FILE NAME: Brakes (BRK)

DATE: 1984 b₴Ø ну

DOC#: BRK2пп

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Comments of the Asbestos Information Association/ North America Submitted to the U.S. Environmental Protection Agency on the Natural Resources Defense Council's Petition to Prohibit the Use of Asbestos in Brakes

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November 28, 1984

I. INTRODUCTION

The Asbestos Information Association/North America (AIA/NA), a non-profit organization whose member companies are involved in the mining, manufacturing and marketing of asbestos and asbestos-containing products in the United States and Canada, wishes to comment on the petition to the Environmental Protection Agency filed under section 21 of the Toxic Substances Control Act (TSCA) by the Natural Resources Defense Council (NRDC) on September 13, 1984. The petition requests that the Agency exercise its authority under section 6 of TSCA to prohibit the use of asbestos in brakes for new cars and trucks, and in replacement brakes in existing vehicles.

In these comments, AIA/NA requests that the petition be denied for the following reasons:

1) Ambient levels of asbestos and the small contribution of brake materials to those levels do not represent an unreasonable risk to the public.

2) The use of asbestos-containing products does not constitute an unreasonable risk to brake maintenance workers and, in addition, EPA should defer to the Occupational Safety and Health Administration on workplace regulation.

3) Substituting materials for which the health effects have not been evaluated and whose use is uncontrolled for asbestos, which is highly regulated, could result in greater health risks to the public and workers.

4) A ban would be contrary to the international consensus on the controlled use of asbestos.

5) The NRDC petition to ban the use of asbestos in brakes is not based on considerations of "unreasonable risk" as required by TSCA, but rather, on an approach which advocates a "zero risk" standard for the statute.

The discussion which follows will address each of these points in turn.

II. The Use of Asbestos-Containing Brakes Does Not Constitute A Public Health Hazard

In determining whether asbestos emissions from friction products pose a public health problem, two distinct issues are raised:

1) Do such emissions contribute significantly to the ambient level of asbestos?

2) Are ambient asbestos concentrations a significant public health hazard?

If the answer to either question is "no," then it can safely be concluded that no regulatory steps are necessary to reduce such emissions. That is, if friction product use does not contribute substantially to ambient exposure levels, then attempts to reduce such emissions will not have a significant impact on any risk posed by such ambient concentrations. Similarly, if the ambient concentrations are not so high as to pose an unreasonable risk, then, regardless of the extent to which friction product emissions contribute to such levels, they are not worthy of regulatory concern.

AIA/NA is unaware of any substantial review that has concluded the ambient asbestos levels are worthy of regulatory concern. In 1971, the National Academy of Sciences prepared a report collecting all available information on asbestos as an air pollutant. In its Conclusion and Recommendations, the NAS panel noted:

> [T]here are levels of inhaled asbestos without detectable risk. It is not known what range of respirable airborne asbestos fibers will ultimately be found to have no measurable effects on health. At present, there is no evidence that the small numbers of fibers found in most members of the general population affect health or longevity.

The International Agency for Research on Cancer, after surveying and evaluating all the available published literature on asbestos, also concluded:

> At the present time, there is no evidence that exposure of the general population to past levels of asbestos dust in the ambient air or in beverages, drinking-water, food or pharmaceutical preparations increased the risk of cancer.

In 1977, after a thorough review of the available data, a working group of experts reported to the Commission of the European Communities:

> [T]here is no established evidence that, true ambient exposure through air, water, drugs, beverages, food, as prevalent in Western European countries at this moment carries ... a definite [health] risk: however

> there exist too many uncertainties to deny such a risk, though if the risk was substantial, it is likely it would have been detected by now.

Finally, the United Kingdom's 1979 Simpson Report concluded:

> [T]here is no quantitative evidence of a risk to the general public from exposure to asbestos dust.
>
> It is concluded that the presence of chrysotile alone or contaminated with small quantities of amphiboles is unlikely to have produced any material increase in the risk of lung cancer in the general population or any appreciable number of cases of mesothelioma. The same is certainly true of asbestosis.

In short, the uniform opinion of these respected authorities, each of which has investigated the issue in depth, is that there is no evidence indicating exposure to asbestos in the ambient environment poses a public health problem.

This consensus that ambient concentrations of asbestos pose no public health hazard of any significance establishes a framework within which to ask more particular questions about friction product emissions. In light of the expert opinion, it is unlikely that any problem exists. Nonetheless, review of the evidence is useful to confirm that conclusion.

Determination of the extent to which friction product emissions contribute to ambient asbestos concentrations requires data on four different issues:

1. How much asbestos is worn away from brakes and clutches through use of these friction products?

2. What percentage of the asbestos material that is worn is emitted in the form of asbestos fibers?

3. What percentage of the emitted asbestos fibers become airborne, thus contributing to ambient concentrations?

4. To what extent do the emitted airborne asbestos fibers contribute to ambient concentrations?

As the following discussion highlights, experts who have analyzed these four questions have reached general agreement on questions 1 and 3. The only dispute in the data collected occurs with respect to question 2, and there is general consensus in all but one study. Differing methodologies have been employed to answer question number 4.

1. Asbestos Wear. It was generally agreed in the early and mid-1970's that approximately 35,000 tons of asbestos were being worn annually from brakes and clutches. That amount was originally calculated by investigators from the Bendix Corporation, led by Michael Jacko.

The 1973 Bendix estimate was based on an assumption that of the annual amount of friction material then being installed on automobiles, trucks, trailers and buses (171 million pounds), 25% (or 43 million pounds) was discarded at

the time of relining (i.e., not worn off), and another smaller percentage (11.7 million pounds) was discarded when the vehicles were junked, leading to a remaining 117 million pounds that were worn away annually. As approximately 60% of this friction material was asbestos, the investigators concluded that approximately 74 million pounds, or 37,000 tons, of asbestos were being worn.

2. Percentage of Wear Which Is Asbestos Fiber. Several studies have been conducted to determine the percentage of asbestos friction material wear that is emitted in the form of asbestos fibers. Such studies are necessary because chemical and physical changes occurring in the braking process cause a large percentage of the debris not to be emitted in the form of asbestos fibers. Under high temperatures, chrysotile asbestos undergoes dehydroxylation and recrystalization resulting in non-fibrous forsterite or olivine. Forsterite will form only from pure asbestos, making it more likely that olivine will be found in brake debris, and explaining why some observers did not detect forsterite in their samples.

That friction wear dust is qualitatively different from asbestos in terms of potential health effects has been demonstrated in a number of studies. For example, Davis and Coniam (1973) found very low fibrogencity for automobile brake lining dust as compared to studies with native fibers in mouse injection studies. Similarly, the study of LeBouffant et al. (1983) showed that chrysotile heated to 700°C, as occurs in

braking, loses its tumorigenic potency by intrapleural administration.

The most extensive and well-designed study of friction material wear was conducted by The Bendix Corp. under contract with and in cooperation with EPA. Through the design of special equipment attached to brakes and clutches to capture emissions in actual use, the investigators were able to obtain data from actual driving conditions. Both typical and more abusive driving conditions were tested, using both original and aftermarket equipment, for both disc and drum brakes, from five different manufacturers. More than 8,000 miles were driven during the testing.

The collected wear debris were analyzed by both optical and transmission electron microscopy. Some samples were independently analyzed by Batelle Columbus Laboratories (whose results were slightly lower than those of Bendix). The Bendix/EPA study found that very small percentages -- well below 1% by weight -- of brake debris were asbestos:

Vehicle Test	Range	Overall Average
1	.05 - 1.65%	.38%
2	.03 - 1.42%	.25%
3	.003 - .51%	.07%
		.20%

Similarly small percentages of brake wear that were asbestos fibers were also found by several other investigators

in studies under simulated driving conditions. One of earliest studies was conducted by the U.S. Department Health, Education and Welfare in the late 1960's. Je: R. Lynch tested 15 different automobile, truck and bu and clutches on friction testing machines and dynamom under various conditions to determine the percentage fibers in the emitted material. Lynch also reported less than 1% of brake wear was asbestos fibers.

Dynamometer tests in the early 1970's by Fo Company yield comparable results (Anderson, et al. 1 streams in front of and behind a disc brake assembly a dynamometer were sampled under break-in, normal us temperature conditions. Fibers were measured by tr electron microscopy. The Ford findings, each of wh multiplied by a factor of ten to account for possib in collection, processing and counting were also we

Asbestos fiber from brake in airborne wear dust

Asbestos fiber released from lining wear

Findings that less than 1% of friction ma asbestos fiber were also reached in two British s debris from stationary brakes were analyzed (Hick Knight, 1970; Hatch, 1970). It was only in one c stationary brake study conducted by the Mount Sir tal researchers that higher values were found. study, Rohl, et al. (1976) reported that they ob samples of automobile brake drum dusts and exami

by optical microscopy, X-ray diffraction, and transmission and scanning electron microscopy. No details of the collection or analytic procedures nor the rationale for choosing the particular 10 automobiles, are provided. Only overall results are reported. Asbestos fibers were found to constitute 2% to 15% of the weight, with an average of 3% to 6%.

The two most recent studies to examine asbestos brake emissions, neither of which are cited in the NRDC petition, are in accord with the earlier studies which demonstrated a very low content of asbestos in brake dust. Williams and Muhlbairer (1982) concluded that over 99.99% of the mass of original asbestos fibers was broken down into nonfibrous magnesium silicates. Similarly, Cha et al. (1983) reported that their analysis of brake dust agreed well with the results of Williams and Muhlbaier (1982), finding that the dust only averaged an asbestos content of 0.018%.

In sum, only one study has found friction product wear emissions to be more than 1% asbestos by weight. That study was conducted by analyzing dust in stationary brakes rather than through collection from brakes and clutches in use. Considerable questions arise about its inordinately high values and their relation to actual, in-use emissions. The totality of the evidence would indicate that less than 1% of friction product wear (i.e., less than 350 tons annually) is asbestos fiber.

3. The Disposition of Emitted Fibers. All emitted fibers from friction product wear do not become airborne. Many will re-

main in the friction mechanism; others will settle to the earth. The most extensive testing to determine what percentage of emitted fibers become airborne was done as part of the Bendix/EPA study.

In the Bendix/EPA study, three brake emissions collectors were used, with the "sump" collecting debris that normally would remain trapped in the brake, the "surface" collecting debris that would normally drop to the road, and the airborne filters collecting the debris that become airborne. The weight of the asbestos fibers in each test of each type brake was determined for all three final resting places. Based on a model of the braking experiences that a typical automobile would encounter during its life, and using the automobile test vehicle data from the study, the investigators were able to calculate the percentage of all asbestos fiber wear that would be deposited in each of the three possible locations:

Road Dropout	81.9%
Airborne	3.7%
Retained in brake	14.4%

Less than 3% of the fibers were estimated to be airborne for trucks, so that an overall figure of 3.2% airborne was calculated for all vehicles.

4. Friction Material Emission As a Contribution to Ambient Concentrations. In the NRDC petition, there is mention that 158,000 pounds of asbestos are released into the

atmosphere each year from the normal braking process of automobiles. This figure, quoted in the petition, is taken from the study prepared by M.G. Jacko and R. T. DuCharme for EPA in 1973 (contract 68-04-0020), and published by the Agency as document No.: PB-222 372.

A condensed version of this report was also published in Society of Automotive Engineers, Vol. 18, May 14-18, 1973. The authors of the petition, however, failed to quote the entire paragraph in the EPA report, which says:

> 10.5 SUMMARY OF ASBESTOS EMISSIONS
>
> The results indicate that more than 99.7 percent of the asbestos used in friction material is converted to a non-fibril form. The total asbestos emissions for all vehicles in the United States is estimated to be 158,000 pounds annually. Of this total, a small part was found to remain airborne. The contribution to the atmosphere is estimated to be 5060 pounds, or 3.2 percent of the total asbestos emissions.

It is therefore clear that, according to the cited study, the contribution of asbestos to the atmosphere from braking is 5, 060 pounds/year, and not 158,000 pounds.

More recent studies have also calculated the contribution of brake dust emissions to the ambient atmosphere. Williams and Muhlbaier (1982) concluded that, "an expected urban concentration due to braking of 0.063 ng/m^3 can be predicted. This is small fraction, 0.06 to

0.5% of the measured urban asbestos concentrations of 10-100 ng/m3 (Nicholson et al., 1971)."

The results of the study of Cha et al. (1983) are again in accord, finding that "application of the asbestos emission rates to air quality models confirmed Williams and Muhlbaier's finding that about 1% of asbestos fibers in city core districts originated from disc brake wear."

The above-cited studies, in sum, amply demonstrate that the contribution of brake dust emissions to ambient levels of asbestos is not significant and certainly cannot be interpreted as constituting an "unreasonable risk" to the general public.

III. Asbestos and Automobile Maintenance Workers

The NRDC also claims in its' petition that automobile maintenance workers are at a particular risk from exposure to asbestos brake products. This claim is based upon a calculation predicting the excess risk of various populations occupationally exposed to asbestos (Nicholson et al. 1982). The calculations for different occupationally exposed groups are made by extrapolating from a study of insulation workers, Selikoff et al. (1979), for which no exposure data exists. The claimed number of excess deaths are therefore the result of a highly technical and subjective series of infer-

ences, and should not be used as the basis for a finding of unreasonable risk under TSCA.

The problem of estimating risks by extrapolating from studies which lack exposure data was recently emphasized in comments from the Environmental Health Committee of EPA's Science Advisory Board addressed to Administrator William D. Ruckelshaus. After reviewing a draft document entitled "Asbestos Health Assesment Update" prepared by the Office of Health and Environmental Assessment in EPA's Office of Research and Development, the Committee made the following observations with regard to exposure data use in the draft:

> The document gives greater weight in deriving a risk value to studies in which individual exposures were not estimated. In fact, epidemiologic studies are available in which individual exposures are estimated. In addition, the distribution of samples at a site generally adhere well to a log-normal distribution. The document, however, uses pooled samples from all sites, which assumes a similarity of sites and sources. These differences need to be emphasized for the regulator, because any statistical bias in the description of the past incidents in which asbestos exposure was associated with health effects, will be replicated in the prospective estimates of risk used in regulating.

Such concerns indicate that, at the very least, extrapolations of risk based on studies for which exposure data does not exist should be evaluated very carefully, and not be

accepted at face value for the purpose of issuing regulations.

A study more on point, actually examining a cohort of brake lining repair and maintenance workers occupationally exposed to asbestos, failed to demonstrate any significant or unreasonable risk (Nicholson et al., undated). Among the relevant conclusions in this study were:

1) A greater prevalence of X-ray abnormalities is found among garage mechanics who repaired brakes than among blue collar controls or garage workers who do not engage in brake or auto body work.
(Note that this conclusion is confounded by the inclusion of auto body workers.)

2) The pulmonary function results of garage mechanics engaged in brake work are no different from non-garage workers and other general population controls.

Such modest observations can hardly support a finding of unreasonable risk.

Additional evidence of the small risk to workers from asbestos-containing brakes or other friction materials is present in the recently published study of Berry and Newhouse, 1983. In that study, the mortality experience of 13,460 workers over nearly forty years in a factory manufacturing friction materials was analysed. Although the exposure levels of these workers were many times higher than the exposures of brake maintenance workers, the study concluded:

> There was no evidence of an overall increase in mortality, or of any excess of deaths due to lung cancer either in relation to the national population or, within the factory population, to different levels of exposure.
>
> There was also no convincing evidence of excess mortality from gastrointestinal tumours either in the main mortality study or in the case-control study.
>
> Of 11 workers dying of mesothelioma in the study, eight worked on the contract in which crocidolite was used and another may have had intermittent exposure to crocidolite. [Crocidolite is not used in the manufacture of friction materials.]

An even more recent study, that of McDonald et al., 1984, of an American asbestos friction products plant, produced similar results, with the exception that no mesotheliomas were detected:

> To summarise, if we accept that the high mortality from all causes (including respiratory cancer) in men employed for less than one year was probably due to some form of selection, our results suggest that the adverse health effects of employment in this chrysotile friction products plant were small.
>
> In our plant no amphibole asbestos was used (until after 1957 [anthophyllite]) and no mesothelioma was found.

Again, the above-cited studies indicate that even under the much higher exposure circumstances, compared to brake maintenance workers, found in the past in the manufacture of asbestos-containing friction materials, the risk is small.

However, the NRDC petition urges the EPA to ban the use of asbestos in brakes on the basis of this occupational risk. Besides not being supported by the available evidence, such an action would encroach upon the rulemaking activities of the Occupational Safety and Health Administration (OSHA), the agency with primary responsibility for the regulation of workplaces and occupational risks.

Earlier this year, OSHA proposed to revise the workplace standard for asbestos and in June and July held five weeks of hearings which extensively addressed the issue of occupational asbestos exposure. A new standard is expected to be issued in 1985. The record developed during the OSHA proceeding establishes that the revised standard supported by AIA/NA will eliminate any remaining significant risks in the occupational setting. Were OSHA to accept recommendations made by AIA/NA, the revised asbestos standard would be the tightest of any country in the world. While it may never be possible to prove that such low exposures are absolutely safe, any reasonable assessment of the risk remaining at such low levels will show that such risks are far lower than countless other risks commonplace in many workplaces today.

The NRDC petition, in large part, requests that EPA address this very same issue. Whether or not EPA has legal authority to regulate occupational risks, and AIA/NA believes

it does not, it makes little sense for two government agencies to conduct lengthy rulemakings on the same subject.

IV. A Ban on Asbestos Would Lead to the Uncontrolled Use of Substitutes Which May Present A Greater Health Risk

The petition cites the availability of substitutes for asbestos as a basis on which to prohibit its use in brakes. While addressing to a limited extent the technical aspects of materials which make them suitable candidates for substitution, the petition fails to raise the issue of the health risks of substitutes.

It is commonly recognized that the health effects of asbestos appear to be closely related to the physical characteristics of fibers. "Asbestos" itself is only a generic term based on commercial and regulatory usage which applies to six different mineral fibers. The evidence is very suggestive that any fibers, naturally occuring or man made, that have similar physical properties present a health risk.

A very recently published study, undertaken by the National Academy of Sciences (NAS) at the request of the EPA, addresses this very issue. In summarizing its findings on the relationship of fiber characteristics to health effects, the NAS report, entitled "Asbestiform Fibers: Nonoccupational

Health Risks," listed the following factors "in approximately descending order of the strength of the positive evidence."

> Respirability. For significant health effects to result from inhalation of asbestiform fibers, the fibers must reach the lower portions of the respiratory tract where they cause the most damage. Although the limiting upper diameter appears to be about 3 um, fibers that are much longer than wide can penetrate deeply in the respiratory tract.
>
> Length, Diameter, and Aspect Ratio (i.e., Ratio of Length to Diameter). Experiments inducing mesothelioma in rodents by injections of test material have indicated that long, thin fibers yield more tumors than do short, thick fibers. Samples with an overwhelming majority of fibers shorter than 5 um yielded mesothelioma in rats when injected intraperitoneally, but the pathogenic role of short fibers, especially those shorter than 3 um, is unclear. Fibers longer than approximately 10 um cannot be completely engulfed and inactivated by macrophages, and they have tended to produce more disease in animal tests than have the shorter fibers.
>
> Other Properties. The number of fibers, which is also correlated with surface area, generally appears to be a more relevant measure than mass in determing pathogenicity. Durability also appears to be a factor. The more durable fibers appear to be more pathogenic in some studies than fibers that are less durable. The relevance of fiber surface charge to effects on human health remains to be demonstrated. Some experimental studies have indicated that surface charge appears to be involved in cytotoxicity. Although chemical composition is related to physical properties of asbestiform fibers, a direct role for chemical composition per se in biological activity has not been demonstrated.

Considering what is already known concerning the potential health effects of fibers generally, the NRDC petition's advocacy on behalf of the uncontrolled use of aramid or other fibers in brakes, in place of the controlled use of asbestos, takes on an air of rashness. The health benefits, if any, to be derived from such a course of action must be viewed skeptically in light of what is presently known.

Similarly, the effects of a wholesale switchover to semi-metallic brakes must be given far more thoughtful consideration. Metals are known to posses a carcingenic potential; what are the effects of occupational and environmental exposure to respirable particulates from semi-metallic brake dust? Until an answer can be formulated to this question, indiscriminate substitution of semi-metallic brakes for asbestos-containing brakes should not be endorsed, much less required, by a government agency charged with protecting public health and the environment.

V. A Ban Would Be Contrary to the International Consensus on the Controlled Use Approach to the Regulation of Asbestos

That an international consensus exists favoring the regulatory approach of controlled use as oppossed to a ban on the use of asbestos was vividly illustrated following the announcement by EPA last year that it planned to issue proposals

calling for the immediate ban of certain asbestos-containing products and a more gradual phase-out of remaining asbestos uses. Diplomatic notes opposing EPA's regulatory approach were forwarded from Canada, the European Economic Community (EEC), the United Kingdom, Belgium, the Federal Republic of Germany, Austria, Switzerland, and Mexico.

In a speech delivered in December, 1983, Canadian Ambassador to the United States Allan Gotlieb noted:

> Nations that make up the European Economic Community have concluded, on the basis of a lengthy review by international experts, that properly regulated and labeled asbestos used at minimal exposure levels poses no undue risk. This position has the support of the International Labor Organization. A group of experts comprised of industry, labour and government representatives developed a code of practice for the "safe use of asbestos" which is generally consistent with the approach of the EEC.

This unfavorable international reaction prompted the EPA to conduct a poll through the State Department to determine whether any nations supported its plans. Only Denmark of all the responding nations supported the EPA approach (see "Inside EPA," at 5, August 31, 1984). Ironically, Denmark is the first nation to have taken regulatory action to address one of the most serious flaws in a ban approach. It has established an all-fiber regulatory

standard to assure that any fiber use is closely controlled.

The growing international awareness and consensus on the potential dangers resulting from the uncontrolled use of substitutes is echoed as well in the positions taken on this issue by responsible parties in the United States. The U.S. Department of Labor has recently joined the many nations who have concluded bans are unwarranted. In the Department's official comments to an ILO questionnaire on asbestos, the Department wrote:

> While continued use of asbestos may be curtailed where suitable substitutes are available, it should still be recognized that with appropriate protective measures asbestos is still a valuable resource. With regard to the replacement or substitution of asbestos by "harmless or less harmful substances," it should not be presumed that any substitute will be "harmless or less harmful." Rather, each potential substitute should be thoroughly evaluated.

The AFL-CIO's comments to the same ILO questionnaire agree that any "[a]ctions to require or encourage the substitution of asbestos must include a full evaluation of the toxicity of the substitute materials and regulation of these materials as necessary."

It is amply evident that the great majority of expert world opinion favors the approach of the controlled use of asbestos as oppossed to a ban and the resulting in-

crease in the unregulated use of substitute materials whose health effects have not been evaluated.

VI. The NRDC Petition Would Require the Application of "Zero Risk" Standard Rather Than the "Unreasonable Risk" Standard Required by TSCA

While acknowledging that TSCA requires a determination of "unreasonable risk" as the basis for regulatory action by the EPA, the NRDC petition is essentially premised upon a "no safe threshold" or "zero risk" approach. The petition asserts that "no 'safe threshold' levels of exposure to asbestos can be established," and, again, that "it is currently impossible to set a 'safe' level for exposure to asbestos."

Such assertions, while useful within the context of theoretical exercises such as the extrapolation of risk from high to low levels of exposure, become meaningless as guides for practical action. A claim of "no safe threshold" or "no safe level of exposure" is, at base, a declaration of the obvious, clothed in sinister garb. Limiting the proposition to the population of the United States at the present time, "no safe threshold" means there can be no guarantee of the total absence of any adverse effect in a population of approximately 230 million people. How many guarantees of absolute safety can be made concerning any sub-

stance, activity, or event on such a scale? A society which attempts to regulate to such a standard would soon find itself paralyzed and unable to function.

Regulation under TSCA, however, may not be based upon an absolute "no safe threshold" or "zero risk" approach. The statute specifically calls for the relative weighing and balancing of factors culminating in a determination of "unreasonable risk" before regulatory action is taken. Stripped of its reliance on deeply flawed projections of asbestos-associated disease - such as the discredited and disavowed "Estimates Paper" prepared by the U.S. Department of Health, Education and Welfare in 1978 - and its facile discussion of substitutes, the NRDC petition to ban the use of asbestos in brakes is an appeal for action based on a "zero risk" approach. As such, it must be denied as being outside the scope of actions permitted under TSCA.

VII. Conclusion

As the discussion in the preceding sections indicates, the use of asbestos in brakes does not constitute an unreasonable risk of injury to health or the environment. The absence of unreasonable risk, further evidenced in the international preference for the controlled use as opposed to the banning of asbestos, the questionable benefits of the unregu-

lated use of substitutes, and the social and statutory rejection of a "zero risk" approach to regulation should lead to the denial of the NRDC petition.

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