ENVIRONMENTAL PROTECTION AGENCY

[FRL–6974–2]

RIN 2060–AI72

Hazardous Air Pollutants List

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of denial of a petition to delist methanol from the list of hazardous air pollutants.

SUMMARY: This notice announces EPA's decision to deny a petition from the American Forest and Paper Association (AF&PA) requesting that EPA remove the chemical methanol (CAS No. 67–56–1) from the list of hazardous air pollutants (HAP) in section 112(b)(1) of the Clean Air Act (CAA). Petitions to delist a substance from the HAP list are permitted under section 112(b)(3) of the CAA.

The EPA is denying the petition because we cannot conclude that there are adequate data to determine that emissions of methanol may not reasonably be anticipated to cause any adverse effects to human health. This decision is based on our examination of the available information concerning the potential hazards of and projected exposures to methanol emissions. We have determined that the appropriate health-based criterion for evaluating the risks associated with methanol emissions is the range of 0.3 to 30 milligrams per cubic meter (mg/m^3). To demonstrate that exposures are reasonably anticipated not to result in any adverse effects to humans, including sensitive subpopulations, the estimated 24-hour exposure concentrations would need to be 0.3 mg/m^3 or lower. Our review of the petitioner's exposure assessment leads us to conclude that maximum 24-hour exposures could be in the range of 2 to 7 mg/m^3, which is well above 0.3 mg/m^3. Because the criteria for removing a substance from the list of HAP have not been met, EPA must deny the petition. Moreover, any future petition for the removal of methanol from the list of HAP will be denied as a matter of law unless such future petition is accompanied by substantial new information or analysis.

FOR FURTHER INFORMATION CONTACT: Mr. Chuck French, Emission Standards Division (MD–13), Office of Air Quality Planning and Standards, U.S. EPA, Research Triangle Park, North Carolina 27711, telephone (919) 541–0467, electronic mail address: *french.chuck@epa.gov.*

SUPPLEMENTARY INFORMATION: *Docket.* The EPA has compiled a docket, No. A–99–23, that contains documents relevant to this notice of denial. The docket reflects the full administrative record for this action and includes all the information relied upon by the EPA in the development of this notice of denial. The docket is a dynamic file because material is added throughout the decision process. The docketing system is intended to allow members of the public and industries to readily identify and locate documents. It is available for public review and copying between 8:30 a.m. and 5:30 p.m., Monday through Friday (except for Federal holidays) at the following address: U.S. EPA, Air and Radiation Docket and Information Center (6102), 401 M Street, SW, Washington, DC 20460. The docket is located at the above address in Room M–1500, Waterside Mall (ground floor). Alternatively, copies of the docket index, as well as individual items contained within the docket, may be mailed on request from the Air Docket by calling (202) 260–7548 or (202) 260–7549. A reasonable fee may be charged for copying docket materials.

World Wide Web (WWW)

In addition to being available in the docket, an electronic copy of this notice will be available on the WWW through the Technology Transfer Network (TTN). Following signature, a copy of the notice will be posted on the TTN's policy and guidance page at http://www.epa.gov/ttn/oarpg. The TTN provides information and technology exchange in various areas of air pollution control. If more information regarding the TTN is needed, call the TTN HELP line at (919) 541–5384.

Judicial Review

Today's final action denying AF&PA's petition to remove methanol from the list of HAP constitutes an order under section 112 of the CAA that is based on a determination of nationwide scope and effect. Pursuant to section 307(b)(1) of the CAA (42 U.S.C. 7607(b)(1)), a petition for review of this action may be filed only in the United States Court of Appeals for the District of Columbia, and must be filed within 60 days from the date of publication of this final action.

Outline

This notice is organized as follows:

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E. Risk Characterization
F. Other Elements of the Petition
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I. Background

Section 112 of the CAA contains a mandate for EPA to evaluate and control emissions of HAP. Section 112(b)(1) presents the list of HAP which includes a list of specific chemical compounds and compound classes used to identify source categories for which EPA must promulgate emissions standards. The EPA is required to periodically review the list of HAP and, where appropriate, revise this list by rule. In addition, under section 112(b)(3), any person may petition the EPA to modify the list by adding or deleting one or more substances. A petition to remove a HAP from the HAP list must demonstrate that there are adequate data on the health and environmental effects of the substance to determine that emissions, ambient concentrations, bioaccumulation, or deposition of the substance may not reasonably be anticipated to cause any adverse effects to human health or the environment. The petitioner must provide a detailed evaluation of the available data concerning the substance's potential adverse health and environmental effects and characterize the potential human and environmental exposures resulting from emissions of the substance.

On March 8, 1996, the AF&PA submitted a petition to delete the chemical methanol (methyl alcohol, methyl hydroxide, wood alcohol, wood spirit) (CAS No. 67–56–1) from the HAP list. Following receipt of the petition, we conducted a preliminary evaluation to determine whether the petition was complete according to Agency criteria. To be deemed complete, a petition must consider all relevant available health and environmental effects data. A petition must also provide comprehensive emissions data, including peak and annual average emissions for each source or for a representative selection of sources, and must estimate the resultant exposures of people living in the vicinity of the sources. In addition, a petition must address the environmental impacts associated with emissions to the ambient air and impacts associated with the subsequent cross-media transport of those emissions. The petitioner submitted several supplements to the petition between March 1997 through February 1999 to address deficiencies

identified during the completeness review. We determined the petition to delete methanol to be complete, and we published a notice of receipt of a complete petition in the **Federal Register** on July 19, 1999 (64 FR 38668). We also requested comment on the petition, including a request for additional data relevant to EPA's consideration of the petition.[1]

II. Criteria for Delisting

Section 112(b)(2) of the CAA requires the EPA to make periodic revisions to the initial list of HAP, outlines the criteria to be applied in deciding whether to add or delete a substance from the list and identifies pollutants that should be listed as:

> * * * pollutants which present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects (including, but not limited to, substances which are known to be, or may reasonably be anticipated to be, carcinogenic, mutagenic, teratogenic, neurotoxic, which cause reproductive dysfunction, or which are acutely or chronically toxic) or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or otherwise * * * .

To assist the EPA in making judgments about whether a pollutant causes adverse environmental effects, section 112(a)(7) defines an ''adverse environmental effect'' as:

> * * * any significant and widespread adverse effect, which may reasonably be anticipated, to wildlife, aquatic life, or other natural resources, including adverse impacts on populations of endangered or threatened species or significant degradation of environmental quality over broad areas.

Section 112(b)(3) establishes general requirements for petitioning the Agency to modify the HAP list by adding or deleting a substance. Although the Administrator may add or delete a substance on his or her own initiative, when EPA receives a petition to add or delete a substance from the list, the burden is on the petitioner to include sufficient information to support the request under the substantive criteria set forth in section 112(b)(3)(B) and (C). The statute directs the Administrator to either grant or deny a petition within 18 months of receipt. If the Administrator decides to grant a petition, the Agency publishes a written explanation of the Administrator's decision, along with a proposed rule to add or delete the substance. The proposed rule is open to public comment and public hearing and all additional substantive information received is considered prior to the issuance of a final rule. If the Administrator decides to deny the petition, the Agency publishes a notice of its denial, along with a written explanation of the basis for denial. A decision to deny a petition is a final Agency action subject to review in the DC Circuit Court of Appeals under section 307(b) of the CAA.

To promulgate a final rule deleting a substance from the HAP list, section 112(b)(3)(C) provides that the Administrator must determine that:

> * * * there is adequate data on the health and environmental effects of the substance to determine that emissions, ambient concentrations, bioaccumulation or deposition of the substance may not reasonably be anticipated to cause any adverse effects to the human health or adverse environmental effects.

We do not interpret section 112(b)(3)(C) to require absolute certainty that a pollutant will not cause adverse effects on human health or the environment before it may be deleted from the list. The use of the terms ''adequate'' and ''reasonably'' indicate that the Agency must weigh the potential uncertainties and their likely significance. Uncertainties concerning the risks of adverse health or environmental effects may be mitigated if we can determine that projected exposures are sufficiently low to provide reasonable assurance that such adverse effects will not occur. Similarly, uncertainties concerning the magnitude of projected exposures may be mitigated if we can determine that the levels which might cause adverse health or environmental effects are sufficiently high to provide reasonable assurance that exposures will not reach harmful levels. However, the burden remains on a petitioner to demonstrate that the available data support an affirmative determination that emissions of a substance may not be reasonably anticipated to result in adverse effects on human health or the environment (that is, EPA will not remove a substance from the list of HAP based merely on the inability to conclude that emissions of the substance will cause adverse effects on human health or the environment). As a part of the requisite demonstration, a petitioner must resolve any critical uncertainties associated with missing information. We will not grant a petition to delist a substance if there are major uncertainties which need to be addressed before we would have sufficient information to make the requisite determination.

A denial of a petition may take one of two forms, it may either be a denial with prejudice, in which case any future petition will be denied as a matter of law unless it is accompanied by substantial new evidence; or it may be a denial without prejudice, in which case EPA will consider future petitions without the presentation of substantial new evidence. The EPA will issue a denial with prejudice when there are adequate data available which lead EPA to conclude that emissions of a substance can be anticipated to result in adverse effects to human health or the environment; or when EPA concludes that the available evidence cannot support a determination that a substance may not reasonably be anticipated to result in adverse effects to human health or the environment and, therefore, that substantial new information or analyses would be necessary to allow the Agency to make such a determination. Today's denial is a denial with prejudice because EPA concludes that the available evidence (the data and analysis upon which the petitioner relies) cannot support a determination that methanol emissions may not reasonably be anticipated to result in adverse effects to human health or the environment.[2]

III. Evaluation of the Petition and Subsequent Material

A. Submission of the Petition and Subsequent Material

The original petition submitted on March 6, 1996, and the supplemental materials provided by AF&PA up through February 18, 1999, contain information on chemical characteristics

[1] We received eighteen submissions in response to the request for comments concerning the methanol petition. The submissions are in the docket. Fifteen of these were from various industry groups and supported the removal of methanol from the HAP list. The other three comments received were from States opposed to the petition. We considered all comments during our technical review.

[2] A denial with prejudice serves a vital administrative purpose. It prevents the endless re-submission of essentially identical petitions (with only peripheral or trivial changes) in the wake of an EPA decision on the merits of a petition. Thereby, once EPA has denied a petition to delist based on a full consideration of the merits, any future petition to remove the same chemical will not trigger another full evaluation of the merits unless it includes substantial data or analyses that were not present in the earlier petition. Conversely, EPA may issue a denial without prejudice, for example, where there has not been a complete examination of the merits of a petition, and where, therefore, EPA has not reached a decision on the petition that is based on a robust evaluation of the underlying technical data and analyses. For example, where a petition obviously lacks some element necessary for EPA to properly evaluate the petition, EPA may deny such petition without prejudice and allow the petitioner to re-submit the petition with the necessary additional information without a determination that the additional information constitutes substantial new data or analysis. See, e.g., Notice of Denial, January 13, 1993 (58 FR 4164) (denying without prejudice a petition to remove five glycol ethers from the list of HAP).

of methanol, emissions sources, fate and transport, exposure, toxicity, atmospheric transformation, and environmental impacts. We determined that these materials constituted a complete petition, and that AF&PA's petition was complete as of February 18, 1999. In October 1999, during the technical review of the complete petition, a significant new study, sponsored by the Health Effects Institute (HEI), titled ''Reproductive and Offspring Developmental Effects Following Maternal Inhalation Exposure to Methanol in Nonhuman Primates'' (Burbacher, et al., 1999) (hereinafter the ''Burbacher Primate Study''), was published in the HEI Research Report Number 89 (i.e., HEI Report) along with commentary by the HEI Health Review Committee. Because of the direct relevance of this information, we considered the Burbacher Primate Study, as well as the entire HEI Report in our technical review. Moreover, the petitioner provided EPA with additional materials on November 13, 1999 and July 3, 2000, in support of the original petition. These materials provided comments, opinions and interpretations regarding the data presented in the Burbacher Primate Study.

B. Uses, Sources, and Chemical Characteristics of Methanol

Methanol is used as a solvent in various adhesives, cleaners, and inks. Other sources include wood pulping; combustion of biomass, refuse, and plastics; and manufacture of petroleum, charcoal, and plastics. The petition describes methanol as a simple alcohol containing one carbon atom. Methanol is reported to occur naturally as an emission resulting from metabolism in vegetation, microorganisms, and insects. It has also been found in volcanic gases. Methanol is produced during the natural biodegradation of organic wastes of all kinds, including sewage and wastewater sludge, by microorganisms normally found in the environment.

C. Methanol Health Effects Analysis

In the materials submitted between March 1996 and February 1999, the petitioner presents an evaluation of the available health effects data, including human and laboratory animal studies. The petition states that there is a significant amount of data on methanol toxicity to both animals and humans. Most of the data relate to acute exposure through ingestion and, to a lesser degree, acute inhalation exposures, although there are also numerous studies of sub-chronic and chronic inhalation exposures at low concentrations. The petition describes four studies of exposed human workers and several studies of mice, rats, dogs, and nonhuman primates.

Based on negative results in mutagenicity testing, the petition asserts that methanol is not likely to be genotoxic. Moreover, based on testing in mice for 18 months and rats for 24 months, and on an understanding of methanol's metabolism and likely mode of action, the petition states that there is no evidence to indicate, nor reason to believe, that methanol is carcinogenic.

The petitioner proposes that the primary adverse effects of methanol that occur after acute high exposures are metabolic acidosis and central nervous system effects including eye damage. These acute toxic effects result from saturation of a metabolic pathway that results in accumulation of formate. Other effects reported in four epidemiology studies of clerical workers exposed to high concentrations of methanol include headaches, nausea, and blurred vision.

The petition states that there are no reports of reproductive or developmental effects in humans due to methanol exposures. However, laboratory inhalation studies have shown reproductive and developmental effects in animals exposed to relatively high concentrations. The petitioner determined that the most sensitive toxic endpoint from the available studies was developmental effects (ossification of cervical ribs) in mice exposed in the womb as identified in a study by Rogers, *et al.* 1993. In that study, pregnant mice were exposed by inhalation to methanol concentrations ranging from 1,300 to 19,500 mg/m^3 for 7 hours per day on days 6–15 of pregnancy. The no-observable-adverse-effect-level (NOAEL) reported in the Rogers mouse study is 1,300 mg/m^3.

No EPA inhalation reference concentrations (RfC) are currently available for methanol to assess the potential for adverse human health effects due to inhalation exposure. Therefore, the petitioner conducted a dose-response assessment with the available toxicity data to derive a similar health-based criterion called a ''safe exposure level'' (SEL). The petitioner asserts that exposures at or below the SEL can be expected to produce no adverse human health effects from lifetime inhalation exposures. The SEL was derived based on an approach similar to the EPA RfC methodology, which incorporated the identification of the most sensitive toxic endpoint from a critical study and a corresponding NOAEL, an adjustment of the NOAEL from an animal exposure concentration to an equivalent human exposure concentration, and application of selected uncertainty factors.

The petitioner identified the Rogers mouse study as the critical study with a NOAEL of 1,300 mg/m^3. To determine the human-equivalent concentration (HEC) of methanol, the petitioner used this NOAEL and converted it to a human-equivalent NOAEL by multiplying the animal species NOAEL by the ratio of a breathing rate divided by the body weight of the animal species to the same parameters for humans, which resulted in a HEC of 8,300 mg/m^3. Application of a standard 10-fold uncertainty factor for interspecies extrapolation and another standard 10-fold uncertainty factor for individual variation in the population results in a calculated SEL of 83 mg/m^3.

To support the claim that the SEL is safe, the petitioner presents information on background body levels in humans. Methanol is found in the body without exogenous exposures to the chemical in ambient air. This background body concentration, which is approximately 1–2 milligrams/liter (mg/l) methanol in blood, is attributed to both natural metabolic processes and dietary sources (such as fresh fruit and vegetables, fermented beverages, and Aspartame-sweetened diet beverages). The petitioner predicts, using pharmacokinetic (PK) models, that steady state blood methanol levels in humans exposed to 83 mg/m^3 are similar to typical measured background levels in humans.

The EPA is unconvinced by the petitioner's human health effects assessment and the proposed SEL. We conclude that the petitioner's SEL is not an appropriate criterion for decision making for this petition. In fact, as discussed later in today's notice, we have derived a range for a health-based decision criterion that includes values that are significantly lower than the petitioner's SEL. Our concerns about the health effects assessment and the SEL, which are explained below, are the basis for our denial of the petition to remove methanol from the HAP list.

We agree with the petitioner that the available evidence does not suggest that methanol is genotoxic or that it is likely to be carcinogenic. We agree that documented adverse effects of methanol after acute high exposures include metabolic acidosis and central nervous system effects, including eye damage. We also agree that developmental effects could be one of the most, or the most, sensitive endpoint and could occur after acute or chronic exposures. However, as shown in the Burbacher Primate Study, reproductive effects could also be

considered among the most sensitive endpoints.

The petitioner derived its proposed SEL using the available information in much the same way that EPA might use this information to derive an RfC. A specified NOAEL from a critical study (Rogers et al.) was identified and adjusted to an HEC yielding a NOAEL(HEC) of 8,300 mg/m^3. This value was then divided by uncertainty factors of 10-fold each for interspecies extrapolation and for intraspecies variability to produce an SEL of 83 mg/m^3.

In response to suggestions by EPA scientists in 1996, the petitioner made no duration adjustment of the NOAEL in calculating the HEC. However, the question of whether and how developmental effects data should be duration-adjusted has been a matter of ongoing discussion within the Agency and the broader scientific community. Although the specific protocol for acceptable duration-adjustment remains to be more fully developed, we believe the current state of scientific understanding differs from the understanding in 1996 and tends to support incorporating duration-adjustment in the petitioner's derivation of the SEL for methanol. In order to be public-health protective, since either the chemical or its damage may accumulate, current risk assessment procedures adjust for duration of exposure, i.e., adjust short-term inhalation exposures associated with adverse effects by a concentration times time (''c × t'') factor in order to derive health risk estimates for longer-term exposures. To duration-adjust the NOAEL, the concentration would be multiplied by an additional factor of 7/24 hrs/day (because Rogers et al. exposed the mice for 7 hrs/day). In this case, the resulting SEL would be 24 mg/m^3.

We also note that the petitioner's SEL analysis did not employ available techniques such as the benchmark dose (BMD) method to utilize more of the data from Rogers et al. to characterize the dose-response relationship. Current EPA practice in deriving RfC is to apply the BMD method whenever the data are appropriate for its application. This method has been used relatively recently in health assessments for several pollutants (such as methylmercury, carbon disulfide, antimony trioxide, manganese, and diesel exhaust), which are available in the EPA's Integrated Risk Information System (IRIS). We did not require the petitioner to specifically include a BMD approach as part of the completeness review. However, we suggested to the petitioner (in a letter dated September 30, 1998) that the health hazard assessment could be strengthened by utilizing more than one method to derive the SEL. For example, we stated that using the EPA's BMD method would provide a useful comparison to the petitioner's approach.

A BMD analysis was included in the published paper by Rogers et al. and yielded 305 parts per million (ppm) (approximately 400 mg/m^3) as the BMDL–5 (lower 95 percent confidence limit on the maximum likelihood estimate for a 5 percent added risk for the incidence of cervical ribs). We have conducted additional but still preliminary BMD analyses on data from the study by Rogers et al. using various mathematical models in conjunction with the EPA BMD software under development. By our initial calculations, a BMDL–5 for excess risk of cervical ribs could fall in a range from roughly 195 to 325 mg/m^3. The difference between this range of estimates and the value reported by Rogers et al. is due in part to differences in the calculation of added risk versus excess risk, as well as other minor differences in the treatment of the data. If the BMDL–5 value we have calculated were used instead of the NOAEL in the petitioner's derivation of their SEL, the resulting SEL would be roughly 4–7 fold lower, or on the order of 10–20 mg/m3, assuming that the BMDL–5 is used as an alternative for a NOAEL and the same uncertainty factors are applied. Incorporating the duration-adjustment noted above would yield an SEL on the order of 4–6 mg/m^3.

Also in response to our previous suggestions, the petitioner provided a supplementary analysis in August 1997 of PK data for experimental animals exposed to methanol by inhalation. This analysis involved dosimetric adjustments of the exposure concentrations based on either a default value or data from various publications (Perkins et al., 1995; Horton et al., 1992). The petitioner concluded that the PK data supported their use of the default dosimetric adjustment and indicated that the default value provided a conservative (protective) SEL. A more refined model of methanol inhalation pharmacokinetics (Fisher et al., 1999) has recently become available. That model appears to suggest that relative respiratory uptake in monkeys may be less than previously understood. To the extent that respiratory uptake in humans approximates that of nonhuman primates, this finding may tend to support the petitioner's claim that the default dosimetric adjustment is conservative in the case of the mouse data. However, the default adjustment would still be used and, thus, no change in the SEL is implied on this basis.

In October 1999, several months after the petition was determined to be complete, the Burbacher Primate Study was released by the HEI. This study was funded through the HEI and published after a thorough review by an ad hoc peer review panel, as well as the standing HEI Health Review Committee, both of which comprised well-recognized, independent, scientific experts.

In that study, Burbacher et al. exposed 11–12 adult female rhesus macaque monkeys per group to 0, 200, 600, or 1,800 ppm (0, 260, 780, 2,300 mg/m^3) methanol vapors for 2.5 hours/day, 7 days/week, prior to and after conception, but terminating before parturition. The investigators measured reproductive performance of the mothers and also evaluated the offspring at regular intervals during the first 9 months of life to assess their growth and neurobehavioral development. They also conducted PK studies to determine whether methanol disposition (absorption, distribution, metabolism, and excretion) was altered by repeated methanol exposures.

No significant effects in reproductive function distinguished the methanol-exposed adult groups from the control group, except for a statistically significant ($p = 0.03$) decrease in the duration of pregnancy. Pregnancies resulting in live births were about 6–8 days (5 percent) shorter in the methanol-exposed groups. However, as described below, there are uncertainties and ongoing debate as to whether this decrease is related to methanol exposures.

With regard to effects on the offspring, the investigators evaluated growth measures and various neurological functions. The only significant effect in growth measures was a severe wasting syndrome that became evident in two female offspring from the 1800 ppm group at 1–1.5 years of age. Again, as described below, there is uncertainty and debate as to whether this wasting was due to methanol exposure or some other factors.

Neurobehavioral development was evaluated in several ways, including clinical assessments, as well as objective tests of sensorimotor development, visual acuity, memory, and social interaction. Two effects were reported. First, a concentration-related delay in sensorimotor development was measured in male offspring during the first month of life. As reflected in the infant's ability to reach for, grasp, and retrieve a small object, sensorimotor development was delayed by

approximately 9 days for the 200 ppm group to more than 2 weeks for the 600 and 1,800 ppm groups. In addition, the offspring prenatally exposed to methanol did not perform as well as controls on the Fagan Test of Infant Intelligence. The Fagan test has been shown to reflect information processing, attention, and visual memory function in human and nonhuman primate infants and has been proven to be sensitive to the effects of prenatal exposure to toxic chemicals such as methylmercury and polychlorinated biphenyls (PCB), as well as correlating well with IQ measures in children at later ages. The test is based on the ability of an infant to recognize previously seen visual stimuli and distinguish them from novel stimuli. A higher level of cognitive function is implied by a tendency to attend preferentially to a novel stimulus. All three groups of prenatally methanol-exposed infants failed to show a significant preference for novel social stimuli (pictures of monkey faces), whereas the control group did show a significant novelty preference as expected. However, performance was not concentration-related, nor was there a significant overall methanol effect across the four groups.

As stated by HEI, ''the investigators reported no systematic effects of prenatal methanol exposure on most of the measures used to test infant neurobehavioral development.'' Moreover, HEI concludes that ''overall, the results provide no evidence of a robust effect of prenatal methanol exposure on the neurobehavioral development of nonhuman primate infants.''

The petitioner submitted comments on the Burbacher Primate Study in November 1999 and July 2000. In the November 1999 submittal, the petitioner stated that ''it is doubtful whether this decrease in gestation period was related to methanol exposure, as there was no dose-response and no apparent differences in the offspring, in terms of body weight or other physical parameters, between those animals exposed *in utero* and the control group. The reduced duration of pregnancy moreover was within the normal range of gestation periods for this species.'' The petitioner also stressed that there was no evidence that the wasting syndrome observed in two offspring was related to methanol exposure. In addition, the petitioner asserted that the study provides no reliable evidence of an adverse effect of prenatal exposure on the neurobehavioral development of the offspring. Furthermore, the petitioner stressed that the Burbacher Primate Study shows that repeated exposure to concentrations of methanol vapors as high as 1800 ppm does not result in accumulation of blood formate above baseline levels. The petitioner concludes that overall, the PK data provide further support for the SEL of 83 mg/m[3].

The petitioner submitted additional comments on the Burbacher Primate Study in July 2000. The EPA generally considers substantive augmentation of an already complete petition late in the decision-making process to be a petition amendment that requires withdrawal and re-submission of the petition, thereby restarting the statutory clock for Agency decision making.[3] However, in this case the petitioner requested that EPA delay its decision on the petition until after conducting a preliminary review of the petitioner's new submission. The EPA agreed to do so, and to reserve judgement (pending this review) as to whether the content of this submission amounted to substantive new information or analysis. To the extent that this material might constitute a substantive augmentation of the petition, we are not obligated to consider it in connection with our decision on the current petition. Nevertheless, because we believe that the arguments and comments presented in the new submission are merely extensions of the arguments and comments previously offered by the petitioner or presented in the HEI Report, we have fully considered all of the petitioner's submissions as a part of today's decision.

In the July 2000 submittal, the petitioner presented the opinions and comments of five expert scientists[4] who had conducted independent reviews of the HEI Report. The petitioner summarized the comments of the experts stating that ''those experts express strong reservations against drawing any conclusions about methanol reproductive or developmental effects from the HEI Report, both because the statistical analyses performed presented a likelihood that some differences between controls and exposed groups would occur just by chance, and because the observed effects were inconsistent with the other results of the study. In particular, the lack of any clear dose-response relationship; the inconsistencies between results for different cohorts, sexes, or tests of related functions; and the fact that some of the effects identified were associated with only a small increase in maternal blood methanol all caused AF&PA experts to conclude that the reported effects on gestation period and neurobehavioral development are unlikely to be real.'' The detailed comments from the petitioner and experts are presented in the docket.

The data from the 1999 Burbacher Primate Study complement and extend the current understanding of methanol health effects. As the HEI Health Review Committee noted in its commentary, the experiments in this study were ''well designed and executed with appropriate quality control and quality assurance procedures. Thus, one can have confidence in the data.'' Moreover, because nonhuman primates are the best surrogate to study methanol toxicity and neurobehavioral development in humans, the results are highly relevant for risk assessment. We agree with these statements by the HEI Health Review Committee about the relevance of the Burbacher Primate Study for risk assessments, and while it is evident that the results of the study are subject to multiple interpretation, we believe that, absent additional data, the observed effects must be considered in any risk assessment of methanol emissions.

As mentioned previously in today's notice, there was a statistically significant ($p = 0.03$) decrease in the duration of pregnancy. Although no other adverse reproductive outcomes (*e.g.,* reduced fertility, spontaneous abortion, reduced neonatal size or weight) were statistically significant, it is noteworthy that cesarian sections (C-sections) were performed only on methanol-exposed females, that is, two C-sections per group for a total of six in the methanol-exposed groups versus no C-sections in the controls. These operations were performed in response to signs of difficulty in the pregnancy (*e.g.,* vaginal bleeding) and, thus, serve as supporting evidence of reproductive dysfunction in the methanol-exposed females.

The HEI Health Review Committee stated that the pregnancy durations in both control and methanol-exposed groups were within the norms of other colonies. However, the reason for having a concurrent control is to provide a more direct comparison with

[3] This interpretation is necessary in order to avoid situations where EPA might otherwise have insufficient time to adequately review and analyze substantive information submitted by a petitioner at or near the end of the statutory time period. See CAA section 112(b)(3)(D). However, it is entirely within a petitioner's discretion to direct EPA to either proceed with a determination without looking at such material, or to re-submit the petition with the new substantive material.

[4] The five experts were as follows: David G. Hoel, PhD., from Medical University of Texas; Anthony R. Scialli, M.D., from Georgetown University; Thomas B. Starr, PhD., from TBS Associates; and Alice F. Tarantal, PhD., from University of California, Davis.

the experimentally treated animals. Monkeys in other colonies were not necessarily subjected to the same conditions or type of handling that existed in the Burbacher Primate Study. Moreover, it is not clear what ''norms'' have been established or how they should be applied in this case. By analogy, a reduction of IQ from 102 to 98 is a small percentage change around a norm of 100, but if this reflects a population average change, the reduction is quite meaningful. Although no one should generalize an effect size from the small number of monkeys in the Burbacher Primate Study to an entire population, neither should the difference between methanol-exposed and control groups be dismissed as inconsequential because it is ''within the norms.''

As to the petitioner's comment that ''vaginal bleeding 1–4 days prior to delivery of live born-healthy infants is not that unusual in this species, so vaginal bleeding does not necessarily imply an at risk fetus requiring cesarian-section delivery,'' it is noteworthy that the control animals did not have such bleeding. No evidence was given by AF&PA to counter the determination of the veterinarians conducting the study that placental separation was occurring in the methanol-treated animals requiring C-section. While the exposed animals that received C-sections were excluded from the analysis regarding the determination of gestation length, this finding, in conjunction with the shortened gestation length of the other methanol-exposed animals, would support the notion of problems with maintenance of pregnancy. Overall, this is not a trivial outcome on duration of pregnancy and may have adverse consequences on the offspring, even in the absence of frank effects. Furthermore, the lack of an increasing dose-related trend in the pregnancy duration data does not nullify the fact that all of the methanol-exposed groups, both when tested collectively and separately against controls, had significantly shorter pregnancy lengths. In summary, the reduction in pregnancy duration observed in this study appears to constitute an adverse reproductive effect associated with methanol vapor concentrations of 200–1800 ppm.

As mentioned above, the only significant effect in growth measures was a severe wasting syndrome that became evident in two female offspring from the 1800 ppm group at 1–1.5 years of age. In both cases, the animals ate normally but lost weight and failed to grow normally, which led to progressive weakness and ultimately their having to be euthanized. No infectious agent or pathogenic factor could be identified. Thus, it appears that a highly significant toxicological effect on growth could be attributed to prenatal methanol exposure at 1800 ppm.

As noted previously in today's notice, two neurobehavioral development effects were found. A concentration-related delay in sensorimotor development was measured in male offspring during the first month of life. Also, the offspring prenatally exposed to methanol did not perform as well as controls on the Fagan Test of Infant Intelligence. The HEI Health Review Committee recommended that these neurobehavioral findings should be interpreted ''cautiously'' for various reasons. The first reason for caution was the small number of animals in each group. In our view, however, the low number of animals presumably implies less statistical power to detect an effect, not necessarily that an apparent effect was more likely due to chance. On this basis, we find the results to be no less credible and perhaps even more credible, if anything. The second reason for caution was that no adjustment was made for multiple comparisons. However, it is not clear to us, nor apparently to the statisticians involved in either analyzing or reviewing these data (otherwise, an adjustment would have been made), what would be the most appropriate adjustment to make in this instance, because the concept of having a battery of tests is to evaluate different domains of function that are presumably somewhat, if not entirely, independent of each other. The third reason for caution was that ''no dose response was generally noted'' in connection with the observed effects. Actually, for the sensorimotor effects, we note that a concentration-related trend was evident in the data for males and for both sexes combined (although not for the females alone); the basis for the gender-specific nature of this finding is unknown, but other developmental neurobehavioral effects, including the developmental toxicity effects of ethanol (Osborn et al., 1998; Rudeen, 1992), are known to differ between sexes and, thus, cannot be dismissed as necessarily chance occurrences. As for the lack of a concentration-related trend in the Fagan test results, this could well reflect the inherent constraints of the measured endpoint, which typically is an approximately 60 percent response preference for novel stimuli vis-a-vis a 50 percent chance response level. If the control group performs at the 60 percent level and the most impaired subjects perform at approximately the 50 percent chance level (worse than chance performance would not be expected), the range over which a concentration-response relationship can be expressed is necessarily quite limited and, thus, the lack of a clear monotonic trend is not surprising.

As the fourth reason for caution, the petitioner and the HEI Committee point out that a consistent effect was not seen on other measures of cognitive performance in the Burbacher Study, namely, the Nonmatch to Sample Test. However, the lack of a significant methanol effect on this test may have been due in part to the fact that the task was apparently quite difficult for the infant monkeys, regardless of their exposure. Also, other studies suggest that these particular tests reflect different neuroanatomical mechanisms (McKee and Squire, 1993; Clark *et al.*, 1996) and, therefore, may be independent of one another. Hence, the lack of consistency among different tests does not necessarily imply that the few significant results are implausible. Measures of cognition used in the assessment battery not only measure different neurobehavioral functions but also were performed at different ages. A developmental perturbation would not be expected to affect all tests of all endpoints at all times of assessment. Thus, the tests of visually-directed reaching and recognition memory would not necessarily be expected to give the same results. The supposition of the AF&PA expert reviewers that gross effects should be seen on measures of head circumference and early measures of growth and development is an oversimplification of the range of effects that may follow developmental exposures to neurotoxic agents. Consequently, we find that the lack of concordance among all the tests in the Burbacher Primate Study is not a cogent argument for a lack of biological plausibility for effects of gestational exposure to methanol.

As the fifth reason for caution, the HEI Health Review Committee and petitioner note that maternal blood methanol levels in the 200 ppm group were only slightly higher than the controls (*i.e.,* approximately double). But as the HEI Health Review Committee states, ''these results may indicate sensitivity to even small increases in maternal blood methanol, or they may indicate random findings.'' Without a better understanding of the fetal PK processes that could have been involved in these effects, it may be presumptuous to suppose that the measured maternal blood methanol levels are an adequate indicator of fetal exposure to the responsible toxic agent.

In summary, the HEI Health Review Committee's notes of caution do not warrant dismissal of the findings. Therefore, we conclude that these findings provide plausible evidence of developmental neurotoxicity in infant monkeys that had been exposed prenatally to methanol via their mothers' exposure to concentrations of 600–1800 ppm methanol vapor and possibly lower.

We also have concerns regarding the potential background levels of methanol in human blood resulting from consumption of fruit. The assertion is made by the petitioner that foods (especially fresh fruit) provide quantities of methanol, as measured in human breath, that would constitute a background level similar to that found from anthropogenic sources. This assertion is derived from papers by Taucher *et al.* (1995) and Lagg *et al.* (1994), in which four individuals are fed either three peaches, three peaches and one orange, six peaches and one banana, or five peaches and four bananas. Breath measurements were taken starting before, during, and starting immediately after consuming these fruits. There is no discussion as to whether these individuals rinsed their mouths out after consuming the fruit. Nor is there any correction for off-gassing of methanol from the residual mouth contents or stomach contents. Additionally, studies by Batterman *et al.* (1998) suggest that human breath concentrations of methanol following inhalation exposure only achieve equilibrium with blood concentrations ''if subjects are in a methanol-free environment for 30 min or more after exposure'' due to desorption from the lining of the respiratory tract. There is reason to suspect that the same thing happens with the fruit in the mouth, esophagus, and stomach, especially given the tendency of high-fiber foods such as fruit to leave remnants on teeth and to stimulate gas release from the upper GI.

The peak human breath concentrations reported in the Taucher *et al.* and Lagg *et al.* studies are only 3 ppm (3.9 mg/m^3) from the largest quantity of fruit 2 hours post-consumption and 4 ppm (5.2 mg/m^3) from 100 ml of 48 proof homemade brandy with 0.19 percent methanol at 4 hours post consumption. The breath concentration of methanol after brandy consumption falls off with a half-life of about 1.5 hr, roughly identical to what is seen from the Batterman *et al.* study, while the concentration after eating fruit does not decline, strongly suggesting that the source material is still in the mouth and upper GI tract. Although a concentration of 3–4 ppm in exhaled breath is within the range of human experience, it is probably an extreme case. The acute consumption of sufficient fruit to raise breath concentrations more than twice that level most likely involves acute GI effects sufficient to discourage the attempt. In summary, based on the weight of evidence, we think that there are reproductive and developmental health consequences following exposure to methanol in both mice (Rogers *et al.*) and primates (Burbacher *et al.*) and that these effects should be considered relevant to potential risks in humans.

Although the findings from Burbacher *et al.* provide reasonable qualitative evidence of reproductive and developmental toxicity associated with methanol exposure during pregnancy, characterizing the dose-response relationship in these data is more problematic. It is, therefore, premature to predict an RfC based on the results of that study because the process for RfC development requires a much more extensive analysis and review than is possible within the present time constraints. At a minimum, further analysis of the primate data using BMD or other methods needs to be considered as part of the process to develop an RfC for methanol. However, some perspective can be gained by considering a few of the possible interpretations and applications of the data from the Burbacher study. For example, if 200 ppm (260 mg/m^3) were considered a Lowest Observed Adverse Effects Level (LOAEL) for reproductive toxicity (shortened pregnancy length), adjustment of this value to an HEC, based on temporal (2.5/24 hours) and dosimetric (default value of 1) factors, would yield a LOAEL(HEC) of approximately 27 mg/m^3. Potentially applicable uncertainty factors include a factor of as much as 10 for use of a LOAEL instead of a NOAEL and a factor of up to 10 for intraspecies variability, which could result in a reference value as low as 0.27 mg/m^3. As another example, if 200 ppm were considered a NOAEL for developmental toxicity (neurobehavioral effects in infants) and a temporal adjustment of the HEC were made, the NOAEL(HEC) would be 27 mg/m^3. In this case, an uncertainty factor of 10 for intraspecies variability might be applied, resulting in a possible reference value of 2.7 mg/m^3. A rather wide range of possible values for a health-based criterion, on the order of 0.3 to 30 mg/m^3, can be estimated from the primate data in this manner, depending on which type of effect, effect level, and uncertainty factors are selected, but this range should not be construed as bounds on what a fully developed RfC for methanol vapor might ultimately be.

Taken together, the studies by Rogers *et al.* and Burbacher *et al.* provide a pattern of evidence indicative of reproductive and developmental toxicity associated with exposure of mice and monkeys to methanol vapor during gestation. In our judgment, this evidence is relevant for evaluating potential risks of methanol to human health. The data imply a window of sensitivity during gestation, which is supported by other work that has shown that the critical period for induction of developmental toxicity by maternal inhalation of methanol vapor can be at least as short as 1 day in mice (Rogers and Mole, 1997). However, the minimal period of exposure sufficient to induce such effects has not been determined. This fact suggests that the potential for acute exposures, as well as chronic exposures, must be considered in any human exposure analysis in connection with a petition to remove methanol from the list of HAP.

While we do not believe that the effects observed in the Burbacher Primate Study can be dismissed, we are not prepared at this time to propose a specific alternative to the petitioner's SEL. However, there appears to be some convergence within the range of possible reference values that could be derived from the rodent and primate studies. As noted above, using BMD methods and making duration adjustments of the data from Rogers *et al.*, it is possible to derive values of about 4–6 mg/m^3, which are at the approximate midpoint of the values (0.3–30 mg/m^3) that might be derived from the data of the Burbacher Primate Study. Although one should not place too much weight on these specific numbers, the fact that they converge suggests greater plausibility than if the values were widely disparate.

The selection of an appropriate health effects decision criterion or reference level is a central component in the determination of potential risk. For chronic noncancer risk assessments, the EPA-verified inhalation RfC values are the primary quantitative consensus values used by the Agency. For assessing potential adverse health effects due to short-term exposures (*e.g.,* 24 hours), the Agency utilizes various acute exposure criteria. Sometimes we use EPA developmental RfC values to assess the potential effects to developing humans due to short-term exposures. Other benchmarks that we utilize, when appropriate, may include, among others, acute minimal risk levels (MRL)

produced by the Agency for Toxics Substances and Disease Registry and acute reference exposure levels (REL) produced by the California Environmental Protection Agency.

For methanol, as discussed previously, there are no EPA-verified RfC values available to assess noncancer risks. Moreover, benchmarks produced by other agencies have not utilized the recent results from the Burbacher Primate Study. Therefore, based on our review of the available information, we conclude that a range of 0.3 to 30 mg/m^3 represents the most appropriate criterion for determining whether methanol emissions may reasonably be anticipated to cause adverse human health effects. Furthermore, since the critical effects are adverse developmental outcomes that could occur after short-term exposures, we judged that, of the available exposure duration estimates (*i.e.,* 1-hour, 24-hour, and annual concentrations), 24 hours would be the most appropriate exposure duration to compare to the health criterion range of 0.3 to 30 mg/m^3 for decision-making purposes.

While we conclude, based on available data, that 24-hour exposures below 0.3 mg/m^3 are not likely to result in adverse human health effects, we are unable to make a more precise determination at this time regarding the exposure levels at which adverse effects are likely to occur. The range of values (0.3 to 30 mg/m^3) chosen as a health-based decision criterion is not presented as a bright line between safety and toxicity. There is progressively greater potential concern about the likelihood of adverse effects as exposures increase within, and above, this range, and we cannot conclude based on the available evidence that any level of exposure above 0.3 mg/m^3 may not reasonably be anticipated to cause adverse human health effects. The comparison of exposure estimates to the health criterion is discussed further in the Risk Characterization section of today's notice.

D. Sources of Methanol Emissions and Maximum Levels of Exposure

In the original petition submittal (dated March 1996), it is stated that based on the 1993 Toxic Release Inventory (TRI), approximately 2,303 facilities reported emissions of methanol, which resulted in a total 86,155 tons of methanol emitted to the air in 1993 in the U.S. The 1993 TRI data indicated that the paper and allied products industry accounted for about 52 percent of the methanol emissions. The next largest source category was the chemical and allied products industry which accounted for 25 percent of the methanol emissions. Six facilities reported emissions over 1,000 tons per year (tpy), 195 facilities reported emissions over 100 tpy and 828 facilities reported emissions over 10 tpy. Subsequent petition submittals present emissions estimates based on more recent data sources (*e.g.,* the 1995 TRI) for sources emitting greater than 500 tpy of methanol.

In order to focus the exposure modeling assessment on those sources that are most likely to present unacceptable risks, the petitioner conducted a conservative screening level exposure assessment to identify an emissions cut-off for further analysis. ''Conservative'' refers to the selection of models and modeling parameters that are more likely to result in overestimates, rather than underestimates, of ambient concentrations of a pollutant. A hypothetical plant assumed to have a 10 meter stack with a fenceline 10 meters from the stack was utilized for the screening assessment. A very conservative screening model that assumes no plume rise and conservative meteorology was used to model the emissions dispersion and estimate maximum offsite concentrations. Using this approach, the petitioner concludes that only sources emitting greater than 500 tpy could theoretically result in offsite concentrations greater than 83 mg/m^3. Therefore, most of the emissions inventory development and exposure modeling assessment focused on sources emitting greater than 500 tpy.

In the March 1996 submittal, the petitioner presented stack and fugitive emissions estimates for the 15 highest emitting plants in the U.S. as reported in the TRI. In the supplements received between March 1997 and February 1999, the petitioner identified about 55 additional sources of various sizes and industry types. Overall, the petitioner identified about 60 sources that emit greater than 500 tpy of methanol.

In the original submission, the petitioner also reviewed various materials developed by EPA for estimating HAP emissions. Emission factors found by the petitioner in this material included such source categories as ammonia production, charcoal manufacturing, terephthalic acid production, formaldehyde production, glycol ethers productions and sulfate (kraft) pulping. The petitioner, however, concluded that the lack of emission factor data would preclude the petitioner from compiling a national inventory using the emissions factor approach.

The petitioner also obtained information on methanol's use as a fuel for motor vehicles and asserts that methanol is a promising alternative fuel for motor vehicles, which could help reduce emissions of volatile organic chemicals (VOC) and air toxics such as benzene. However, the petitioner found that methanol as a motor fuel is currently limited to Indianapolis-style race cars, about 14,000 cars in the Federal government and private fleets, and approximately 400 buses in California. The petitioner claims that current methanol emissions from motor vehicles appears to be quite small.

The petitioner concludes in the initial submittal that the TRI was the most suitable database for identifying the most significant industrial categories and individual sources with large industrial emissions and would provide the ''best-estimate'' of methanol emissions in the U.S. The petitioner claims that other potential methanol sources are comparatively small or widely dispersed and are unlikely to cause high ambient concentrations of methanol.

The petitioner submitted additional emissions information in March 1997, January 1998, April 1998, and February 1999. These submittals primarily contained modeling data for a set of facilities and did not discuss emissions inventory development. However, the petitioner did present some emissions data and discussed the selection of 500 tpy as a cut-off for the emissions inventory. The primary focus was to identify sources that emit greater than 500 tpy of methanol.

The petitioner also contacted various States and requested data on methanol emissions. California, Colorado, Kansas, Louisiana, New York, South Carolina, Texas, and Wisconsin responded to this request and provided emission data. The petitioner's review of these data found only one facility that was not considered in the earlier analyses.

The petitioner also reviewed the 1996 TRI for additional facilities. Two petroleum refineries reported methanol emissions in excess of 500 tpy in 1996 that were not considered in the earlier analyses. The appearance of these facilities in the 1996 TRI database was due to new methanol emission estimates that were developed for a hydrogen production process.

Finally, the petitioner reviewed several EPA documents to determine if any large sources had been left out of the earlier analyses. The petitioner could not find any evidence of any large methanol emissions source that needed to be considered. Therefore, the petitioner concluded that all sources

above 500 tpy of methanol were accounted for in the petition.

Based on our review, we believe that the petitioner's analysis for establishing the 500 tpy cutoff for the cited health benchmark (SEL of 83 mg/m^3) is a reasonable approach and is technically sound. We confirmed that only sources emitting more than 500 tpy would have a theoretical possibility of exceeding an offsite concentration of 83 mg/m^3. Therefore, assuming an SEL of 83 mg/m^3 as a guideline, 500 tpy would be an appropriate cut-off for emissions inventory development. Nonetheless, as discussed above, we have determined that the appropriate health based decision criterion is the range of 0.3 to 30 mg/m^3. Therefore, the 500 tpy cut-off may no longer be valid for purposes of evaluating sources that have the potential to cause adverse impacts on human health.

Moreover, while we believe that the petitioner's overall methodology for identifying all the methanol emissions sources greater than 500 tpy is technically sound, a comparison with the EPA's 1996 National Toxics Inventory (NTI) shows that the petitioner may not have found all the sources emitting more than 500 tpy. A query of the 1996 NTI database for methanol resulted in approximately 4,280 facilities reporting methanol emissions. Of these facilities, 37 had methanol emissions in excess of 500 tpy. Nineteen of these 37 facilities were not included in the petitioner's inventory. Two of the facilities not considered in the petitioner's analysis are the International Paper Company in Oregon and the Mead Publishing Paper Division in Maine. These are the largest methanol emitting facilities (2,547 and 2,101 tpy, respectively) found in the NTI. However, the petitioner did include six of the top ten emitting sources reported in the NTI, as well as a few very large sources that were not found in the NTI. One of these sources in the petition has higher reported emissions (2,450 tpy) than all but one source listed in the NTI. The petition also included several sources that are likely to adequately represent the worst-case sources in the U.S., including one source that emits 829 tpy at ground level with a relatively close fenceline. Therefore, the petitioner's emissions inventory is generally acceptable for the purpose of estimating maximum offsite concentrations.

The petition asserts that inhalation is the only significant route of human exposure to methanol emissions. Since methanol rapidly biodegrades and volatilizes in water, it is highly unlikely that humans are exposed to significant amounts of methanol through fallout upon soils or water bodies.

The petitioner used the emission inventory as input in a tiered air dispersion modeling analysis. A ''tiered'' analysis applies successive refinements in model selection and input data to derive successively less conservative predictions of the maximum offsite air concentrations of a given pollutant. Tier 1 is the simplest and most conservative approach; tier 2 is somewhat less conservative and more refined, including some facility-specific parameter data and less conservative assumptions; and tier 3 is even more refined and less conservative than tier 2 and depends on more site-specific information. For the most part, the petitioner utilized a mix of tier 2 and tier 3 approaches from EPA's three-tier analysis method (EPA–450/4–92–001).

The petitioner modeled many sources to estimate maximum annual, maximum 24 hour, and maximum 1-hour concentrations at the boundaries of the facilities. Twenty-four hour concentrations were considered most relevant for risk assessment since the critical effect is developmental/reproductive effects that could occur after short-term exposures.

In the March 1996 submittal, using data from the 15 largest emitting facilities, the petitioner developed ten model plants representative of the largest emitters in ten different industrial categories. When available, the petitioner used source-specific stack parameter data (such as stack height, exit velocity, stack temperature) from the EPA's Aerometric Information Retrieval System (AIRS) database. Otherwise, the petitioner used industry average values. The petitioner used a simple terrain tier 2 modeling approach and assumed all emissions are from the same location and the fenceline is 100 meters from the stack. Meteorological data from each of five cities in the U.S. were used in the modeling to represent a variety of meteorological conditions. This modeling approach predicted maximum 24-hour ambient methanol concentrations of 0.1 to 4.5 mg/m^3 resulting from the methanol emissions.

To show conservatism of the tier 2 modeling, the petitioner conducted more refined modeling (tier 3) using more site-specific data for one of the largest facilities. The maximum 24-hour concentration decreased by a factor of 3 for this facility using the tier 3 approach.

In the March 1996 submittal, the petitioner also included a conservative screening-level modeling analysis of complex terrain, whereby a single large plant (emitting 2,000 tpy) was placed in a hypothetical location of complex terrain. This complex terrain analysis predicted a 24-hour maximum concentration of 6.9 mg/m^3. In addition, the petitioner assessed the combined impact of hypothetical co-located plants, whereby two large plants were assumed to have emissions being released from the exact same location. The results from the combined impact of co-located sources yielded a maximum predicted 24-hour ambient concentration of 6 mg/m^3.

In March 1997, the petitioner submitted a supplement that included tier 3 modeling for 19 additional facilities, most of which are among the largest in the U.S. This modeling analysis included 12 pulp and paper mills and seven facilities from other industries. The maximum 24-hour offsite concentration from this analysis was 2.5 mg/m^3. This supplement also included further evaluation and modeling of potential co-location situations. The petitioner searched TRI and found there were no instances where two large sources were within 2 miles of each other. However, the petitioner did identify five medium to small sources along a 1-mile line in Lexington, NC. Also, the petitioner found three pulp and paper mills in the Wisconsin Rapids, WI area and a number of medium and large sources in the Mobile, AL area. The petitioner modeled each of these co-location scenarios and predicted the maximum 24-hour concentration to be 0.6 mg/m^3.

The March 1997 supplement also presented tier 3 complex terrain modeling analyses for two actual plants located in complex terrain, which predicted a maximum 24-hour concentration of 0.4 mg/m^3. In addition, data on measured ambient levels of methanol were presented showing that background levels of methanol are less than 0.8 mg/m^3 .

In January 1998 and February 1999, in response to EPA comments, the petitioner submitted modeling analyses for 13 additional facilities that included tier 3 modeling analyses for eight facilities and tier 2 modeling analyses for five facilities. These facilities included all the non-paper sources with greater than 500 tpy reported in the TRI for years 1993–95. The range for the 24-hour maximum offsite concentration for 12 of these plants was 0.1 to 3 mg/m^3. However, there was one facility (the Missouri Chemical Works), modeled using tier 3 approach, for which the maximum 24-hour concentration was 7.6 mg/m^3. This source was originally identified as emitting 829 tpy of fugitive emissions released at ground level in the January 1998 submittal based on

1995 TRI emissions reporting. Subsequently, in the July 2000 submittal, the petitioner states that in 1998, this facility initiated several changes that reduced emissions by about 70 percent. The petitioner remodeled this facility using 1999 emissions estimates (253 tpy), which decreased the maximum offsite concentration to 3.65 mg/m^3.

In the February 1999 submittal, the petitioner attempted to demonstrate that the pulp and paper mills modeled in previous submittals were representative of the industry and included at least one worst-case example. The petitioner stated that the modeling analyses included the source with the highest total emissions, the two facilities with the highest fugitive emissions, as well as two large sources with low-level releases. Moreover, the petitioner creates a very conservative hypothetical worst-case analysis for a paper plant to show that the theoretical worst-case offsite air concentration for a source emitting 1,815 tpy is 31 mg/m^3.

In summary, the petition includes modeling analyses using a mix of tier 1, tier 2 and tier 3 approaches for roughly 50 sources in the U.S., including many of the largest emitting sources. Moreover, the petition includes modeling analyses for sources located near one another (*i.e.,* co-location) and for a few facilities in complex terrain. Overall, the maximum modeled fenceline concentration from any facility using the tier 2 approach was about 4.5 mg/m^3, and the maximum concentration of any facility using the tier 3 approach (with updated emissions data) was 3.65 mg/m^3.

We agree with the petitioner that inhalation is the primary route of human exposure to methanol emissions. The petitioner provides a tiered-based dispersion modeling analysis of facilities emitting greater than 500 tpy methanol. Following generally acceptable modeling guidelines, the petitioner estimates maximum 24-hour modeled fenceline concentrations from the inventoried facilities using conservative screening techniques and more refined (tier 3) modeling procedures. Further, the petitioner shows that combined impacts from co-located sources, as well as background ambient concentrations, are negligible and will not appreciably contribute to maximum predicted ambient levels. Overall, we generally believe that the petitioner's conclusions regarding ambient concentrations of methanol that are likely to result from facilities emitting greater than 500 tpy are technically sound and credible. Nonetheless, we have a number of comments regarding the petitioner's analyses.

With regard to the March 1996 submittal, we think that some of the input parameters in the simple terrain tier 2 analysis were not as conservative as they should be for a tier 2 analysis. For example, fugitive emissions were approximated from a height of 50 feet. These should have been modeled as ground-level sources. Also, no basis for many of the site-parameter assumptions are provided. However, the rest of the model assumptions in this tier 2 analysis appear to be conservative, therefore, the results are most likely conservative. The tier 3 detailed modeling of a single large facility also used the same fugitive source assumption (50 feet release height). Therefore, the results from the tier 3 analysis may not result in a conservative estimation of fenceline concentrations. The complex terrain modeling of a single large facility was performed with an extremely conservative model (SCREEN2/VALLEY), thus these results are most likely conservative. Also, the analysis of combined impact of co-located plants utilized some very conservative assumptions, thus, these concentrations are most likely overpredicted.

With regard to the March 1997 submittal, it appears that the tier 3 modeling of 19 large facilities was performed following EPA modeling guidelines. Detailed documentation of the approach, input data and results are provided. The results from the complex terrain analysis appear to be credible. Also, the reported measured ambient levels of methanol appear to coincide well with the data from the EPA's AIRS database. Thus, the March 1997 submittal is judged to be technically sound and appropriate.

With regard to the January 1998 and February 1999 submittals, it appears that the modeling of each of the 13 facilities follows EPA modeling guidance. The one facility (Missouri Chemical Works) that had a maximum 24-hour modeled concentration of 7.6 mg/m^3 (using 1995 TRI emissions data) seems to be a very good ''worst-case'' example. Model documentation for this run was provided and appeared to justify the results.

The analysis (in the February 1999 submittal) of a hypothetical worst-case pulp and paper mill is extremely conservative. The predicted worst-case air concentration of 31 mg/m^3 is clearly an overestimation for this type of facility, and fenceline concentration predictions for a facility of this type would likely be much lower using a more realistic approach.

In summary, based on the analyses presented in all the submittals, the maximum modeled fenceline concentration from any facility using very conservative hypothetical screening level approaches was 31 mg/m^3, the maximum concentration using tier 2 approaches for actual plants was about 4.5 mg/m^3, and the maximum concentration of any facility using the refined tier 3 approach was 7.6 mg/m^3 (using 1995 data) and 3.65 mg/m^3 (using 1999 data).

Overall, based upon our technical review of the series of submittals, we think that the ambient concentrations predicted by the analysis are technically sound and credible. However, it is possible that, using a different facility source configuration, a different inventory, or a different model, predicted concentrations could be higher or lower than those presented in the petition. Furthermore, year-to-year variations in meteorological conditions could result in different predicted concentrations. While dispersion models are generally designed to be conservative, it is possible that the models utilized in the analysis are not as conservative as expected. Also, as discussed above, the petitioner did not appear to include all sources greater than 500 tpy in the modeling analysis. Thus, the maximum concentration of 3.65 mg/m^3 predicted by the refined (tier 3) model using the updated emissions data may not accurately reflect actual worst-case fenceline concentrations. However, we think it is unlikely that any existing facility would present offsite ambient concentrations that are higher than the maximum concentration of 7.6 mg/m^3 predicted for the Missouri Chemical Works using the 1995 TRI data (829 tpy emitted at ground level).

Moreover, we agree with the petitioner's conclusion that background sources and co-location of facilities are not significant. Monitoring values of methanol, primarily measured near large emitters, are found to generally be less than 1.0 mg/m^3. The worst-case average methanol concentration in the AIRS monitoring database was found to be 0.2 mg/m^3. Furthermore, impacts from individual facilities fall off rapidly with distance, thus, it is highly unlikely that coincidental impacts from multiple facilities would greatly increase maximum predicted impacts.

Finally, when comparing model predicted estimates to health criteria, the petitioner makes a conservative assumption. Namely, the petitioner does not apply an inhalation exposure assessment to the air level predictions, instead elects to use the maximum

exposed individual (MEI) approach. The MEI is the predicted exposure for a hypothetical person assumed to be located at the place of maximum predicted offsite air concentration for 24 hours. If an exposure assessment were applied, whereby we determine where actual people are located and account for daily activities and other exposure factors, actual maximum individual inhalation exposures could be somewhat lower than the MEI predictions from the dispersion analysis. Based upon our review of the petitioner's analyses, the likely proximity of inhabitable areas to these large facilities, and knowledge of human activity patterns over a 24-hour period, we conclude that maximum 24-hour exposures to methanol emissions could be in the range of 2 to 7 mg/m^3, but that such exposures may not reasonably be expected to exceed 7 mg/m^3. Notably, this analysis does not address potential increases in exposures which might occur should methanol emissions increase substantially in the future.

E. Risk Characterization

The petitioner states that the maximum predicted 24-hour concentration for any of these facilities was about 3.65 mg/m^3. As stated above, the petitioner proposes a SEL of 83 mg/m^3. Thus, the petitioner asserts that concentrations of methanol anticipated to occur at the fenceline are far below the SEL and cannot reasonably be anticipated to cause either acute or chronic adverse health effects to people living nearby these facilities. The petitioner also asserts, based on data on PK, that even if a person were continuously exposed to the maximum predicted concentration of 3.65 mg/m^3, that individual's blood methanol level would increase by about 0.7 mg/l, which represents only about 3 percent of the mean baseline level of methanol that individuals have in their blood as a result of natural physiological processes.

Generally, the EPA uses a hazard quotient (HQ) approach to characterize the noncancer risk associated with exposures to pollutants. In this approach, the HQ is developed by comparing the level of exposure (and the appropriate duration of exposure) to the appropriate health-based decision criterion that represents a similar duration of exposure. For example, in many assessments, the average lifetime exposures are compared to a chronic RfC to determine the likelihood of adverse effects from long-term exposures. However, for pollutants that cause developmental effects, such as methanol, the critical duration of exposure could be a short duration (hours or days). Therefore, we conclude that a 24-hour exposure concentration is most appropriate for the HQ analysis for methanol.

Assuming that the estimated exposure level represents total exposure (exposure due to the source being evaluated plus all background exposures), if the HQ is less than 1, the reference level is not exceeded, and the adverse health effect represented by the health reference level is unlikely. Usually the RfC is considered protective of all noncancer adverse health effects. Therefore, exposures at or below the RfC are generally not expected to result in any adverse noncancer health effects. If on the other hand, the HQ is greater than 1 (*i.e.,* exposures are greater than the RfC), we generally are unable to conclude that adverse effects are not likely to occur. The risks following exposures above the RfC are uncertain, but risk increases as exposures to such pollutants increase above the RfC.

However, for methanol, at this time, we do not have a single value criterion, such as an RfC, that we think is appropriate for the derivation of an HQ. Instead, as discussed above, we have determined that the appropriate health-based criterion for EPA decision making for this methanol petition is the range of 0.3 to 30 mg/m^3. In other words, at this time, in order to demonstrate that exposures are reasonably anticipated not to result in any adverse effects to humans, including sensitive subpopulations, the estimated 24-hour exposure concentrations would need to be 0.3 mg/m^3 or lower. From the exposure assessment discussion, we have determined that maximum 24-hour exposures could be in the range of 2 to 7 mg/m^3, which is well above 0.3 mg/m^3. Therefore, at this time, we are not able to determine that emissions of methanol may not reasonably be anticipated to result in any adverse effects to humans. This means that the petition has failed to meet the criteria outlined in section 112(b)(3)(C) of the CAA. Therefore, EPA must deny AF&PA's petition, and methanol will remain on the list of HAP under section 112(b) of the CAA. Moreover, because we conclude that the information submitted in connection with this petition does not support a determination that methanol emissions will not cause adverse human health effects, any future petition for the removal of methanol from the list of HAP will be denied as a matter of law unless such petition is accompanied by substantial new information or analysis.

F. Other Elements of the Petition

The petitioner also presented an evaluation of the potential environmental impacts of methanol emissions, and impacts related to atmospheric transformation of methanol emissions into formaldehyde. Because we are denying the petition for the reasons stated above, we do not find it necessary to make final determinations regarding these elements of the petition.

However, we will note a few concerns with regard to the petitioner's environmental impact analysis. First, the petition contends that methanol has low inherent toxicity to aquatic biota, which is a reasonable conclusion based on available information. However, the petitioner fails to demonstrate that the levels emitted from large point sources would not increase methanol levels in nearby water bodies (*i.e.,* ponds) to levels that would cause adverse effects to sensitive biota. Similarly, with regard to terrestrial biota, the petitioner has conservatively estimated ambient concentrations of methanol near large emitters, but did not estimate safe levels for terrestrial receptors with which to compare these concentrations. Moreover, there is no methanol-specific information presented regarding toxicity to terrestrial plants and invertebrates. Instead, the petition summarized the ecological toxicity information by using broad ranges, which is acceptable as a preface to a more complete eco-toxicity assessment, but should be accompanied by a more detailed description of sensitive studies (including a discussion on the quality of the data). Finally, because small terrestrial mammals (*e.g.,* mice) residing near large emitters are likely to be the most highly exposed terrestrial biota, due to their relatively high metabolic rates and small home ranges, the petition should include an estimate of safe levels in air and safe doses for these biota to compare to estimated exposures near large methanol emitters.

IV. Denial of the Petition

Based on our review of the petition submitted by AF&PA and other relevant material (including the Burbacher Primate Study and the materials submitted by the petitioner subsequent to the release of that study), EPA concludes that available data do not support a determination that methanol emissions may not reasonably be anticipated to cause any adverse effect to human health or the environment. This determination is based on our conclusions regarding the appropriate criterion for evaluating the likelihood of adverse health effects and the maximum

24-hour exposures that may reasonably be anticipated to occur. Accordingly, we are denying AF&PA's petition to remove methanol from the list of HAP under section 112(b) of the CAA. Moreover, because we conclude that the information submitted in connection with this petition does not support a determination that methanol emissions will not cause adverse human health effects, we are denying this petition with prejudice, and any future petition for the removal of methanol from the list of HAP will be denied as a matter of law unless such petition is accompanied by substantial new information or analysis.

Dated: April 27, 2001.

Christine T. Whitman,

Administrator.

[FR Doc. 01–10990 Filed 5–1–01; 8:45 am]

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ENVIRONMENTAL PROTECTION AGENCY

[OPPTS–00312; FRL–6776–3]

National Advisory Committee for Acute Exposure Guideline Levels (AEGLs) for Hazardous Substances; Proposed AEGL Values

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances (NAC/AEGL Committee) is developing AEGLs on an ongoing basis to provide Federal, State, and local agencies with information on short-term exposures to hazardous chemicals. This notice provides AEGL values and Executive Summaries for 18 chemicals for public review and comment. Comments are welcome on both the AEGL values in this notice and the Technical Support Documents placed in the public version of the official docket for these 18 chemicals.

DATES: Comments, identified by the docket control number OPPTS–00312, must be received by EPA on or before June 1, 2001.

ADDRESSES: Comments may be submitted by mail, electronically, or in person. Please follow the detailed instructions for each method as provided in Unit I. of the **SUPPLEMENTARY INFORMATION.** To ensure proper receipt by EPA, it is imperative that you identify docket control number OPPTS–00312 in the subject line on the first page of your response.

FOR FURTHER INFORMATION CONTACT: *For general information contact*: Barbara Cunningham, Acting Director, Environmental Assistance Division (7401), Office of Pollution Prevention and Toxics, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460; telephone number: (202) 554–1404; e-mail address: TSCA-Hotline@epa.gov.

For technical information contact: Paul S. Tobin, Designated Federal Officer (DFO), Office of Prevention, Pesticides and Toxic Substances (7406), 1200 Pennsylvania Ave., NW., Washington, DC 20460; telephone number: (202) 260–1736; e-mail address: tobin.paul@epa.gov.

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this Action Apply to Me?

This action is directed to the general public to provide an opportunity for review and comment on ''Proposed'' AEGL values and their supporting scientific rationale. This action may be of particular interest to anyone who may be affected if the AEGL values are adopted by government agencies for emergency planning, prevention, or response programs, such as EPA's Risk Management Program under the Clean Air Act and Amendments Section 112r. It is possible that other Federal agencies besides EPA, as well as State and local agencies and private organizations, may adopt the AEGL values for their programs. As such, the Agency has not attempted to describe all the specific entities that may be affected by this action. If you have any questions regarding the applicability of this action to a particular entity, consult the DFO listed under **FOR FURTHER INFORMATION CONTACT**.

B. How Can I Get Additional Information, Including Copies of this Document or Other Related Documents?

1. *Electronically* . You may obtain electronic copies of this document, and certain other related documents that might be available electronically, from the EPA Internet Home Page at http://www.epa.gov/. To access this document, on the Home Page select ''Laws and Regulations,'' ''Proposed Rules and Regulations,'' and then look up the entry for this document under the ''**Federal Register**—Environmental Documents.'' You can also go directly to the **Federal Register** listings at http://www.epa.gov/fedrgstr/.

2. *In person*. The Agency has established an official record for this action under docket control number OPPTS–00312. The official record consists of the documents specifically referenced in this action, any public comments received during an applicable comment period, and other information related to this action, including any information claimed as Confidential Business Information (CBI). This official record includes the documents that are physically located in the docket, as well as the documents that are referenced in those documents. The public version of the official record does not include any information claimed as CBI. The public version of the official record, which includes printed, paper versions of any electronic comments submitted during an applicable comment period, is available for inspection in the TSCA Nonconfidential Information Center, North East Mall Rm. B–607, Waterside Mall, 401 M St., SW., Washington, DC. The Center is open from noon to 4 p.m., Monday through Friday, excluding legal holidays. The telephone number of the Center is (202) 260–7099.

3. *Fax-on-Demand*. You may request to receive a faxed copy of the document(s) by using a faxphone to call (202) 401–0527 and select the item number 4800 for an index of the items available by fax-on-demand in this category, or select the item number for the document related to the chemical(s) identified in this document as listed in the chemical table in Unit III. You may also follow the automated menu.

C. How and to Whom Do I Submit Comments?

You may submit comments through the mail, in person, or electronically. To ensure proper receipt by EPA, it is imperative that you identify docket control number OPPTS–00312 in the subject line on the first page of your response.

1. *By mail*. Submit your comments to: Document Control Office (7407), Office of Pollution Prevention and Toxics (OPPT), Environmental Protection Agency, 1200 Pennsylvania Ave., NW, Washington, DC 20460. (Note: for express delivery, please see ''In person or by courier'' in Unit I.C.2.).

2. *In person or by courier*. Deliver your comments to: OPPT Document Control Office (DCO) in East Tower Rm. G–099, Waterside Mall, 401 M St., SW., Washington, DC. The DCO is open from 8 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The telephone number for the DCO is (202) 260–7093.

3. *Electronically*. You may submit your comments electronically by e-mail to: oppt.ncic@epa.gov, or mail your computer disk to the address identified above. Do not submit any information electronically that you consider to be CBI. Electronic comments must be submitted as an ASCII file avoiding the