

# The Health Benefits of Ethanol

A White Paper from the Clean Fuels Development Coalition

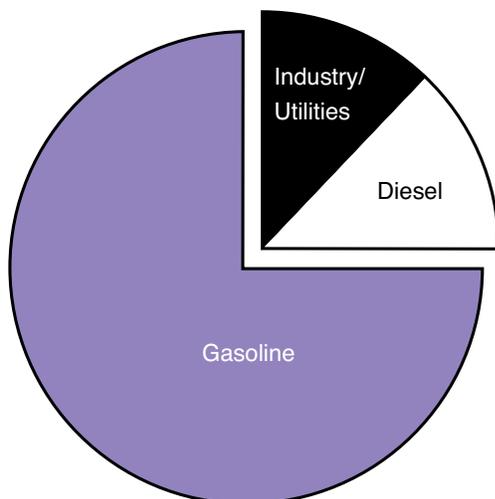
The most important attribute of ethanol and the reason it is blended in nearly 10% of all gasoline—it saves tens of thousands of lives annually—has gone completely unnoticed.

It is critically important to set the record straight, for a whole host of reasons ranging from energy security to public health to deficit spending and finally, to new jobs.

The health benefit stems from alcohol's high octane value. Cars have to have high octane gasoline to avoid something called "engine knock" that today's drivers escape, but that seriously jeopardized driving early last century. Charles Kettering, the famed GM scientist and inventor, discovered lead as a high octane antiknock agent almost 100 years ago and helped set off the automobile boom as a result. But lead turned out to be highly toxic and had to be removed from gasoline during the early Reagan years.

In the early 1980's, there were two possible lead substitutes—alcohol (ethanol and a methanol related cousin called MTBE) and gasoline components called aromatics (or the "BTX" group)—benzene, toluene and xylene. Aromatics are more expensive than ordinary gasoline itself and much more toxic—being carcinogenic and the largest single source of fine particle ("PM 2.5") pollution, which also results from power generation and which prematurely kills perhaps as many as 100,000 people annually, according to the Clean Air Task Force.

## Gasoline is the largest source of man-made carcinogens.



Source: U.S. Environmental Protection Agency

### C. Boyden Gray



C. Boyden Gray, of the District of Columbia, is the former Ambassador to the European Union (2006-2007) and former Special Envoy for Eurasian Energy Diplomacy (2008-2009). He also served as former Special Envoy for European Union Affairs (2008-2009) and as White House Counsel in the administration of President George H.W. Bush (1989-1993).

In his role as Counsel to President Bush, Mr. Gray became one of the principal architects of the 1991 Clean Air Act Amendments, and is widely credited with having triggered the CAA acid rain emissions trading system. He was also involved in the creation of the Energy Policy Act of 1992, which aimed to decrease American dependence on foreign oil, protect our environment, and promote economic growth. He has a long history of involvement with clean fuels and reformulated gasoline, extensive experience with the use of market incentives to achieve environmental goals, and is widely credited with having triggered the use of market incentives in connection with the phaseout of CFCs under the Montreal Protocol.

Even without considering that a substance of such toxicity might be more dangerous ton for ton than power plant emissions of SO<sub>2</sub> (which converts to ammonium sulfate in the air), direct PM emissions from transportation are much more dangerous to the public just on exposure grounds alone. The health benefits of reducing a ton of nitrous oxide (NOx) and sulfur oxide (SOx) are \$4,000 and \$28,000—but the health benefits of reducing direct PM auto exhaust are \$270,000/ton, stemming from the fact that people are much more exposed to concentrated harmful auto emissions than utility pollution.

Not surprisingly, the oil companies chose in the mid-1980's to manufacture and use their own aromatic products to fill in for lead rather than pay another industry. The resulting vast increase in toxic emissions prompted Congress in the 1990 Clean Air Act Amendments to require the use of "clean octane" for limited gasoline blending and require EPA to conduct a proceeding to phase out the rest of the aromatics as soon as possible. High octane MTBE was initially used as the

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“clean octane” 10% additive in nearly all gasoline (in part because it was cheaper than ethanol) until it was found to have water problems, at which time ethanol took its place. This is the reason for ethanol’s growth up to the blend wall of 10%. But EPA never ordered a meaningful reduction of toxic aromatics, which still amount to more than 20% of gasoline, and ethanol use has stopped growing—along with its prevention of premature deaths.

EPA is now imposing huge PM restrictions on stationary sources of air toxics at a cost of tens of thousands of dollars a ton, but ignoring mobile air toxic reductions that cost a fraction per ton but produce much bigger benefits as noted above. So the public pays more than necessary for public health mitigation efforts, funds are diverted from the Midwest to the Mideast, jobs are shipped overseas and tens of thousands of people suffer premature mortality. The war on terror and the drive to lower health costs and budget deficits deserve far better than this.

RFG with Oxygenates, Like Ethanol, Substantially Reduces Harmful Gasoline Emissions	
Air Toxics	-28%
Volatile Organic Compounds	-17%
Nitrogen Oxides	-3%
Carbon Monoxide	-13%
Sulfur Oxides	-11%
Carbon Dioxide	-4%
Particulate Matter	-9%
<b>Reduced Cancer Risk</b>	<b>-20% to -30%</b>

Source: Clean Fuels Development Coalition Technical Committee, California Air Resources Board

If ethanol is such a good bargain, such a magic bullet for security, public health and trade balances, then it is fair to ask the question why the marketplace does not assign it a much bigger role or why it has received such negative press. The question is one that must be addressed. Luckily there is a pretty clear answer and it has to do with how the government itself has tilted the playing field against the values that ethanol brings to the table.

As noted above, one of the major barriers to ethanol’s expansion into the market is the government’s own prohibition against recognition of ethanol’s almost unique value as a clean burning, high octane fuel. This value was well understood by the founders of the auto industry—especially Ford and Kettering (of GM)—who actually thought in the 1920’s that ethanol was the fuel of the future, before the discovery of the big oil

fields in Texas and the Middle East that drove down oil’s price well below that of alcohol. Subsequently, oil consolidated its position both as a fuel and as a virtually equal partner with the U.S. government in foreign policy, using its prominence to avoid antitrust problems as well as air quality regulation, at least until the 1990 Clean Air Act Amendments (and even then, it has diverted attention from itself to the utility and auto industries as a way of avoiding regulation). Of course, today the price advantages are reversed in ethanol’s favor even without the tax incentive—but oil continues to enjoy the most favored position.

## Big Oil Enjoying \$40 Billion Annually in Subsidies

The primary early advantage oil secured was highly favorable tax treatment in the form of direct and indirect subsidies that amounted to around a trillion dollars during the course of the 20th Century. The principal subsidy—the oil depletion allowance (which worked as its name suggests to deplete U.S. oil reserves)—has been now largely phased out, but oil still enjoys about \$40 billion annually in subsidies. This is multiples of the cost of the tax incentive for ethanol (that actually goes to the oil industry). It is therefore a marvel that the government has let the industry get by with shouting “tax increase” whenever oil’s subsidies are questioned, but equally let sit the condemnation that ethanol enjoys an un-American advantage whenever its subsidy is discussed.

But it is even more of a marvel that the government (here the EPA rather than the IRS or the Antitrust Division of the Department of Justice) has focused so intensively on the utilities and the auto industry for the bulk of pollution reductions. EPA’s consistent failure to try to approximate a level playing field between pollutants has provided the oil industry with a regulatory subsidy that amounts to more than \$100 billion annually. That is, by forcing other industries to reduce air toxics and criteria pollutants like PM at costs of tens of thousands of dollars per ton of cleanup when the same reduction could be achieved by oil at a fraction of that cost, EPA is effectively subsidizing the oil companies at the expense of everyone else, including consumers.

It is thus highly misleading when the oil industry complains about the potential job losses from any regulation whatsoever. Regulation that has a negative cost-benefit ratio should of course be rejected. But where a rule levels the playing field and provides huge net benefits to public health or some other public good and relieves other industries of much higher cost and less beneficial regulation, that rule should be embraced because of the increases in both employment and public health. Put another way, regulatory subsidies operate just as tax subsidies do to distort the marketplace, destroy competition and undermine job creation.

The subsidies discussed previously do not include the costs of the US military to keep safe the oil producing regions of the world and keep open the sea lanes to ship the oil. An astounding 90% of oil deposits today reside in hostile hands. The Mideast peace process is in substantial ways held hostage to U.S. oil dependency. And Iran's nuclear ambitions are ultimately in service of its regional oil-related power base.

## EPA Rules Discriminate Against Ethanol

Given the economic and strategic importance of oil, it is therefore not surprising to read recently that oil employs former government regulators in numbers that vastly exceed that of other industries. This massive revolving door with government has resulted in at least four specific EPA rules which discriminate against ethanol—three of which could be corrected without going to Congress as they in fact violate existing Congressional directives.

**The first is EPA refusal to enforce the mobile source air toxics rule.** This requires a reduction in transport fuel toxics as much as available, reasonable cost technologies permit. EPA did nothing in a 2007 rulemaking on the grounds that ethanol's availability as an octane substitute was cloudy at best and was not cost effective in any event—EPA using as a reference point a 1993 study putting the price of oil at \$17 per barrel. Ethanol is now in oversupply and cheaper than gasoline. More importantly, ethanol is less expensive than the aromatics with which it directly competes on octane. The benefits are huge, though perhaps not calculable down to the last dollar. But we know from EPA that aromatics are the largest single source of urban particulate matter (PM) and that the value of reducing each mg of PM is worth approximately \$100 billion, making a 80-90% reduction of aromatics—in line with stationary source reductions and made possible by ethanol's octane—worth at least \$100 billion if not more (the health benefit of reducing

a ton of PM 2.5 caused by aromatics and diesel is worth \$270,000 per ton, almost ten times the \$28,000 per ton value of reducing SO<sub>2</sub> (NOx is worth only \$4,000 per ton). If you recognize that aromatics are also 20% more carbon intensive than regular gasoline and that reducing a ton of carbon is worth today about \$20 per ton, it is possible to grasp the enormity of the net benefits from leveling the playing field on toxics regulation.

Particle pollution is linked to a wide variety of serious health effects, including aggravated asthma, irregular heartbeat, heart attacks, and premature death in people with heart and lung disease. Americans throughout the country are suffering from the effects of pollutants in our air, especially our children who are more vulnerable to these chemicals. By reducing harmful pollutants in the air we breathe, we cut the risk of asthma attacks and save lives." EPA Administrator Lisa P. Jackson 08/09/2010

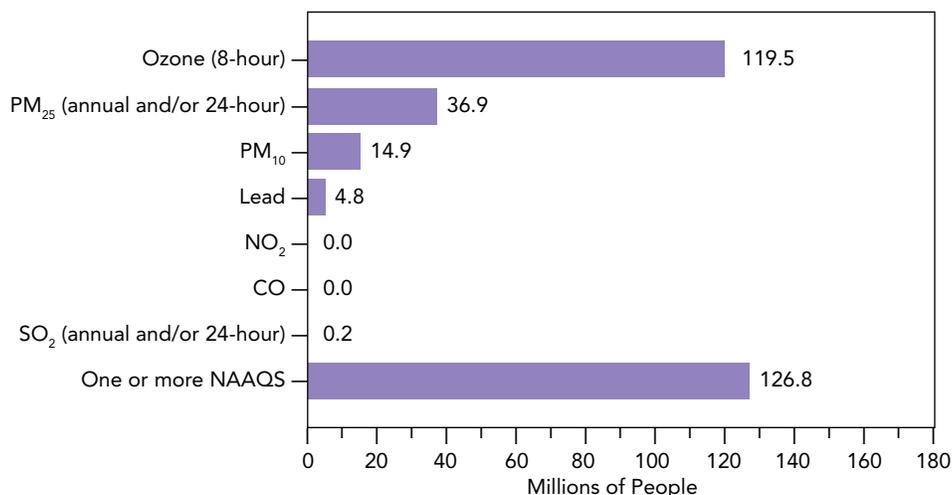
**The second roadblock established by EPA is its rule against state regulation of transport VOCs.** EPA acknowledges the key role transport VOCs—especially aromatics—play in the formation of PM 2.5, but says that it cannot measure the benefits of state regulation with enough precision to permit that regulation. But since the establishment of that rule, EPA has issued a new transport model (MOVES2010) that takes into account an EPA study in the Kansas City metro area that includes aromatics and that acknowledges a 60% increase over prior models in the contribution of transport emissions to PM formation. It has completed other studies as well that confirm the billions that would be saved by phasing out aromatics. As a result, there is no basis for EPA's rule against state VOC regulation.

It is true that, with one big exception, there is limited scope for state regulation of transport VOCs because of federal

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Despite clean air progress, approximately 127 million people lived in counties that exceeded any national ambient air quality standard (NAAQS) in 2008. Ground-level ozone and particle pollution still present challenges in many areas of the country.

Source: U.S. EPA, *Our Nation's Air - Status and Trends through 2008*, February 2010, EPA -454/R -09-002



preemption for nationwide sources of pollution such as cars and fuels. But the exception is very large—regulation of centrally fueled fleet vehicles that the 1990 Clean Air Act Amendments committed to the states and that accounts for as much as one-third of all vehicle miles driven. This is the third major roadblock, as EPA permitted states to abandon fleet regulation in 1993 at a time when PM 2.5 was not even identified as the major pollutant it is now. As a result, states should now understand that they can seek highly valuable reductions from large fleet operations if they ask EPA to rescind the nearly 20-year old waiver.

**The final EPA roadblock is the set of rules prompted by the 2007 Energy Bill that caps the use of corn-based ethanol at 15 billion gallons** and requires advanced cellulosic ethanol to clear a CO<sub>2</sub> life cycle advantage of 50% over baseline gasoline in order to be sold. This is highly discriminatory, as there is no CO<sub>2</sub> regulation of any other CO<sub>2</sub> source that required anything approaching a 50% improvement. Indeed, the major legislative climate proposals such as Waxman-Markey and Kerry-Lieberman never sought more than a 17% improvement. The facts are that modern gas-fired ethanol plants meet a 50% hurdle (and more) and should therefore be allowed to compete in the marketplace with other sources of ethanol—and there should be no minimum hurdle that

requires ethanol to be much cleaner even than tar sands-based fuels. The land use theory that ethanol production destroys the rain forest is a distinct curiosity, since ethanol production from corn has stayed within corn's steep productivity growth and grain exports from the United States have never been higher—using millions less acres than 50 years ago. Indeed, EPA acknowledges that higher corn prices (related to oil prices far more than corn demand) probably relieve pressure on rain forests because higher corn prices result in smaller cattle herds, the growth of which account for most rain forest loss in Brazil.

## The Path Forward

Changing these rules will require new legislation, which will in turn require an extensive educational campaign to reverse the deceptive media that has plagued ethanol for several years. There is also a need for government assistance in providing relief from the monopolization of the gasoline and diesel refueling network in the United States. Tax incentives are one way to provide for flexible fuel pumps to service FFVs to expand the market for ethanol. Another way is to look at the antitrust laws and how they might compare the concentration of fuel providers today with the concentration of TV providers prior to the modern era of cable and satellite.

The national average cancer risk level in 2002 is 36 in a million. Many urban areas as well as transportation corridors show a risk above the national average. From a national perspective, benzene is the most significant toxic air pollutant for which cancer risk could be estimated, contributing over 30 percent of the average individual cancer risk identified in the 2002 assessment. Source: U.S. EPA, Our Nation's Air - Status and Trends through 2008, February 2010, EPA -454/R -09-002

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