uranium Project, Nichols Project, Jab and Antelope, and Moore Ranch).

Secondary sources of uranium

Secondary supplies of uranium continue to enter the U.S. market from utility inventories and down blending of U.S. and Russian highly enriched uranium. The Uranium Producers of America (a 13-company industry consortium) is encouraging DOE to hold its uranium inventory as a strategic reserve for shortages that could develop in the future and to control its impact on the current market.

Production and/or use of mixed oxide fuels

Mixed oxide fuel production was zero. The use of mixed oxide fuels was 0.1 t natU equivalent in 2005.

Production and/or use of re-enriched tails

The DOE and the Bonneville Power Administration initiated a pilot project to re-enrich 8 500 tonnes of the DOE’s enrichment tails inventory in 2005. The pilot project is anticipated to produce a maximum of 1 900 t natU equivalent over a two-year period for use by the Columbia Generating Station between 2009 and 2017.

Production and/or use of reprocessed uranium

Reprocessed uranium production and use is zero.

ENVIRONMENTAL ACTIVITIES AND SOCIO-CULTURAL ISSUES

The USEPA and various New Mexico state agencies have started studies of the environmental impact of historic uranium mining in the Grants Mineral belt of north western New Mexico, the largest producing district in the United States. Although mill sites in the area have been the subject of extensive past assessment, monitoring, and cleanup efforts, mine sites have had much less attention. The USEPA will initially study those sites where companies still exist that can be shown to have corporate financial responsibility for assessment and cleanup under U.S. law. Other sites with no corporate principal responsible party will be studied later. These legacy impacts include ground and surface water, stream sediment, and soil contamination. Impacted ground waters include shallow surficial aquifers and deeper, drinking-water aquifers used by local residents.

Work by the U.S. Geological Survey (USGS) confirms that groundwater reclamation at ISL uranium mines in Texas has not successfully returned water quality to pre-mining baseline using pump and treat technologies. In each case where a company has been released from ongoing obligations, standards have been relaxed in order to do so. In Wyoming and Nebraska, restoration to "class of use" is required. "Class of use" requirements provide a range of concentrations that are typically less restrictive than meeting baseline levels. Operators have been successful in these states in meeting these requirements.

State, county, and local governments, tribes, and environmental groups have stepped up their monitoring and regulatory activities or active opposition to ongoing, proposed new mining, or expansion of existing uranium mines. The Goliad County (Texas) government and many others continue to oppose development of the Goliad ISL mine as the company moves closer to initiating production. Proposed expansion of the Crow Butte ISL operation in northwest Nebraska is being opposed by agricultural and tribal interests. In late 2008, the Hualapai Tribe banned mining on its lands just south of the Grand Canyon in north western Arizona. In the 1980s, the USGS had conducted uranium exploration research on these tribal lands. In the San Juan basin of New Mexico, several tribes oppose uranium mining under Mt. Taylor, a designated Traditional Cultural Property, and in March 2008 won a temporary stay of exploration for one year. Major uranium deposits occur in underlying host sandstones.

Most states with uranium exploration activity are considering regulatory revisions or new regulations to govern uranium mining. In Colorado, concerns over the development of the Centennial ISL project near Greeley resulted in a bill passed by the state legislature and signed into law May 2008 [11]. This bill "requires all *in situ* leach mining to restore all affected ground water to its premining quality for all water quality parameters that are specifically identified in the baseline site characterisation or in the water quality control commission's regulations. Requires applicants for *in situ* leach mining permits to notify the owners of record of lands within 3 miles of the affected land and to describe in their application at least 5 similar mining operations that did not result in ground water contamination and the applicants' compliance history."

In 2006, the U.S. Nuclear Regulatory Commission (NRC) deferred active regulation on ground-water restoration at ISL sites in Nebraska and Wyoming, pending development of agreements with the two States. The main issue of contention is whether the NRC's primary goal of ground-water restoration to pre-operational (baseline) water quality conditions is achievable or whether secondary standards, allowable under other Federal laws, should apply. The differences in concentration between

the two standards are significant; for example, the primary restoration standard at the Crow Butte property in northwestern Nebraska is 0.092 mg/l uranium compared to a secondary restoration standard of 5 mg/l. Ground-water restoration constitutes about 40% of the decommissioning costs for U.S. ISL mines, based on 1994 data for 14 reclaimed properties.

In January 2006, the USEPA released a review document entitled, "Technologically enhanced naturally occurring radioactive materials from uranium mining, Volume 1- mining and reclamation background". This volume documents the uranium mining component of a larger effort to evaluate hazards associated with technologically enhanced, naturally occurring radioactive materials (TENORM) in several industries such as oil and gas production, phosphate mining, water treatment, and rare earth mining. Volume 2 of this report will evaluate the radiation hazards associated with uranium mine wastes. The main focus of both volumes is uranium mine wastes from underground or open-pit mining, but wastes from ISL mining operations are also included. Of particular concern are the radioactive wastes generated by the above-ground parts of the ISL operations, specifically the radioactivity of waters in the evaporation ponds. The NRC has primary authority over these wastes as "byproduct materials" under U.S. regulations, but the USEPA controls the injection of ISL lixiviant fluids under its Underground Injection Control program. In August 2006, the USEPA released a "uranium location" database for the U.S. compiled from 19 other databases which includes names and location data for about 14 800 properties where uranium presence has been identified. Over 4 000 of these locations are mines with past uranium production.

Mine reclamation

See the 2007 edition of the Red Book for a summary of mine reclamation activities to 2006.

The Nuclear Regulatory Commission continues to evaluate how best to determine ground water restoration costs at depleted ISL mines and the associated bond requirements.

URANIUM REQUIREMENTS

Preliminary uranium requirements for the United States in 2008 are 16 424 tU. In the high case, requirements are projected to increase to 23 464 tU in 2030. In the low case, requirements are projected to peak in 2015 at 19 871 tU and then to begin to decline to about 13 124 tonnes U in 2030.

Supply and procurement strategy

The U.S. allows supply and procurement of uranium production to be driven by market forces with resultant sales and purchases conducted solely in the private sector by firms involved in the uranium mining and nuclear power industries.

NATIONAL POLICIES RELATING TO URANIUM

An Agreement between the Government of the United States and the Government of the Russian Federation Concerning the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons (HEU Purchase Agreement) was signed on 16 October 1992 by the United States and the Russian Federation providing for the blending down of 500 tons of HEU to low-enriched uranium

(LEU) over 20 years. USEC, Inc., the U.S. Government's sole executive agent for implementing the HEU Purchase Agreement, receives deliveries of LEU from the Russian Federation for sale to commercial nuclear power plants. USEC purchases and sells only the enrichment component of this LEU under existing commercial contracts with purchasers of enrichment services. An agreement for the maintenance of a domestic uranium enrichment industry that was signed on 17 June 2002 by the Department of Energy and USEC, Inc. contained conditions for USEC, Inc. to continue as the U.S. Government's sole executive agent for the HEU Purchase Agreement. In June 2006 Russia indicated that the HEU agreement will not be renewed when the initial agreement expires in 2013.

Under a separate agreement under the HEU program, the natural uranium feed component is sold under a commercial arrangement between three western corporations (Cameco, COGEMA, and Nukem) and Techsnabexport of the Russian Federation. Outside of the natural uranium feed component of HEU-derived LEU, imports of uranium from the Russian Federation have been limited by the *Agreement Suspending the Antidumping Duty Investigation on Uranium from the Russian Federation* (Suspension Agreement) signed between the Department of Commerce (DOC) and the Ministry of Atomic Energy of the Russian Federation in 1992. As a result of the Suspension Agreement, DOC suspended antidumping investigations and the Russian Federation agreed to sell uranium to the United States under a quota system whereby Russian imports would have to be matched by an equivalent quantity of newly produced U.S. uranium. A 1994 amendment to the suspension agreement contained language specifying an expected termination date of 31 March 2004. However, the Russian Federation did not request the DOC to undertake a termination review, a requirement for termination. The DOC took the position that the Suspension Agreement had not expired. A second sunset review agreement was subsequently signed on 1 July 2005, maintaining the Suspension Agreement terms during the review.

On 13 February 2002, the DOC issued determinations in antidumping and countervailing duty investigations involving LEU from France, Germany, the Netherlands, and the United Kingdom. The DOC placed an antidumping duty order on LEU imports from France while all four countries were issued countervailing duty orders. The decision resulted in countervailing duties being assessed against France, but not against Germany, the Netherlands, and the United Kingdom. The DOC determinations were challenged at the U.S. Court of International Trade (CIT).

In January 2009, the U.S. Supreme Court reversed a lower court decision and upheld a petition of the United States Enrichment Corporation that the purchase of enrichment services, quantified by separative work units (SWU), should be offered protection under the Tariff Act of 1930. Essentially, the decision supports enforcement of anti-dumping practices of low enriched uranium on the U.S. market.

URANIUM STOCKS

As of 2008, the total inventories (including government, producer, and utility stocks) were 97 892 tU. Of this total, government stocks were 57 031 tU which includes 17 596 tU as concentrates, 12 485 tU of enriched uranium, and 25 950 tU of depleted uranium.

Total commercial inventories (producer and utility stocks) in 2008 amounted to 41 861 tU, a 3.2% decline from the 43 227 tU of inventories held in 2007. In 2006, the total was 40 998 tU. In 2008, over 70% of the commercial inventories, or 31 506 tU, were stocks held by owners and

operators of commercial reactors. This was a slight increase from the 31 243 tU owned by this group at the end of 2007.

In 2008, enriched uranium inventories decreased 8.4% to 8 919 tU from 9 732 tU in 2007. However, natural uranium inventories increased 5% in 2008 to 22 588 tU from 21 512 tU in 2007. These changes are relatively small compared to the near 94% increase in natural uranium inventory that occurred between 2004 and 2006.

Utility stocks held at year-end 2006, a total of 30 081 tU, were 20.8% more than the 24 897 tU held at year-end 2005. The 2006 estimated utility inventories of natural uranium had increased to 21 358 tU from 17 439 tU in 2005, while enriched uranium stocks increased to 8 722 tU in 2006 from 7 458 tU in 2005. These totals include utility-owned stocks reported as inventories at enrichment supplier facilities.

URANIUM PRICES

Owners and operators of U.S. civilian nuclear power reactors purchase uranium under spot contracts and long-term contracts. A spot contract is defined as a one-time delivery of the entire contract to occur within one year of contract execution. A long term contract is defined as one or more deliveries to occur after a year following contract execution.

In 2008, purchases under spot contracts amounted to 3 354 tU which is a 33% increase from the 2 525 tU purchased under spot contracts in 2007.

The weighted-average spot price decreased from USD 229/kgU (USD88.08/lb U_3O_8) in 2007 to USD 174/kgU (USD 66.92/lb U_3O_8) in 2008.

The uranium purchased under long-term contracts in 2008 amounted to 16 457 tU which is only a 2% decrease from the 16 816 tU purchased in 2007. In contrast, the weighted-average price under long term contracts in 2008 was USD108.12/kgU (USD41.58/lb U_3O_8) which is a significant increase — 70% — from the USD 63.57/kgU (USD24.45/lb U_3O_8) price in 2007.

Average U.S. uranium prices, 2000-2008
(USD per kilogram U equivalent)

Year	Spot Contracts	Long-term Contracts
2008	174.06	108.12
2007	229.44	63.57
2006	102.64	42.59
2005	52.10	35.62
2004	38.40	31.82
2003	26.26	28.44
2002	24.15	27.51
2001	20.59	28.49
2000	22.20	30.42

Note: Prices shown are quantity-weighted averages (nominal U.S. dollars) for all primary transactions (domestic- and foreign-origin uranium) for which prices were reported. The transactions can include U.S.-origin as well as foreign-origin uranium.
Source: *Uranium Marketing Annual Report*, 2008, Table 7.

United States of America

Uranium exploration and development expenditures and drilling effort – domestic

Expenses in million USD	2006	2007	2008	2009 (expected)
Industry* exploration expenditures [1]	23.3	50.3	50.2	NA
Government exploration expenditures	0	0	0	NA
Industry* development expenditures [2]	132.0	195.4	196.2	NA
Government development expenditures	0	0	0	NA
Total expenditures	155.3	245.7	246.4	NA
Industry* exploration drilling (m) [3]	250 241	670 560	775 109	NA
Industry* exploration holes drilled [4]	1 473	4 351	5 198	NA
Government exploration drilling (m)	0	0	0	NA
Government exploration holes drilled	0	0	0	NA
Industry* development drilling (m) [5]	576 682	897 941	777 547	NA
Industry* development holes drilled [6]	3 430	4 996	4 157	NA
Government development drilling (m)	0	0	0	NA
Government development holes drilled	0	0	0	NA
Subtotal exploration drilling (m)	250 241	670 560	775 109	NA
Subtotal exploration holes drilled	1 473	4 351	5 198	NA
Subtotal development drilling (m)	576 682	897 941	777 547	NA
Subtotal development holes drilled	3 430	4 996	4 157	NA
Total drilling (m)	826 923	1 568 501	1 552 656	NA
Total holes drilled	4 903	9 347	9 355	NA

* Non-government.
[1] DUPR Table 8, Exploration.
[2] DUPR Table 8, Drilling + Land + Reclamation.
[3] DUPR Table 1, Exploration, Feet (converted into meters using EIA Uranium Industry Annual Appendix D Uranium Conversion Guide).
[4] DUPR Table 1 – Exploration, Number of Holes.
[5] DUPR Table 1 – Development Drilling.
[6] DUPR Table 1 – Development Drilling.

Uranium exploration and development expenditures – non-domestic

Expenses in Million USD	2006	2007	2008	2009 (expected)
Industry* exploration expenditures	NA	NA	NA	NA
Government exploration expenditures	0	0	0	0
Industry* development expenditures	NA	NA	NA	NA
Government development expenditures	0	0	0	0
Total expenditures	NA	NA	NA	NA

* Non-government.

Reasonably Assured Conventional Resources by production method*
(tonnes U)

Production method	**<USD 40/kgU**	**<USD 80/kgU**	**<USD 130/kgU**	**<USD 260/kgU**	**Recovery factor** (%)
Underground mining	0	0	82 863	233 960	NA
Open-pit mining	0	2 472	35 847	125 025	NA
In situ leaching	0	36 592	88 530	110 991	NA
Co-product and by-product	0	0	0	0	NA
Unspecified	0	0	195	2 080	NA
Total	0	39 064	207 435	472 056	

* EIA Uranium Reserves Data.

Reasonably Assured Conventional Resources by processing method
(tonnes U)

Processing method	**<USD 40/kgU**	**<USD 80/kgU**	**<USD 130/kgU**	**<USD 260/kgU**	**Recovery factor** (%)
Conventional	0	39 064	207 435	472 056	NA
In-place leaching*	0	NA	NA	NA	NA
Heap leaching**	0	NA	NA	NA	NA
Total	0	39 064	207 435	472 056	NA

* Also known as stope leaching or block leaching.
** A subset of open-pit and underground mining, since it is used in conjunction with them.

Reasonably Assured Conventional Resources by deposit type*
(tonnes U)

Deposit type	**<USD 40/kgU**	**<USD 80/kgU**	**<USD 130/kgU**	**<USD 260/kgU**
Unconformity-related	0	0	0	0
Sandstone	0	39 064	191 953	401 149
Hematite breccia complex	0	0	0	0
Quartz-pebble conglomerate	0	0	0	0
Vein	0	0	0	0
Intrusive	0	0	W	W
Volcanic and caldera-related	0	0	W	W
Metasomatite	0	0	0	0
Other**	0	0	W	W
Total	0	39 064	207 435	472 056

* EIA Uranium Reserves Data.

** Includes surficial, collapse breccia pipe, phosphorite and other types of deposits, as well as rocks with elevated uranium content. Pegmatite, granites and black shale are not included.

United States of America

Prognosticated Conventional Resources
(tonnes U)[1]

Cost ranges		
<USD 80/kgU	<USD 130/kgU	<USD 260/kgU
839 000	1 273 000	1 237 000

Speculative Conventional Resources
(tonnes U)[1]

Cost ranges		
<USD 80/kgU	<USD 130/kgU	Unassigned
858 000	858 000	482 000

Historical uranium production by production method
(tonnes U in concentrate)[1]

Production method	**Total through end of 2005**	**2006**	**2007**	**2008**	**Total through end of 2008**	**2009** (expected)
Open-pit mining*	NA	0	0	0	0	0
Underground mining*	NA	W	W	W	W	NA
In situ leaching	NA	W	W	W	W	NA
Co-product/by-product	NA	NA	NA	NA	NA	NA
Total	358 596	1 805	1 747	1 492	363 640	NA

* Pre-2006 totals may include uranium recovered by heap and in-place leaching.
[1] 2008 DUPR Table 2.

Ownership of uranium production in 2008[1]

Domestic				**Foreign**				**Totals**	
Government		**Private**		**Government**		**Private**			
[tU]	[%]	[tU]	[%]	[tU]	[%]	[tU]	[%]	[tU]	[%]
		NA	NA			NA	NA	1 492	100

[1] 2008 DUPR, Table 2.

Uranium industry employment at existing production centres
(person-years)

	2006	**2007**	**2008**	**2009** (expected)
Total employment related to existing production centres [1]	600	1 076	1 409	NA
Employment directly related to uranium production [2]	412	701	952	NA

[1] 2008 DUPR Table 6, all sectors except Reclamation.
[2] 2008 DUPR Table 6, all sectors except Exploration and Reclamation.

Short-term production capability
(tonnes U/year)

2010				**2015**				**2020**			
A-I	B-I	A-II	B-II	A-I	B-I	A-II	B-II	A-I	B-I	A-II	B-II
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2025				**2030**				**2035**			
A-I	B-I	A-II	B-II	A-I	B-I	A-II	B-II	A-I	B-I	A-II	B-II
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: If the only available projections are based on USD 130/kgU, please report them but clearly indicate this cost category on the form. Also, please do not leave blanks. For example, if there is no production capability at a particular cost, reply "0". If data on production capability are not available, reply "NA".

Mixed-oxide fuel production and use
(tonnes of natural U equivalent)

Mixed-oxide (MOX) fuels	**Total through end of 2005**	**2006**	**2007**	**2008**	**Total through end of 2008**	**2009** (expected)
Production	0	0	0	NA	NA	NA
Use	NA	0	NA	NA	NA	NA
Number of commercial reactors using MOX	0	0	0	0	0	0

Re-enriched tails production and use
(tonnes of natural U equivalent)[1]

Re-enriched tails	**Total through end of 2005**	**2006**	**2007**	**2008**	**Total through end of 2008**	**2009** (expected)
Production	1 015.3	924.5	NA	NA	NA	NA
Use	0	0	NA	NA	NA	NA

[1] *Uranium 2007: Resources, Production and Demand*, OECD, Paris, 2008.

United States of America

Reprocessed uranium use
(tonnes of natural U equivalent)

Reprocessed uranium	Total through end of 2005	2006	2007	2008	Total through end of 2008	2009 (expected)
Production	0	0	0	NA	NA	NA
Use	0	0	0	NA	NA	NA

Net nuclear electricity generation[1, 2]

	2007	2008
Nuclear electricity generated (TWh net)	806.4[1]	806.2

[1] 2007 Electric Power Annual.
[2] April 2008 Electric Power Monthly.

Installed nuclear generating capacity to 2035
(MWe net)

2008	2009	2010		2015	
		Low	*High*	*Low*	*High*
100 700	101 000	101 200	101 200	104 100	104 100

2020		2025		2030		2035	
Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
105 100	113 800	100 700	120 100	74 300	132 200	NA	NA

[1] *Nuclear Energy Data*, OECD, Paris, 2009.

Annual reactor-related uranium requirements to 2035 (excluding MOX)
(tonnes U)

2008	2009	2010		2015	
		Low	*High*	*Low*	*High*
16 424	16 157	17 528	17 528	19 871	19 871

2020		2025		2030		2035	
Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
18 559	19 951	18 051	21 077	13 124	23 464	NA	NA

Source: Submission from the *Nuclear Energy Data*, OECD, Paris, 2009, which used the 2007 Uranium Marketing Annual Report (UMAR).
2009 value: 2007 UMAR Table 12.

Total uranium stocks
(tonnes natural U-equivalent)

Holder	Natural uranium stocks in concentrates	Enriched uranium stocks	Depleted uranium stocks	Reprocessed uranium stocks	Total
Government[1]	17 596	12 485	25 950	NA	56 031
Producer[2]	NA	NA	NA	NA	10 354
Utility[2]	22 588	8 919	NA	NA	31 507
Total	NA	NA	NA	NA	97 892

Sources:
[1] U.S. Department of Energy, *Excess Uranium Inventory Management Plan*, December 2008.
[2] *Uranium Market Annual Report 2008*, Tables 22 and 23.