Comments of the American Chemistry Council
On the Draft Update to Initial Scoping Plan for AB 32
California Air Resources Board
November 1, 2013

1. The Draft Should Take an Updated Approach to End-of-Life Disposition of Consumer Products and Municipal Solid Waste

Section III of the Draft, Subsection 7, begins with the observation that the Recycling and Waste Management Sector covers "all aspects of solid waste and materials management, including landfills; recycling, reuse, and remanufacturing of recovered material; composting; anaerobic/aerobic digestion, and municipal solid waste (MSW); biomass combustion; and landfilling." We could not agree more.[1] It is essential that end of life solid waste management respect the well-established solid waste hierarchy of reduce, reuse, recycle, and recover, a hierarchy embedded as part of EPA solid waste policy.

With respect to "reduce," plastics manufacturers have led the way in recent years with respect to source reduction, best illustrated by innovations making possible further significant reductions in weight of plastic water bottles and milk jugs. And the plastics industry has also been a leader in recycling. Since 1990, the plastics industry, as individual companies and through organizations such as ACC's Plastics Division, has invested more than $2 billion to support increased recycling and educate communities in the United States. These programs include dedicated resources to support better education for the curbside recycling of bottles, containers, and rigid plastics, and away from home recycling infrastructure such as ACC's partnership with CalTrans and California State Parks to deploy recycling bins at California's rest-stops and popular beaches. Additionally, ACC has been one of the lead funders in Keep America Beautiful's new "I Want to be Recycled" campaign to increase recycling awareness among consumers nationally. The recycling of plastics in the United States has grown every year since 1990.

Market incentives to continue aggressively effecting additional source reduction already exist, as it delivers – where performance is maintained - significant and immediate cost savings to shippers, good manufacturers, and consumers alike. So there are two primary future challenges to effectively implementing the hierarchy for continued delivery of GHG emissions reductions: achieving further increases in recycling, and adopting a modernized and integrated approach to energy recovery as a necessary complement.

A. The Board should include plans to promote and educate increased recycling by communities and businesses more aggressively in the Draft.

With respect to recycling, California has continued to pursue aggressive goals for recycling rates, which is laudable. The approach we recommend as most effective to achieving such goals rests on making a state-wide commitment to education and promotion of community recycling opportunities, with expanded local access to recycling facilities for a wider range of household items as well as municipal solid waste. Maximizing participation of voluntary recycling is the most effective, threshold step to any program to

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[1] Efficient recycling of plastics can reduce energy use and greenhouse gas emissions. A study conducted for ACC in 2011 looked at the use of recycled HDPE and PET and found that the recycling of HDPE and PET containers and bottles in 2008 reduced GHG emissions by 2.1 million tons of CO2 equivalents and amount comparable to removing 360,000 cars from the road. Fortunately, recycling plastics has never been easier. Today, 94 percent of U.S. consumers can recycle all types of plastic bottles and caps locally, and over sixty percent of California's communities can recycle other types of plastic containers and lids from products such as yogurt, sour cream, and butter. Recycling plastics helps valuable materials live on as new products. Many people reuse plastics—things like storage bins, sealable food containers and refillable sports bottles, which also helps to reduce waste.

increase recycling. Methodology is readily available to help understand how to motivate recycling behavior.[2] Approaches like Extended Producer Responsibility should not be considered until the classic elements of the solid waste hierarchy have been fully maximized.

B. The Board should directly address the availability and integrated value of energy recovery technologies in the Draft.

Likewise, existing data suggests that the solid waste hierarchy is proven to work with respect to thoughtful implementation of energy recovery, with the Connecticut Resources Recovery Authority reporting energy recovery savings of 32 million barrels of oil and reductions in the volume of material destined for landfills of 90 percent.[3] We urge the Board to address energy recovery more robustly in its Draft, particularly with respect to new and emerging technologies. An extended Appendix of additional information on energy recovery is provided below for the Board's consideration.

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The American Chemistry Council appreciates the opportunity to comment. We urge the Board to take this important and timely opportunity to help meet GHG reduction goals as well as solid waste management priorities and targets through utilization of energy recovery and complementary recycling. ACC looks forward to sharing additional research and information with the Board in the near future and would be happy to discuss these important issues with Board staff.

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[2] See, e.g., Massachusetts Department of Environmental Protection: Recycling: *Why People Participate; Why They Don't*, http://www.mass.gov/dep/recycle/reduce/crbdrop.pdf ("understanding what motivates people to recycle and what discourages them from doing so is the first step towards increasing participation.)

[3] http://www.crra.org/pages/reduce_rrrr.htm#recover

Appendix
Supplemental Information

Transportation Sector

ACC has strongly supported the new Federal standards for fuel economy for cars and trucks. Plastics and composite materials, are helping to solve many of our nation's challenges, including those faced by automakers to meet increasing fuel economy standards. Today plastics and composites typically make up 50% of the volume of a new light vehicle but less than 10% of its weight, which helps make cars lighter and more fuel efficient, resulting in lower energy use and greenhouse gas emissions. For example, a Life Cycle Assessment done recently on two lightweight plastic parts found dramatic potential for energy and greenhouse gas reductions. Lightweighting running boards on 148,658 GMC 2007 Trailblazers reduced the use of energy equivalent to saving 2.7 million gallons of gasoline over the life of the vehicles. CO2 emissions reductions are equivalent to removing 3,182 commuters from area roads for a year.[4] Similarly the LCA found, lightweighting the front end bolster on 70,666 Ford Taurus 2010 models reduced the use of energy equivalent to saving 770,000 gallons of gasoline over the life of the vehicles and CO2 emissions reductions are equivalent to removing 907 commuters from area roads for a year.[5] Additional plastics lightweighting can bring additional savings of energy and CO2 emissions. Another opportunity to increase fuel efficiency and reduce GHG emissions exists through increased use of lightweight polycarbonate glazing in auto applications. LCAs show polycarbonate glazing produces 36% lower life cycle GHG footprint and uses 26-32% lower life cycle energy compared to glass.

Source Reduction

Together, the chemical, plastics and composites industries can successfully harness new and innovative vehicle technologies to help manufacturers safely increase fuel efficiency and reduce greenhouse gases. ACC supports the Federal CAFE regulations that will reduce auto energy use.

Plastics help reduce energy and material consumption at the source. For example, a soon to be released study titled "Impact of Plastics Packaging on Life Cycle Energy Consumption & Greenhouse Gas Emissions in The United States and Canada" conducted by Franklin Associates compared six types of plastic packaging (caps and closures, beverage containers, other rigid containers, carrier bags, stretch/shrink wrap, and other flexible packaging) in the U.S. to the alternatives made with other materials.

According to initial drafts of the study, if alternative materials were used in these six packaging areas, they would:

- Require 450 percent more material by weight;
- Require 80 percent more energy demand – on an annual basis, that's equivalent to the energy from more than 3,800 oil super tankers; and
- Result in 130 percent more global warming potential impacts – that's equivalent to adding 15.7 million more cars to our roads each year.

[4] PE International, Life Cycle Assessment of Polymers in an Automotive Assist Step, April 2012 http://plastics.americanchemistry.com/Education-Resources/Publications/Life-Cycle-Assessment-of-Polymers-in-an-Automotive-Assist-Step.pdf

[5] PE International, Life Cycle Assessment of Polymers in an Automotive Bolster, April 2012 http://plastics.americanchemistry.com/Education-Resources/Publications/Life-Cycle-Assessment-of-Polymers-in-an-Automotive-Bolster.pdf

In packaging as well as in transportation and building products, plastics are already helping to significantly reduce greenhouse gas emissions.

Energy Recovery

Even with the tremendous environmental benefits created by source reduction and recycling, there are some materials that cannot yet be efficiently collected and recycled in a manner that is environmentally and economically beneficial. However, much of this non-recycled material could be converted into various forms of energy to help power homes and businesses in our communities. ACC concurs with Gail Farber, director of public works for Los Angeles County, who said in her submission to the Department of Resources, Recycling and Recovery and the Air Resources Board (July 11, 2013), "We support the 'highest and best use' of waste materials, based on material type and quality of that material; not every material is suitable for composting or recycling and those that are not should be converted into useful products. We believe it is vital for the Scoping Plan to provide adequate consideration to the role that fuels and energy from post-recycled waste materials can play to help achieve greenhouse gas (GHG) emission reductions across all sectors of California's economy."

A number of countries have resourcefully incorporated modern energy recovery approaches and technologies, particularly in Europe (such as Germany, Denmark, Sweden, and Switzerland) and Japan. Recent data show that Europe has achieved a total diversion rate (recycling plus energy recovery) of 61.9% with 35.6% of that total represented by energy recovery. By deploying a combination of recycling and energy recovery, nine European countries have now achieved total diversion rates over 90% for all materials.

A large portion of America's non-recycled waste stream continues to be landfilled – a missed opportunity to recover valuable energy content. In fact, in California nearly one billion tons of waste has been placed in landfills since the passage of AB 939 in 1989 -- the equivalent of filling Dodger Stadium with waste thousands of times.

New and existing energy recovery technologies offer enormous potential to convert more U.S. waste streams to energy and other valuable commodities. In a report prepared for ACC, engineers at Columbia University estimate that if all U.S. municipal solid waste was captured and converted to energy each year, the energy produced would power at least 16 million households.[6] As technologies advance, companies – ranging from Fortune 100 waste management companies to privately-owned, medium-sized companies to small entrepreneurs – are working to commercialize technologies that could convert our waste into valuable products such as liquid fuels and chemical feedstocks.

Energy recovery has been demonstrated to be complementary to plastics recycling. In areas where waste-to-energy facilities operate, it has frequently been documented that communities actually have higher recycling rates.[7]

Energy Recovery– Range of Technologies

Technologies that recover energy from waste recapture the embodied energy in municipal solid waste so that it can be deployed toward a useful end. Not surprisingly, because many plastics are made by polymerizing simple hydrocarbon molecules, they can be "unmade" into simpler constituents through

[6] "Energy and Economic Value of Non-recycled Plastics (NRP) and Municipal Solid Wastes (MSW) that are Currently Landfilled in the Fifty States", The Earth Engineering Institute of Columbia University, 2011.
[7] "Recycling and Waste-to-Energy: Are the Compatible? 2009 Update," Governmental Advisory Associates, Inc. June 2009.

energy recovery. Many plastics contain as much "embodied energy" as other high-Btu fuels, like coal, and more energy than traditional fuel sources like wood. In the Columbia University report cited above, it was estimated that mixed plastics in the waste stream average 14,000 BTUs/lb. This energy content is higher than most coals currently burned in the United States, as well as that of petroleum coke.

There are three groups of technologies used to recover energy from municipal solid waste:

- Waste to energy (large scale thermal treatment)
- Engineered Solid Fuel (processing non-recycled wastes into replacement fuels for coal and petroleum coke)
- Conversion technologies (Pyrolysis or gasification to produce fuels, waxes and chemical feedstocks)

GHG Emissions Benefits of Energy Recovery

Currently, U.S. waste-to-energy plants prevent the release of thirty million metric tons of greenhouse gasses in the form of carbon dioxide equivalents that otherwise would be released into the atmosphere on an annual basis.[8] Comparing the greenhouse gas footprint of a waste-to-energy plant to a landfill facility, nearly one ton of carbon dioxide equivalents are avoided for every ton of trash handled by a waste-to-energy plant. Greenhouse gas emissions are reduced in three ways:

- Avoiding methane emissions from landfills (some of this methane can be collected and used to generate electricity, some would not be captured and would be emitted to the atmosphere)
- Recycling ferrous and/or nonferrous metals (lower emissions and energy consumption than production from virgin raw materials)
- Avoiding emissions from fossil fuel based power production

In 2007, the Global Roundtable on Climate Change (GROCC) issued a joint statement identifying waste-to-energy as a means of reducing carbon dioxide emissions from the electric generating sector.

In several of the studies commissioned by ACC (and found on our website at http://plastics.americanchemistry.com/energyrecovery) greenhouse gas emissions reductions and environmental benefits from converting our non-recycled plastics and paper waste into energy are documented.

The study by the Earth Engineering Institute at Columbia University found that "increased Waste to Energy capacity would reduce the carbon footprint of waste management in the United States. For example, a 25% diversion of mixed biomass and non-recycled plastic in municipal solid waste from landfills to new waste to energy facilities will result in greenhouse gas (GHG) reduction of 35 to 70 million tons of carbon dioxide equivalents, depending on the degree of landfill capture in present landfills."[9]

Analysis by the University of Texas demonstrated the GHG and other emissions benefits of energy recovery through conversion into Engineered Solid Fuel and use of that fuel as an alternative to coal at a cement kiln. "The experimental test burn and accompanying analysis indicate that using Municipal Recovery Facility residue to produce (Engineered Solid Fuel) for use in cement kilns is likely an

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[8] "Municipal Waste to Energy in the United States: 2012 – 2013 Yearbook and Directory", Ninth Edition. Berenyi, Eileen (Westport, CT: Governmental Advisory Associates. 2012)

[9] "Energy and Economic Value of Non-recycled Plastics (NRP) and Municipal Solid Wastes (MSW) that are Currently Landfilled in the Fifty States", The Earth Engineering Institute of Columbia University, 2011.

advantageous alternative to disposal of the residue in landfills. The use of (Engineered Solid Fuel) can offset fossil fuel use, reduce CO2 emissions, and divert energy-dense materials away from landfills."[10]

Two of the more advanced and emerging conversion technologies for recovering energy from mixed plastic waste are called pyrolysis (or de-polymerization) and gasification. In the pyrolysis process, plastics are heated in the absence of oxygen until they eventually melt and then gasify. Most of the gases are then cooled, condensed and converted into synthetic crude oil or further refined into synthetic fuels such as diesel or naphtha. Other gas by-products can be used for heating required in the conversion process. In the gasification process, non-recycled wastes are heated and converted to synthesis gas (syngas) in an oxygen deficient atmosphere. The syngas has significant versatility as it can be converted into chemicals or fuels such as methanol and ethanol.

The primary benefit of plastics conversion technologies is their potential to convert non-recycled plastics into valuable petroleum feedstocks and fuels, thus displacing extraction and refining of fossil fuels.

In addition to the greenhouse gas benefits of traditional mass burn waste-to-energy and engineered solid fuels, the 2012 report from the Research Triangle Institute (RTI) found similar GHG benefits for new conversion technologies. "Life-cycle environmental review shows that waste conversion technologies have significant environmental benefits in energy saved and greenhouse gases averted compared to landfill disposal. Specifically, the study concluded that not only does gasification and pyrolysis of waste plastics save energy compared to landfill disposal, but that , gasification of MSW saves 0.3–0.6 tons of carbon equivalent (TCE) emissions per ton of MSW and pyrolysis of waste plastics saves 0.15–0.25 TCE emissions per ton when bother are compared to landfill disposal.[11]

To date, several companies have matured beyond pilot-scale facilities and now have full-scale commercial systems as well as partnerships and investments with larger waste management and recycling companies. Continued growth of all these technologies that divert useful materials from landfill and convert more of our non-recycled waste to energy and useful products will have a significant impact on greenhouse gas reductions in California.

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[10] "Residue-Derived Solid Recovered Fuel for Use in Cement Kilns" by: John R. Fyffe, Alex C. Breckel, Aaron K. Townsend, Dr. Michael E. Webber. The University of Texas at Austin, Cockrell School of Engineering. July 1, 2012

[11] "Environmental and Economic Analysis of Emerging Plastics Conversion Technologies," Final Project Report, RTI International. January 10, 2012.

ACC offers a series of reports which are publicly available at http://plastics.americanchemistry.com/energyrecovery:

- "Plastics to Oil - Conversion Technology: A Complement to Plastics Recycling", 4R Sustainability Inc. 2011.
- "Energy and Economic Value of Non-recycled Plastics (NRP) and Municipal Solid Wastes (MSW) that are Currently Landfilled in the Fifty States", The Earth Engineering Institute of Columbia University, 2011.
- "Environmental and Economic Analysis of Emerging Plastics Conversion Technologies*",* Research Triangle Institute International, 2012
- "Residue Derived Solid Recovered Fuel for Use in Cement Kilns", The University of Texas at Austin, Cockrell School of Engineering, 2012.
- Gasification of Non-Recycled Plastics from Municipal Solid Waste in the United States —Gershman, Brickner & Bratton, Inc., 2013