Order Code RS20863
Updated September 26, 2006

Methyl Bromide and Stratospheric Ozone Depletion

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Summary

Methyl Bromide (MeBr), a widely used pesticide in agriculture, is regulated for its potential ozone-depleting effects in the Earth's stratosphere. Controls on production, emissions, and trade are mandated internationally under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (the "Protocol") and domestically under Title VI of the U.S. Clean Air Act (CAA). Production for *nonessential* uses was banned December 31, 2004, but the Protocol still regulates post-2004 production for *critical uses*. U.S. agribusinesses have sought Critical Use Exemptions from the Environmental Protection Agency (EPA) to treat commodities with MeBr after the ban. Exemptions are resisted by some Protocol parties and environmental advocates who seek a rapid, definitive ban on production *and* use. Chemical companies maintain they cannot foresee development of effective chemical substitutes for all uses of MeBr in the near term, and agricultural producers indicate they may have to rely on less economical and less effective treatments. Production allowances for MeBr for 2005-2007 were approved under the Protocol and the EPA has approved allocation for registered users. Its production in decline, the EPA has stated it may permit commercial trade of pre-2005 manufactured MeBr. This report is updated as warranted.

Introduction

Methyl Bromide (MeBr) plays an important role in international agriculture because of its effectiveness in killing insects and plant pathogens. MeBr is used extensively for "pre-planting" and "post-harvest" treatment of crops and for "quarantine and pre-shipping (QPS)" treatments of agricultural commodities and containers for international importing and exporting of agricultural goods. In the mid-1980s, a group of atmospheric scientists discovered that gaseous emissions of MeBr rise into the upper atmosphere where the compound is decomposed by sunlight. Bromine oxide (BrO), which is a powerful ozone-depleting substance (ODS), is released as a byproduct.[1] When BrO rises into the stratosphere, in the ozone layer about 9-22 miles above Earth's surface, it is highly chemically

[1] David Fahey, National Oceanic and Atmospheric Administration Aeronomy Lab, reprinted as *Scientific Assessment of Ozone Depletion: 2002*, "Twenty Questions and Answers About the Ozone Layer," U.N. World Meteorological Organization, Geneva, Mar. 2003.

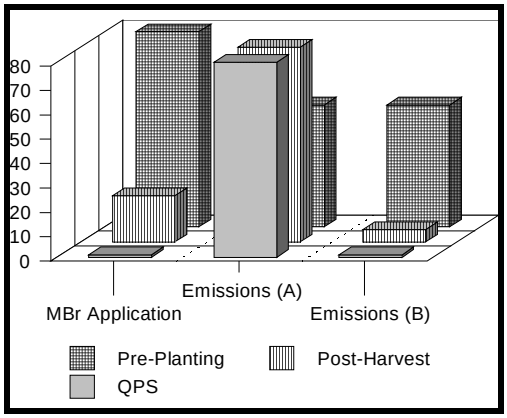
reactive and causes the density of ozone (O_3) there to thin. This thinning increases exposure to different wavelengths of ultraviolet (UV) radiation at the surface. The ozone layer acts to trap most harmful forms of short-wave ultraviolet UV-B from space. Biologists warn that UV-B can be genetically damaging to life forms at the cellular level.[2] Conversely, UV-A radiated from the sun can penetrate the ozone layer and reach the Earth's surface. Although less harmful than UV-B exposure, UV-A can cause some forms of fatal skin cancers and blindness in humans.[3]

MeBr Use and Emissions

As a pesticide, MeBr is proven effective at killing molds, other fungi, insects, and worm (nematode) infestations of crops. In 1991, 66,000 metric tons (Mt) of MeBr were produced globally, and predominantly for agricultural uses.[4] U.S. production of MeBr in 1991 was 25,500 Mt. Total tonnage for 1991 is the baseline from which a subsequent phaseout would be required under the Protocol and the 1990 CAA amendments.

Figure 1 shows that in agricultural applications, typically about 80% of manufactured MeBr is used to fumigate soils prior to planting to prevent root damage. Another 20% is used as a pesticide to treat post-harvested commodities such as fruits, vegetables, dried foodstuffs, stored grains, cut flowers, and timber; to treat wooden crates and shipping palettes; and to fumigate crop storage facilities. About 1% of total use is for quarantine and pre-shipment (QPS) treatments of agricultural imports and exports.

Figure 1. Methyl Bromide Use by Application and Emissions Per Unit Discharged (%)



Source: Produced by CRS using U.N. Environmental Program (UNEP) global baseline data for 1991for tonnage produced and emissions resulting from its various uses.

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[2] Ozone Secretariat, U.N. Environmental Program (UNEP), "Environmental Effects of Ozone Depletion: 1998," *Journal of Photo Chemistry and Photobiology*, vol. 46, nos. 1-3, Oct. 1998. UV radiation is classified by its wavelength.

[3] U.N. World Meteorological Organization (WMO), U.N. Environmental Program (UNEP), *Scientific Assessment of Ozone Depletion: 1994*, Ch. 10, "Methyl Bromide," [Global Ozone Research and Monitoring Project — Report No. 37].

[4] A metric ton (Mt) is about 1.1 U.S. tons.

The profile of emissions differs for various uses. **Figure 1** shows that about 50% of MeBr is emitted into the atmosphere during controlled pre-planting applications.[5] Post-harvest and QPS applications can result in up to 80% of emissions discharged if not conducted in a contained environment (*emissions scenario A*). Contained uses may still account for 5% and 1% losses to the atmosphere, respectively (*emissions scenario B*).

Critical Use Allowances (CUAs)

U.S. agribusinesses and small farm owners alike are concerned about a possible ban on future MeBr production. Many anticipate higher costs of doing agricultural business because of diminishing supplies, lack of viable or economically feasible alternatives for some uses, and possible future restrictions on international trade of U.S. agricultural products if MeBr treatment were to be prohibited. In the spring of 2003, the United States, among 13 countries, petitioned the Protocol parties for Critical Use Allowances (CUAs) to produce MeBr after the then-proposed post-2004 ban of *nonessential* uses.[6]

Critical Stock Allowances (CSAs). CSAs, since approved under the Protocol, would supplement declining production and diminishing sources of MeBr for agricultural use. The EPA and similar agencies on behalf of industrialized countries petitioned Protocol parties for allowances to trade inventories of "pre-phaseout" manufactured MeBr. Only Protocol parties would be permitted CSAs to acquire floor stocks of MeBr from other parties with surpluses. However, acquired floor stocks would still have to remain under an overall annual cap that also includes annual *consumption*, or CUAs for new MeBr produced for domestic use or importation. The cap would be based on a percentage of 1991 global production. When submitting 2007 U.S. Nominations for Critical Use Exemptions (NCUEs) to the Protocol Secretariat, the EPA indicated that future demands for MeBr would likely decline because of the introduction of promising alternatives for some applications in the marketplace.[7] The EPA is now allocating Protocol-approved CUAs for 2007 to registered U.S. MeBr users.[8]

Steps That Have Been Taken To Acquire U.S. CUAs of MeBr

In 1992, methyl bromide (MeBr) production became regulated under the 1987 Montreal Protocol as an ODS whose production phaseout was planned for December 31, 2004. The CAA Amendments of 1990 authorized the EPA to regulate MeBr as a Class-I

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[5] U.S. Department of Agriculture, Agricultural Research Service, "Methyl Bromide, Fumigation," [http://www.ars.usda.gov/Research/docs.htm?docid=10408&page=15], accessed Sept. 15, 2006.

[6] See U.N. Environmental Program Ozone Secretariat, Draft Decision IX/1, "Further Adjustments and Amendments to the Montreal Protocol," and Decision IX/2: "Critical Use Exemptions for Methyl Bromide" (UNEP/OzL.Pro.9/6, June 10, 1997).

[7] EPA, "EPA Methyl Bromide Inventory Shows Downward Trend," *EPA Newsroom*, Sept. 7, 2006.

[8] EPA, Notice of Proposed Rulemaking: The 2007 Critical UseExemption from the Phaseout of Methyl Bromide, July 26, 2006 [Public Hearing, Docket No.: 2005-0538] available at [http://www.epa.gov/ozone/mbr/0721crit.html], accessed Sept. 12, 2006.

ODS. In 1993, a concurrent U.S. phaseout was scheduled under Title VI of the CAA, "Protection of Stratospheric Ozone."[9]

In early 2003, the agricultural community had urged EPA to secure critical use exemptions for MeBr use in a post-2004 regulatory regime. This strategy would be accomplished in three ways: (1) authority granted under the Montreal Protocol, (2) deregulation of approved quantities by the EPA, and (3) introduction of legislation by Congress to codify such actions. However, Protocol parties have not always agreed with U.S. submissions for CUAs, as discussed below. For example, during international negotiations for 2005 growing-season production allowances, some Protocol parties had challenged the EPA's NCUEs. Facing uncertainty about future supplies of MeBr for domestic agricultural businesses, President Bush and some Members of Congress considered U.S. withdrawal from the international treaty.[10] In the wake of such concerns, and some compromises by U.S. delegates, it appeared to some observers that the United States's position gained greater support among Protocol parties during negotiations for its 2006 growing season. For example, they have since authorized U.S. production allowances for the 2007 growing season and the EPA has submitted NCUEs and requests for CUAs for the 2008 and 2009 growing seasons.[11]

Montreal Protocol Regulations and the United States. At the 15th Meeting of Parties (MOP) to the 1987 Montreal Protocol held in November 2003 in Nairobi, Kenya, Department of State (DOS) negotiators debated NCUEs approved by the EPA for the 2005-2006 growing seasons. To provide MeBr for those NCUEs, the EPA had recommended CUAs of 39% of 1991 baseline production levels for 2005 and 34% for 2006, the largest request among industrialized country parties.[12] During the 15th MOP, some delegates questioned whether "for the United States, what was being sought was truly essential."[13] Decisions about final MeBr production allowances for industrialized countries were deferred until the 16th MOP held during November 2004 in Prague, Czech Republic, pending a U.N. Environmental Program (UNEP) Methyl Bromide Technical Options Committee (MBTOC) "needs analysis" to determine global tonnage of MeBr needed for the 2005-2006 growing seasons. At an "Extraordinary MOP" (EMOP/1) held in February 2004 in Montreal, Canada, CUAs for the United States were authorized at

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[9] The EPA listed MeBr as a "Class-I ODS" under the Clean Air Act, when it was determined to have an Ozone Depletion Potential (ODP) of 0.75, i.e., >0.2. (CFCs-11/12 have an ODP of 1.00).

[10] The Senate Committee on Foreign Relations considered Treaty Doc. 106-32, decided Oct. 2, 2002, which restricted international trade of MeBr among Montreal Protocol parties except by exporting and importing licenses approved by Protocol parties. U.S. withdrawal from the treaty would mean a loss of exporting privileges with other industrialized and Article 5(1) parties.

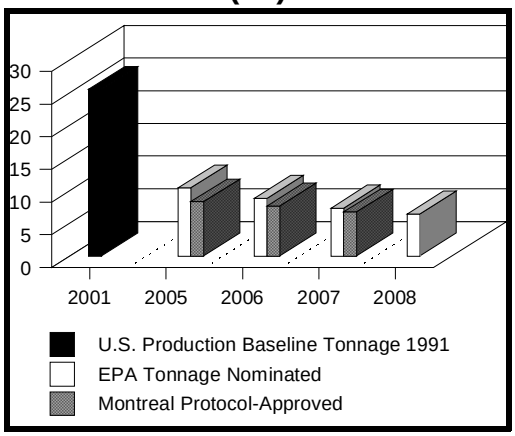
[11] The EPA has posted "Methyl Bromide Critical Use Exemption Process 2008: Methyl Bromide Usage Newer Numerical Index: All Sector Comprehensive," available at [http://www.epa.gov/spdpublc/mbr/CUN2008/2008_BUNNIE_Combined.pdf], accessed Sept. 18, 2006 .

[12] EPA, "U.S. Government Nominates Critical Use Exemptions for Methyl Bromide: Materials Submitted to the Ozone Secretariat of the United Nations, [EPA] *Environmental News*, Feb. 7, 2003, at [http://www.epa.gov/spdpublc/mbr/], accessed Sept. 18, 2006.

[13] Andrew Revkin, "U.S. Seeks Exemptions for Pesticide, European Union Leads Critics as Ozone Talks Open in Nairobi," *New York Times*, Nov. 11, 2003, p. 3.

37.5% of 1991 tonnage level (or 9,562 Mt), which included a 2.5% supplement, or 638 Mt. (See **Figure 2**) The Protocol-approved levels were closer to what the United States sought for 2005; however, U.S. negotiators were warned that CUAs for the 2006 growing season could be reduced to about 27% of 1991 baseline, or 6,900 Mt. An EMOP/2 was held in July 2005 in Montreal, Canada, at which final U.S. CUAs for 2006 were authorized at 32%, or 8,160 Mt. At the 17th MOP, held in Dakar, Senegal, in December 2005, Protocol parties approved U.S. CUAs of 26.3%, or 6,749 Mt, for the 2007 growing season. This represented about 91% of the total allowances requested by the United States. That amount included 5,100 Mt, or 20% of baseline for CUAs (new production imports) and 1,658 Mt, or 6.25% authorized as CSAs. Also, a supplemental 0.03% of U.S. baseline tonnage, or 7.7 Mt, was approved for 2006 uses.

Figure 2. Post-2004 U.S. Methyl Bromide Critical Use Allocations (Mt)



Source: Created by CRS with EPA data, 2006.

EPA Actions. In March 2003, the EPA solicited comments on a proposed rule to establish "exemptions for farmers' critical uses of MeBr."[14] Anticipating that Congress might approve legislation to implement those exemptions, the EPA sought further to ban production of MeBr for *all* uses by December 31, 2014. Reiterating a decision made at EMOP/1, EPA officials stated that this action would send a "clear market signal" to chemical industries and agribusinesses to pursue alternative treatments.[15] In May 2003, the EPA initiated a Nomination for Critical Use Exemptions (NCUEs) of MeBr process and received 57 petitions from commercial growers who foresaw no economically feasible substitute treatments for certain agricultural applications in the near term (by 2007). The petitions were either approved, returned for additional information, or rejected outright.

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[14] EPA, "Process for Exempting Critical Uses of Methyl Bromide ... Proposed Rule," *Federal Register*, v. 69, Aug. 25, 2004, pp. 52366-52402.

[15] UNEP, Mar. 2004, Adoption of Decisions, Decision Ex.I/1. Further adjustments relating to the controlled substance in Annex E, Decision 81, Preamble, "Noting that, by 1 Feb. 2006, non-Article 5 Parties will submit national management strategies that will send a clear signal on the phase-out of critical uses of methyl bromide."

The EPA concluded that about 11,500 Mt of MeBr was needed for the 2005 growing season alone.[16] EPA submitted final NCUEs for 2005 and 2006, and requested CUAs of 17,383 Mt.[17] U.S. CUAs for the 2007 growing season were approved at nearly 26.3% of baseline, about 91% of that requested. On December 13, 2005, the EPA issued a notice of a proposed rulemaking to permit trade of preexisting stocks of MeBr by allocating Critical Stock Allowances (CSAs).[18] In January 2006, the EPA solicited from domestic MeBr users NCUEs for 2008-2009, and requested CUAs of 25% of baseline to the Protocol Secretariat.[19] Also, the EPA announced a *notice-and-comment* period for use of domestic CSAs, and updated a schedule of registered MeBr producers and users to include entities with older floor stocks eligible for trading.[20]

Congressional Legislation. On February 15, 2006, H.R. 1257 was introduced to support continued domestic production of MeBr for CUAs for the 2006-2007 growing seasons, whether or not the United States request would be approved under the Protocol. The bill was referred to the House Committee on Energy and Commerce and later, on March 22, 2006, to the Subcommittee on Energy and Air Quality.[21] No further legislative action occurred. Proponents of H.R. 1257 include agricultural producers who continue to argue for production allowances for MeBr (proportionate with that authorized for developing countries annually through 2015) to trade U.S. commodities on "a level playing field in the global marketplace."[22] Opponents of this bill include many environmental interests who would ban all U.S. uses of MeBr in the near term. Meanwhile, the EPA has considered banning *all* domestic uses of MeBr by 2015.[23]

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[16] BNA, Inc., "Methyl Bromide Production for Export Can Continue Until 2005 under EPA Rule," *Daily Environmental Report*, vol. 82, April 29, 2002, p. A-6.

[17] EPA Notice, "Request for Applications for Essential Use Exemptions to the Production and Import Phaseout of Ozone Depleting Substances Under the Montreal Protocol for the Years 2006 and 2007," *Federal Register*, vol. 69, Oct. 6, 2004, pp. 59918-5990.

[18] EPA, Rules and Regulations: "Protection of Stratospheric Ozone; Process for Exempting Critical Uses of Methyl Bromide for the 2005 Supplemental Request," *Federal Register*, vol. 70, Dec. 13, 2005, p. 73604.

[19] U.S. CSAs were first discussed at a hearing. U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy and Air Quality, *Methyl Bromide: Update on Achieving the Requirements of the Clean Air Act and the Montreal Protocol*, Hearing, [Serial No. 108-118] July 21, 2004 (Washington, DC: GPO, 2004).

[20] EPA, "Fact Sheet - Final Rule to Create a Critical Use Exemption to the Phaseout of Methyl Bromide for the Year 2006,"at [http://www.epa.gov/ozone/mbr/FR2006CUE_Factsheet.html].

[21] U.S. Congress, House Committee on Government Reform, Subcommittee on Energy and Resources, *Methyl Bromide: Are U.S. Interests Being Served by the Critical Use Exemption Process?* Oversight Hearing, [Briefing Memorandum] Feb. 15, 2006, available at [http://reform.house.gov/ER/Hearings/EventSingle.aspx?EventID=39507].

[22] Under the Protocol, Mexico, Brazil, and China (so-called Article 5(1) countries) can use MeBr at agreed upon levels for domestic needs through 2015.

[23] See H.R. 3403 (109th Cong.) and U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy and Air Quality, *Status of Methyl Bromide under the Clean Air Act and the Montreal Protocol*, Hearing [Serial No. 108-55], June 3, 2003 (Washington, DC, GPO: 2004) available at [http://energycommerce.house.gov], accessed Sept. 18, 2006.