Testimony of A. Blakeman Early
On Behalf of the American Lung Association
before the Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety
Senate Environment and Public Work Committee
June 14, 2000

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Good morning Mr. Chairman and members of the committee. My name is Blakeman Earl) . I at.. an environmental consultant appearing on behalf of the American Lung Association. I was invited to discuss the benefits and problems associated with the use of ethanol in gasoline under the Clean Air Act. While the American Lung Association has been accused of being anti- ethanol, we consider our position to be neither anti nor pro ethanol. Our view is that ethanol should be used in gasoline when it can help provide useful properties to reduce air pollution and it should be discouraged from being used if the result is increased air pollution. Ethanol in Gasoline Helps Reduce Carbon Monoxide (CO) Ethanol's greatest attribute is its ability to provide oxygen to the fuel which can reduce carbon monoxide. Therefore, the ALA supports the use of ethanol in the wintertime oxy-fuel program to help reduce unhealthy levels of carbon monoxide. The oxy-fuel program is mandatory under the Clean Air Act for areas that are classified "moderate" non-attainment for carbon monoxide. But as you know, the air pollution effort against CO is being won and the number of these areas is diminishing. This is due primarily to improvements in emissions control equipment on new cars. Ethanol helps to reduce CO tailpipe emissions from older vehicles. Ethanol Provides Clean Octane Ethanol is a good source of octane and contains no aromatics and modest levels of sulfur. These three attributes make it useful as a blending component in gasoline. As a result, refiners use ethanol to help achieve limits on toxic aromatics and sulfur in the RFG program. We anticipate refiners will also use ethanol to help meet sulfur limits in EPA's recently promulgated Tier II sulfur limits for conventional gasoline which begins in 2004.

~While ethanol can help achieve limits to aromatics and sulfur, they do not guarantee that result, which is in part why the ALA does not support mandatory use of ethanol in RFG. Looking at Figure B2, taken from the Blue Ribbon panel report, you can see that the RFG sold in Chicago in 1998 achieved among the smallest reduction of air toxics, despite the presence of 10 percent ethanol.\1\ Further, looking at the attached Figures 15, 16, and 17 taken from an analysis of 1996- 1998 gasoline quality, you can see that sulfur levels in RFG sold in Chicago in 1996 and 1997 were among the highest in the nation despite the use of ethanol. However, in 1998 sulfur levels in Chicago dropped by 40 percent even though oxygen mandate was still being met with relatively the same amounts of ethanol.\2\ Ethanol can help lower sulfur level but does not guarantee it.

\1\~ Achieving Clean Air and Water, The Report of the Blue Ribbon Panel on Oxygenates in Gasoline, September, 1999, p. 43.

\2\ An Analysis of 1996-98 Gasoline Quality in the United States, SAE 199-01-3584, October, 1999.

The findings above demonstrate why the ALA does not support mandating ethanol to achieve any other outcome besides CO reductions in the wintertime. The ALA and many environmental organizations supported a 2 percent oxygen requirement for RFG in the Clean Air Act Amendments of 1990 based on the assumption at the time such requirement would guarantee reductions of VOCs, and tonics. We now know we were

wrong. Clearly, the best way to obtain reductions of specific pollutants from gasoline is to mandate them - set performance standards - and let refiners meet such requirements however they choose to.

Ethanol Increases Gasoline Volatility

Now let me turn to the problems caused by mandating ethanol in gasoline. Quite simply the big problem with ethanol use in gasoline is that it significantly increases volatility when mixed in gasoline al levels above 2 percent by volume. Reducing gasoline volatility during hot summer weather is one of the most important strategies for improving summertime gasoline in order to reduce smog. That is because with the advance of pollution equipment on automobiles, evaporation of gasoline hydrocarbons is now a greater contributor to smog in most areas than the tailpipe hydrocarbon emissions. The volatility increases that ethanol causes in summertime can overwhelm any benefit it provides in reducing CO tailpipe emissions, sulfur dilution or aromatics dilution. That is why the ethanol industry only talks about the tailpipe emissions benefit from ethanol in RFG. The ethanol industry often quotes last year's National Research Council study of reformulated gasoline as finding that CO reduction credit should be included for ethanol in EPA's complex model for RFG because CO tailpipe emissions contribute to ozone formation. But they fail to acknowledge what we believe to be a more important finding. The NRC report stated, "...the increase in the evaporative emission from the ethanol-containing fuels was significantly larger than the slight benefit obtained from the lowering of the CO exhaust emissions using the ethanol-containing fuel."\3\ The NRC also acknowledged that ethanol increases BOX tailpipe emissions relative to non-ethanol containing fuel. These NOX emissions also contribute to greater ozone and particulate formation.\4\ The bottom line: the reduction in CO tailpipe emissions obtained by using ethanol in summertime gasoline are not worth the increase in evaporation and the increases in NOX tailpipe emissions from a smog contribution point of view. Incidentally, the increases in evaporation do not just contribute to ozone formation. Since the gasoline also contains toxic aromatics, such as benzene, these will evaporate more readily along with the ethanol. While ethanol may dilute the amount of benzene in a gallon of gasoline, the amount of benzene that ends up in the ambient air due to increased evaporation from the fuel may be greater than if the ethanol were not added at all.

\3\ Ozone-forming Potential of Reformulated Gasoline, May, 1999, p. 158.

\4\ California Environmental Protection Agency Air Resources Board, Air quality Impacts of the Use of Ethanol in California Reformulated Gasoline, December, 1999.

It is argued that if ethanol is mandated in RFG, air quality is protected because refiners are required to limit the volatility by the RVP limits of EPA's RFG regulations. Thus the impact of ethanol on volatility is not a factor. This is not true. First, while it is clear refiners can off-set the volatility effect of ethanol by blending it with super low volatility blend-stock, we do not know what potential air quality benefits may be lost by changing other parameters of the fuel to meet the RVP limit. For instance, a refiner might actually increase aromatics because they need a sulfur-free component that is low in volatility to help off-set volatility increases from using ethanol. For example, turning back to Table B2, if ethanol were required in RFG sold in Rhode Island where MTBE has been used to provide oxygen, the significant tonics reductions achieved might decline to the same level achieved in Chicago as refiners increase aromatics to help off-set the volatility effect of the ethanol. Low Volatility RFG With Ethanol Can Cause Increased Evaporation of Fuel Even RFG with low RVP that contains ethanol may cause increases in evaporation compared to non-ethanol containing RFG in two ways: through increased permeation of "soft parts" in auto engines and also through co-mingling with ethanol free fuel.

EPA in its Tier 2 Final Rule identified permeation as a problem that can increase evaporation of gasoline. Essciitially, alcohol in fuels promote the passage of hydrocarbons through the "soft products" in cars, such as

plastic fuel tanks, hoses, and "o" ring seals. As a result, all new cars subject to Tier evaporative emissions requirements have to demonstrate that they are using materials that resist the permeability effect by testing them with fuel containing 10% ethanol.\5\ But of course this does nothing to protect the vehicles on the road today. Only vehicles being made since approximately 1994 have been consistently using alcohol resistant soft materials. How much will an ethanol-containing RFG meeting RVP limits increase evaporation from vehicles on the road today? Probably a great deal. The Toyota Corporation presented test data to the California Air Resources Board that showed a high RVP fuel increased evaporation from gaskets, plastic fuel tubes and plastic gas tank material by 500, 1300, and 800 percent, respectively (See Tabs 1, 2, 3). Even if a fuel meeting RVP limits caused permeation at a half or quarter of the rate of the non-complying fuel tested, this would have a major adverse impact on vehicle evaporative emissions. This concern is of special relevance to a renewable fuel mandate that would apply in areas that are in non-attainment for ozone where conventional gasoline is used. I will discuss this in a moment.

\5\ See discussion at 64 Federal Register, 26084, May 13, 1999.

Ethanol Fuel Can Increase Volatility of Non-ethanol Fuels

Finally, I must note the impact that ethanol volatility can have through a mechanism referred to as "co-mingling". Essentially when two fuels with the same RVP, one ethanol free and one containing ethanol, are mixed together the volatility of the entire mix is substantially raised. In a circumstance where consumers purchase ethanol free fuel, use a portion and then purchase fuel with ethanol in it, even if the ethanol blend is low RVP RFG, volatility can raise as much as 8/10ths of a pound RVP\6\. In essence the adverse volatility effect of ethanol is not limited to the absolute volume sold in a given market area. It can be greatly magnified, depending how much consigners switch back and fords in purchasing the two types of fuels. Whenever the volume of ethanol in the gas tank exceeds 2 percent, the volatility of the entire tank-full of gasoline will be increased. The "co-mingling" might occur between ethanol containing RFG and conventional fuel among drivers who frequent the areas on the border between non-RFG and RFG areas; among purchasers of ethanol-containing and ethanol-free conventional gasoline in non-attainment areas for ozone; or even within an RFG area where there is ethanol-free and ethanol containing RFG. The volatility increases that could be caused by the permeation and co-mingling effects of ethanol in RFG, under some conditions, could potentially offset the entire lower volatility benefit of moving from Phase 1 RFG to Phase 2 RFG.

\6\ In-use Volatility Impact of Co-mingling Ethanol and Non-ethanol Fuels, SAE 940765, February 1, 1994.

Ethanol Should Not Be Mandated in Summertime Gasoline Used in Smoggy Areas

All this leads the ALA to the conclusion that ethanol should not be mandated for use in summertime gasoline - RFG or conventional - in areas with smog problems. To the extent that refiners are allowed to use ethanol in summertime on a widespread basis, we must develop ways of calculating and off-setting the adverse effect from increased evaporation that will occur either from permeation, co-mingling, or both. For instance, California has lowered the RVP of its Phase 3 CalRFG by one tenth of a pound in an effort to offset the co-mingling effect. California is studying the need to provide a greater off-set. If ethanol is mandated through a renewable fuel standard such as is in Senator Daschle's S. 2053, which will triple the amount of ethanol in the national fuel supply, appropriate measures need to be taken to protect areas with smog problems. Congress should eliminate the one pound RVP waiver (Section 21 1 (h)(4)) currently available for corlventional gasoline containing 10 percent ethanol sold in the summertime in areas that are non-attainment for ozone. The RVP waiver for 10 percent ethanol fuel also should be eliminated from use in areas designated as non-attainment under the eight-hour National Ambient Air Quality Standard for ozone promulgated in July, 1997. The waiver could be retained for ethanol- containing gasoline sold in areas that do not have smog problems. This also

happens to be the region of the country where much of the ethanol is currently produced. Given what I have described today, refiners must at a minimum meet the same RVP limits that apply to ethanol-free conventional gasoline so that higher volatility ethanol-containing gasoline does not contribute to increased smog in areas that already have unhealthy levels of smog. This, of course, would not prevent the evaporative effects caused by co-mingling that I described previously. It would encourage refiners to avoid selling ethanol-containing gasoline in areas with smog problems during the designated ozone season because meeting lower volatility limits would increase refining costs. Of course, during the rest of the year refiners would be free to sell ethanol-containing gasoline in these areas, as no RVP limits apply.

Congress should also modernize the anti-dumping provisions for conventional gasoline in Section 211 (k)(8) to prevent increases in aromatics and other air pollution increasing constituents as they modify RFG. The ALA suggests substituting 1999 for the current 1990 baseline as a simple means of up-dating this provision to protect conventional gasoline.

Ethanol Increases NOX and Particulates

Most test data show that ethanol in RFG increases NOX tailpipe emissions. In California, the Air Resources Board asserts that these NOX increases are converted in the atmosphere to particulate poiiu~ion, thus making it more difficult to achieve the PM-1C National Ambient Air Quality Standard\7\. The ethanol industry asserts that ethanol in RFG actually reduces particulate emissions based on a test conducted by the Colorado Department of Health and Environment. Since this test involved higher RVP winter time fuel and wintertime temperatures, the ALA sees it as supporting the use of ethanol in wintertime oxyfuel, but not useful in judging the benefits of ethanol in RFG. We believe that the NOX increases from ethanol in RFG add to the body of evidence indicating mandatory ethanol use in RFG may increase rather than decrease air pollution levels from fuel.

\7\ Letter from Michael P. Kenney, Executive Officer, California Air Resources Board to Robert Perciasepe, Assistant Administrator of U.S. Environmental Protection Agency, February 7, 2000.

Ethanol Use in Gasoline and RFG Will Grow

Much discussion has been generated about mandating the us of ethanol in gasoline for air quality reasons, which the ALA opposes. However, we do believe there will be a large role for ethanol in gasoline without any mandate for one simple reason: octane. Assuming that MTBE is either phased down or eliminated from gasoline, which the ALA supports, refiners face a dramatic shortage in clean octane even if every MTBE plant in the nation is converted to produce iso- octane or allylates, the most logical substitutes for MTBE. This is because MTBE plants converted to produce iso-octane or alkylates lose about 30% volume and produce a product that contains 15 percent less octane per gallon. This octane shortage is magnified by EPA's Tier 2 low-sulfur gasoline standard which will be in full effect in 2006. Refiners will lose modest amounts Of Octane in conventional gasoline, as they treat it to reduce sulfur in order to meet the new 3G ppm sulfur average requirement. As a result of these two impacts, a rough calculation h~dica.es iliat demand for ethanol needed to supply octane in gasoline should increase to 3.4 to 3.8 billion gallons per year by 2006, depending upon whether MTBE is totally eliminated from gasoline.(See Tab 4 and Tab 5) This is at least twice the baseline volume of ethanol projected by the Department of Agriculture to be produced in 2006.\8\ Should Congress fail to lift the oxygen mandate for RFG so that all the octane currently provided by MTBE be replaced by ethanol in order to simultaneously meet the oxygen requirement, the demand for ethanol would reach 4.6 billion gallons per year in 2006. This would appear to exceed the ability of the ethanol industry to supply ethanol, based on a study conducted for the Governors's Ethanol Coalition.\9\ (See Tab 6) Such an outcome would undoubtedly lead to shortages, price spikes, and disruptions which could only lead to reductions in the air quality benefits provided by the RFG program.

\8\ U.S. Department of Agriculture, Economic Analysis of Replacing MTBE with Ethanol in the United States, March, 2000.

\9\ John Urbanchuk, Ability of the U.S. Ethanol Industry to Replace MTBE, March 20, 2000.

Clearly, we will need large increases of ethanol in gasoline, as we phase out MTBE. From an air quality perspective, it is best to set air quality performance requirements for gasoline and allow refiners to use ethanol when and where they need to while meeting performance requirements, taking into account evaporation effects from permeation and co-mingling. Should Congress ~decide to mandate ethanol in gasoline, we urge that additional air quality protections be put in place that would encourage ethanol use in ways that benefit air quality and not add to the air pollution burden.