Product Stewardship Opportunities within the Automotive Industry – *Executive Summary*

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This Executive Summary is extracted from a research report entitled “Opportunities for Product Stewardship within the Automotive Sector”. For a copy of the full report, or to receive more information on this research please contact:

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Executive Summary

Today, approximately 95% of the cars and trucks we drive in the U.S. enter the vehicle recycling infrastructure when they reach the end of their useful life. Each individual vehicle is recycled at a rate of more than 75% by weight. This collection and recycling rate is high when compared to other products such as appliances, aluminum cans or paper products, which are collected at rates of 52%, 55% and 42% respectively. This is partly because recyclers are able to recover and resell useable automotive components and to recycle most metal materials from the vehicle. Remaining materials however, are shredded and sent to landfill as automotive shredder residue (ASR). Five million tons of ASR is disposed of in landfills in the U.S. each year. Several factors influence this process, including the types of materials in the vehicle (both valuable and less-valuable materials), the ease of recovering each material and whether there are markets for the recycled materials.

While there is much activity in the U.S. to reduce emissions generated during vehicle use, find alternative fuel systems and address environmental impacts of operations, other end-of-life issues associated with vehicles have been less researched to date. There may be potential to further reduce the environmental impact of vehicles through increased use of recyclable materials and materials with recycled-content, and reductions in materials of concern.

This report presents information on the vehicle design process, materials used in vehicles and some of the trends in materials used. It also describes factors that can influence materials used and presents challenges and opportunities to address materials of concern, recyclable materials and recycled-content in vehicles. In these areas it was found that there are opportunities to improve the environmental performance of vehicles across the life cycle, referred to as product stewardship in this report. This Executive Summary presents conclusions drawn from the report, as follows:

There may be potential to further reduce the environmental impact of vehicles through vehicle design. It is important to understand the vehicle design process in order to find effective points for making any design changes. During the vehicle design process, there are certain optimal points for making changes to a vehicle’s design (i.e., making a car door with a new recycled-content plastic, or using a lead-free solder in an electronic component), be it to an existing vehicle or a new vehicle model. Likewise, there are points during the design process that are sub-optimal (in terms of cost efficiency) for making such changes. In addition, vehicle sub systems are often shared among vehicles and combine to form what are known as vehicle platforms. From each platform a large number of different vehicles may be built and sold globally (i.e., a mid-sized sedan platform may support economy cars as well as luxury cars). Once a design is changed, that change might be reflected in all the vehicles on that platform, globally. For this reason, it is possible that a design change made in the U.S. may be reflected in cars produced and sold overseas, while vehicles designed in the European Union (e.g. to meet requirements of the ELV Directive) or in Japan may also be produced and sold in the U.S.
While automakers in the U.S. have long been undertaking environmental activities, international drivers are challenging the industry to go further on specific issues. Over the past two decades, U.S. automakers have set goals and worked to restrict uses of mercury, lead, cadmium and hexavalent chromium in specific vehicle components. Many U.S. automakers are also working to increase the use of materials with recycled-content or materials that are recyclable. Collectively, automakers are working on certain issues, such as the USCAR Vehicle Recycling Partnership’s (VRP) “preferred practices” for recycling. The European Union’s End-of-Life Vehicle Directive will challenge automakers to go further, in some areas. It specifies the elimination of substances of concern, sets recyclability targets and encourages more recycled content to be incorporated in vehicle designs. According to some manufacturers, the Directive has already influenced further reduction in lead and hexavalent chromium and has led to new supplier requirements in data collection. Today, most automakers in the U.S., the European Union and Japan require their suppliers to disclose all materials used in vehicles by entering this data into an international materials database system (IMDS).

Several trends in automotive design, while not entirely driven by environmental concerns, may impact recyclability. First, companies are looking to use fewer types of materials in an attempt to reduce costs. This may positively influence the recyclability of vehicles in future, in part because less sorting may be needed at the end of life. Second, electronics are increasingly used in vehicles in navigation and entertainment systems, among others. This trend may pose problems to vehicle recycling as electronics contain highly varied materials (from different plastics to flame retardants to heavy metals such as lead). Third, reducing vehicle weight for fuel efficiency will change the material make up and will in turn affect recyclability.

There are also trends in the materials used in vehicles that will affect recyclability. First, there is a clear increase in the use of plastic materials. Currently, these are not recovered or recycled from vehicles at a high rate. To a lesser extent, there is an increase in the use of composites (which, to date, are not highly recyclable) and an increase in the use of natural fibers or other bio-based materials. Automotive manufacturers and suppliers are researching new materials, such as soy based urethane foams. It is as yet unclear how these may impact vehicle recyclability.

Several research groups in the U.S., Europe and Japan have been developing technologies to separate and recycle plastics from ELVs. While these technologies now exist, they are not widely available or applied. This is partly because they are not yet cost effective, there are no strong markets for the recycled materials and the markets for virgin plastics are well established. Without an applied infrastructure to separate and recycle plastics, and subsequent markets for their resale, higher recyclability goals set by automakers will not reduce the amount of ASR going to landfill. Without a recycling infrastructure, there is less incentive to invest in selection and testing of recyclable materials.1

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An increase in the use of recycled content in vehicles would require a consistent and large supply of feedstock. There is currently a lack of infrastructure in the U.S. for identifying, separating and recycling volumes of plastic large enough to support the automotive industry.

Automotive manufacturers are using recycled content in some applications; however there are opportunities for it to be used more. This may help to develop markets for recycled materials from vehicles, but perhaps also from carpets and plastic beverage containers as well. Important challenges include the resources needed to test and approve these new materials, as well as life cycle studies to determine whether they actually reduce the environmental impacts from vehicles. For instance, using recycled content may compromise recyclability.

Automakers and suppliers recognize mercury, cadmium, lead, hexavalent chromium and brominated flame retardants as important issues. The use of these materials is being reduced in several applications. In cases where they are still used, alternative designs and materials exist or are under development. Thus, there may be opportunity to support research on alternative design solutions and to support the changeover from existing materials, technologies or designs. The same may be true for uses of PVC, sodium azide and various potential materials in hybrid batteries.

The use of electronics in vehicles is increasing, and these contain heavy metals, flame retardants and materials that are difficult to separate and recover at end-of-life. This is true for electronics in both automotive and non-automotive applications. Currently, the electronics industry is working on product stewardship initiatives in several U.S. States, in the European Union and globally. There may be opportunity for the automotive industry to both support this work (i.e., supporting environmentally preferable or eco-labeled electronics) and to be involved in it.

Establishing consistent communication and feedback among manufacturers, suppliers and end-of-life managers will be essential to helping make the end-of-life treatment of vehicles more cost effective. To enhance communication about recyclable materials in vehicles, new materials in vehicles (such as composites or plastics containing natural-fiber) and materials of potential concern, it will be important to identify all parties who may be affected and engage them, both early and throughout a collaborative process. As examples, it may be possible to learn from BMW’s approach to certifying vehicle recyclers, or Mercedes Benz’s recycling system of service stations in Germany. Furthermore, there may be potential to increase “labeling” or otherwise marking certain types of materials in the vehicle. This could make it easier for each actor in the chain to recognize potentially valuable materials and find opportunities to dismantle, separate and recycle materials that are currently sent to landfill. In addition, it may be worth exploring how to encourage manufacturers, suppliers, material producers and recyclers to set and report publicly on goals for environmental improvement. This could help to educate customers on the environmental impacts of

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vehicles, progress being made to address these impacts and how they may be able to support these efforts. In turn, this could stimulate demand for vehicles designed for better environmental performance.

**Using a life cycle approach to assess potential new materials is important.** Life cycle assessments are currently the best-known approach to uncover certain environmental trade-offs among various alternatives. For example, the industry is moving away from using hexavalent chromium and flame retardants (PBDE and PBB), yet there may be a need to better understand the environmental impact of any alternatives to these. Additionally, the increasing use of bio-based materials may improve certain aspects of environmental performance, but may also reduce performance in other aspects, such as recyclability. To ensure effective use of resources for environmental improvement, it may be prudent for government and industry to further work together on alternatives and understanding the life cycle impacts of these alternatives.

**As new vehicle designs continue to evolve, it will be important to identify and prevent life cycle environmental impacts.** It will be most resource-effective to further focus on prevention instead of clean up, and avoid developing technology today that becomes unacceptable tomorrow.