Mattress Stewardship
Briefing Document
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Prepared by the Product Stewardship Institute, Inc.
The Product Stewardship Institute

The Product Stewardship Institute, Inc. (PSI) is a national non-profit environmental institute with membership from 46 states, over 200 local governments, and more than 70 businesses, organizations, universities, and non-U.S. governments. PSI establishes cooperative agreements to reduce the health and environmental impacts from consumer products. PSI’s projects involve all those responsible for the manufacture, distribution, use, and end-of-life management of products. PSI creates opportunities for all those involved in the product lifecycle to share information, discuss areas of agreement and disagreement, identify collaborative research needs, and develop product stewardship solutions together.

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I. Introduction

Purpose of this Briefing Document

The purpose of this Mattress Stewardship Briefing Document is to prepare participants for a PSI-facilitated meeting that will be held in Hartford, Connecticut, on April 11, 2011. The Briefing Document includes a proposed issue statement, project goals, and process, and presents key issues, potential solutions, and other information derived through discussions with key stakeholders, as well as other documentation. See Appendix A for a list of those interviewed.

The Briefing Document is part of PSI’s Mattress Stewardship Initiative, which is sponsored by the Connecticut Resources Recovery Authority, Covanta Energy, the City of Austin (Texas), the Connecticut Department of Environmental Protection, and Spring Into Action (a mattress recycler). PSI thanks the many individuals who provided input on the document and the project.

Scope of Project

This project is focused on mattresses and box springs from residential sources (including both single and multi-dwelling units), as well as large-scale generators such as hospitals, hotels, universities, military, and other institutions.

Proposed Issue Statement

Approximately 40 million mattresses and box springs are sold in the United States each year for use in residential and institutional settings. Whether they are recycled or disposed, used mattresses represent a significant cost for many local governments and institutions to manage. Currently, most mattresses and box springs are disposed of in landfills or incinerators, where their bulk and relative flexibility makes them difficult to handle and expensive to manage.

Mattresses are hard to compact and keep buried in a landfill, and the springs can easily catch in equipment used in landfill and incinerator operations. This problem has led certain disposal facilities to require the removal of mattresses prior to loads being dumped at the facility, resulting in drastically increased management costs for many communities. Only a small percentage of mattresses and box springs are dismantled and recycled annually. While some mattress components have value, including steel springs and polyurethane foam, there is still a net cost to collect and recycle them. Although mattress recycling facilities exist in some areas...
across the country, there is limited collection and consolidation infrastructure. Reusing or refurbishing mattresses may be prohibited or discouraged in some areas owing to health concerns, such as the recent rise in bed bug infestations and allergens including bed bug droppings and dust mites. There is also no assurance that a refurbished mattress will meet flammability consumer safety regulations, be free of bed bugs, or be of otherwise high quality. In addition, there is concern about deceptive business practices from companies selling refurbished mattresses that do not meet proper standards.

**Proposed Project Goals**

1) Develop a long-term financing system to manage mattresses and box springs in a manner that alleviates the financial burden faced by governments.

2) Determine whether the usual hierarchy of waste management should be promoted with respect to used mattresses and box springs by maximizing the safe and responsible reuse and refurbishment of mattresses and box springs, and recycling their disassembled components, prior to disposal.

3) Increase consumer and retailer awareness of risks associated with the unsafe refurbishment of mattresses and box springs sold by non-compliant businesses.

4) Gain a better understanding of the lifecycle impacts of mattresses and box springs.

**PSI Stakeholder Process**

In April 2010, PSI conducted an email survey of its state and local government members to better understand the extent of the problems with mattress disposal. The survey generated more than 80 responses, with many respondents indicating that mattress disposal is a significant problem. Thirty stakeholders echoed these concerns, outlined in the proposed issue statement, at a September 1, 2010 meeting in Middletown, Connecticut. Based on the survey responses and September 2010 meeting, PSI has developed this *Briefing Document* and will hold a multi-stakeholder meeting in Hartford, Connecticut, on April 11, 2011. PSI will also conduct follow-up workgroup conference calls to begin implementation of selected strategies.

**II. Manufacturing and Sales**

About 40 million mattresses and box springs are sold in the U.S. each year.¹ About 40% of these mattresses and box springs are sold at traditional furniture stores, although mattress specialty stores, known as “sleep shops,” are increasing their market share.² The rest of the mattresses and box springs sold each year are through department stores, factory-direct stores, warehouse clubs, and other distribution outlets accessed over the Internet.³
The mattress industry is increasingly using more recycled and renewable materials in the manufacturing process. Many components of mattresses and box springs can be made from recycled or sustainably sourced materials:

- Steel springs can be made from recycled scrap steel and can then be recycled at the end of a mattress’s life.

- Some manufacturers have begun using oil from renewable sources, such as soy and castor bean, to make certain types of polyurethane foam. This renewably-sourced oil replaces petrochemicals.

- Some manufactures combine plant-based latex with other materials to produce latex foam.

- To create mattress fabrics and other fillings, manufacturers can choose to use many different renewable fibers, including cotton, wool, silk, coconut fibers, and rayon.

- Most polyester fibers used in mattresses are made from recycled bottles and other products.

- Most of the wood used in manufacturing mattresses and box springs comes from the leftover parts of trees harvested from sustainable forests that cannot be used for building construction.\(^4\)

All mattresses must meet federal flammability standards set and administered by the Consumer Product Safety Commission: the 2007 Standard for the Flammability (Open-Flame ignitions) of Mattress sets, and the Standard for the Flammability of Mattresses (cigarette ignitions), enacted in 1973.\(^5\)

### III. Management of Discarded Mattresses

**Overview**

Mattresses that are no longer needed can be discarded in several ways: (1) given or sold for re-use or refurbishment, (2) dismantled to recycle mattress components, (3) disposed of either in a landfill or a waste-to-energy plant.

Sometimes, the mattress owner decides how it will be discarded; in other cases, as discussed below, the old mattress is taken away when a new one is delivered and the company, therefore, decides how the mattress will be discarded. The opportunities and
challenges presented by these different approaches are summarized in Table 1 and discussed below.

**Table 1. Methods to Manage Mattresses and Box Springs: Opportunities and Challenges.**

<table>
<thead>
<tr>
<th>Waste Management Method</th>
<th>Opportunities</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reuse</td>
<td>Reduce need for new materials</td>
<td>Mattresses may be past their lifespan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance with flammability standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bed bugs and other cleanliness issues present risk to consumers</td>
</tr>
<tr>
<td>Renovation/Refurbishment</td>
<td>Reduce need for new materials</td>
<td>Lack of national standards to protect against consumer fraud</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bed bugs and other cleanliness issues present risk to consumers</td>
</tr>
<tr>
<td>Recycling Materials</td>
<td>Recover materials with market value</td>
<td>Requires funding to be sustainable</td>
</tr>
<tr>
<td></td>
<td>(e.g. steel and polyurethane foam)</td>
<td>Currently limited number of recycling operations</td>
</tr>
<tr>
<td></td>
<td>Large supply</td>
<td></td>
</tr>
<tr>
<td>Energy Recovery – Waste to Energy</td>
<td>Captures useful energy</td>
<td>If shredders are used, mattresses can get caught in equipment</td>
</tr>
<tr>
<td>Incineration</td>
<td>Captures metals pre-burn or post-burn</td>
<td></td>
</tr>
<tr>
<td>Disposal – Landfill</td>
<td>Increased tipping fees for mattresses</td>
<td>Mattresses take up a lot of space relative to their weight and are difficult to manage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mattresses can damage equipment</td>
</tr>
</tbody>
</table>
**In-Home Replacement**

Retailers play a key role in collecting used mattresses from consumers. Most retailers selling mattresses offer to take used mattresses and box springs back from consumers, sometimes free of charge when delivering a new product. About 50 percent of the time when mattress and box spring sets are delivered by a retailer a used mattress is taken away. Retailers manage those used mattresses through one or more of the following methods: (1) provide them to private entities that pick them up (either for a cost or for free) and refurbish them; (2) hire a contractor to haul them away; (3) donate them to charities for reuse; or (4) dispose of them in a landfill or incinerator. The International Sleep Products Association (ISPA) estimates that up to half of all used mattresses collected by retailers upon delivery of a new mattress – or roughly 25 percent of all discarded mattresses - are taken by renovators, while most of the remaining units are sent to a landfill. Although some retailers allow private entities (known as “scavengers”) to pick up used mattresses, others see this as a practice that enables their competitors since they resell used mattresses for profit.

**Discarding Mattresses from Institutions**

Hotels, hospitals, colleges, and other institutions and businesses use large numbers of mattresses. Typically, colleges and universities replace older mattresses with new ones in scheduled phases. For example, Yale University handles mattresses in the summertime, replacing only a percentage of the more than 4,000 beds on campus each year. Mattresses are often replaced before the end of their life and can therefore be reused. Yale works with the Institutional Recycling Network, a company that facilitates the reuse and recycling of mattresses, to donate mattresses that are in good condition to summer camps, shelters, and other charities. For the remaining 50-100 mattresses that are collected each year and cannot be reused, the University currently disposes of them as part of their bulky waste. Yale’s Recycling Coordinator, C.J. May, noted that, although mattress disposal is not a significant logistical problem, managing mattresses does pose a problem when it comes to reaching the University’s long-term sustainability goals.
Refurbishment/Reuse

The Consumer Product Safety Commission (CPSC) defines mattress renovation as “a wide range of operations,” including, “replacing the ticking or batting, stripping a mattress to its springs, rebuilding a mattress, or replacing components with new or recycled materials. Any one, or any combination of one or more, of these steps in mattress renovation is considered to be mattress manufacture.”

Thirteen states have developed licensing requirements that apply to the sale of new and used mattresses. Many states do not have any licensing, labeling or sanitation requirements, and there is a lack of consistency among states that do have regulations in place. The International Association of Bedding and Furniture Law Officials (IABFLO), founded in 1936, is an organization made up of state officials from states with licensing requirements, as well as manufacturers, retailers and non-governmental organizations. The IABFLO promotes uniformity of labels across states with licensing requirements. The goal of the IABFLO is to work towards the establishment of a single set of laws to apply to the bedding and furniture industry worldwide.

Despite the current regulations in these states, some in the mattress industry believe that the standards and current enforcement capabilities are inadequate to guarantee safe refurbishment of mattresses. There are a number of issues associated with mattress renovation that pose a risk to consumers. First, the presence of bed bugs, dust mites and their droppings, and other allergens, as well as overall cleanliness of used mattresses, are a concern. Second, if mattresses do not meet the federal flammability standards, they should not be resold. Finally, consumer fraud is an issue that all those involved in the mattress industry agree must be addressed. The ISPA, the trade association, estimated in 1995 that the “underground market” for used mattresses sold illegally could account for as much as 35% of new units sold annually. Without a national standard, illegal renovators can easily move mattresses to other states that have limited enforcement or no regulations at all. A key issue is whether states can develop regulations to ensure safe and honest reuse and renovation of mattresses.
Connecticut Regulations

Connecticut is one of the 13 states nationwide to require registration to sell new and used mattresses. The Department of Consumer Protection requires all bedding and/or upholstered furniture manufacturers, supply dealers, renovators and second hand dealers to be licensed. The following terms are defined by the Department of Consumer Protection (see Table 2):

Table 2. License Types, Connecticut Department of Consumer Protection, 2011.

<table>
<thead>
<tr>
<th>License Type</th>
<th>Definition</th>
<th>Cost of License</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Uses all new filling material</td>
<td>$100</td>
</tr>
<tr>
<td>Renovator</td>
<td>Uses filling with some new filling added</td>
<td>$50</td>
</tr>
<tr>
<td>Second Hand Dealer</td>
<td>Sale or rental of second hand bedding or upholstered furniture</td>
<td>$50</td>
</tr>
<tr>
<td>Supply Dealer</td>
<td>Manufacturer or sale of filling material</td>
<td>$100</td>
</tr>
</tbody>
</table>

In 2010, 233 second hand licenses and 26 renovator licenses were issued in Connecticut. Since upholsterers are also considered manufacturers, there is no data to show the number of mattress manufacturer licenses that are distributed. Although only 26 renovator licenses were distributed, this number does not accurately portray the number of Connecticut renovators. Most renovators pay the extra $50 to obtain a manufacturing license that allows them to make new products, such as pillows. Therefore, it is difficult to estimate how many renovators legally operate under a license in Connecticut. Finally, retailers that choose to resell a returned mattress must apply for a second hand license.

Renovators are required to attach a yellow tag to mattresses that have been refurbished indicating the materials that have been added. Second hand dealers must also attach a yellow tag to any used mattress they sell. However, consumers are often not made aware that the mattress they are buying is not new. Although this lack of making consumers aware does not currently violate the Unfair Trade Practices Act, the Connecticut Department of Consumer Protection is working to change the regulations to require renovators and second hand dealers to post clearer information for consumers.

In addition to obtaining a license, renovators, second hand dealers, and manufacturers that perform upholstery work (e.g., making new pillows or cushions) must also apply for a
Sterilization Permit from the Connecticut Department of Consumer Protection. There are two current approved methods for mattress sterilization, Sterifab® and Microban® X-580, both of which have tracer chemicals added for enforcement purposes. The Connecticut Department of Consumer Protection performs routine enforcement inspections and responds to consumer complaints. Inspectors issue a warning if mattresses are not sterilized, and can label mattresses “off sale” if mattress contamination is evident. Fines can also be issued. On one occasion, the Department of Consumer Protection has fined a mattress rental company $50,000 for not adhering to sterilization requirements after receiving a warning.

**Bed Bugs**

In the past few years, bed bugs have reemerged as a national concern, particularly in cities. Although the pests often reside in mattresses and box springs, bed bugs have recently been discovered in movie theaters and retail stores. They can also infest any interior furnishing, including carpet, furniture, and draperies. The rise of bed bug infestations proposes a challenge to all those that handle used mattresses. In addition, institutions including hotels, universities, prisons, hospitals and long-term care facilities face challenges in controlling the spread of bed bugs. According to Dr. Gale Ridge, an entomologist at the Connecticut Agricultural Experiment Station, bed bugs can survive many months without human contact, making it very difficult to determine if a mattress or box spring is contaminated. Bed bugs do not transmit diseases, but they can cause sores, discomfort, stress, and allergic reactions to those affected. The economic costs of eliminating infestations can be high; multiple pesticide applications or expensive heat treatments are often required to control contamination.

A combination of increased travel, general lack of knowledge and education to prevent contamination, inadequate pest control practices, and an increased resistance to pesticides have contributed to the resurgence of bed bugs. In addition, some pesticides that were once used to control bed bugs have since been eliminated in response to public concerns about the safety of pesticide use. In addition, Dr. Ridge states that illegal businesses that sell used mattresses, sometimes labeled as new, are also contributing to the spread of bed bugs. “Scavenging” is a big issue, says Dr. Ridge, especially when entities transport mattresses and box springs to states where there are no licensing requirements or other mattress regulations.

Mattresses and box springs infested with bed bugs pose a challenge to the usual waste management hierarchy. In order to safely promote the honest refurbishment of mattresses, state and local governments would incur added costs to enforce current standards. Developing more stringent standards and ensuring compliance would require additional oversight, adding
to the burden that governments face for managing mattresses. Whether and how refurbishment should be promoted is a key issue for the Mattress Stewardship Initiative to address.

**National Efforts to Address Bed Bugs**

The U.S. Environmental Protection Agency has formed the Federal Bed Bug Workgroup to coordinate efforts to develop recommendations for a national strategy to address this issue. This Workgroup includes officials from the Departments of Housing and Urban Development, Agriculture, Commerce, and Defense, as well as the National Institutes of Health and the Centers for Disease Control and Prevention. A National Bed Bug Summit, held in April 2009, identified problems and developed recommendations for governments and property owners, including consumer education and communication, training for pest control operators, and further research. The Second National Bed Bug Summit was held February 1-2, 2011, as a follow-up to prioritize actions recommended in 2009.

**Addressing Bed Bugs in Connecticut**

Connecticut has had to address the bed bug problem in recent years. Since the first documented case of infestation in 1996, incidents have grown exponentially, although statistics are unavailable owing to incidents being grossly under-reported. Officials responded by establishing the Connecticut Coalition Against Bed Bugs (CCABB) in 2008 to run what has become a series of forums to address the bed bug problem. The CCABB, led by the Connecticut Agricultural Experiment Station, is comprised of several entities including the Connecticut Department of Health, Pest Elimination, the Chief State’s Attorney, Department of Environmental Protection, the Norwalk Department of Health, and Waltham Services. In addition to the CCABB’s work, two bills, HB 5858 and SB 540, were introduced in January 2011 that aim to address the increasing public health threat posed by bed bugs. The Senate bill would require those reselling mattresses to ensure they are not infested with bed bugs, and the House bill outlines measures that landlords and tenants must take to control the spread of bed bugs.

**Recycling Mattresses from Households, Institutions, and Businesses**

Currently, only a small percentage of used mattresses and box springs are deconstructed and their materials recycled. Although mattress recycling facilities exist in some areas across the country, there is limited collection and consolidation infrastructure, which requires mattresses to be shipped long distances for processing. The ISPA lists 23 recycling operators across 13
states on its website, as well as 5 recycling operators in Canada. Various recycling operations claim to be able to divert up to 90% of mattress and box springs components from landfills. In addition to focusing on the economic benefits of mattress recycling, some recyclers, such as Goodwill Industries, Project for Pride in Living, and St. Vincent de Paul, also provide social and environmental benefits. Table 3 outlines the opportunities and challenges presented to recycle components of mattresses and box springs.

**Table 3. Recycling Mattress and Box Spring Components: Opportunities and Challenges.**

<table>
<thead>
<tr>
<th>Material</th>
<th>Uses</th>
<th>Opportunities</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel springs</td>
<td>Scrap metal</td>
<td>Has highest value</td>
<td>Volatile market</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lots of material (steel can make up nearly 50% of innerspring mattress’ weight)</td>
<td>Springs are not easily compacted, transportation issues</td>
</tr>
<tr>
<td>Polyurethane foam</td>
<td>Carpet underlay</td>
<td>Lots of material (foam makes up nearly 10% of mattress’ weight)</td>
<td>Can be a volatile market</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High demand, U.S. was a net importer of scrap foam in 2004</td>
<td>Proposed legislation to ban certain PBDEs in foam and testing would make recycling cost-prohibitive</td>
</tr>
<tr>
<td>Cotton and other fibers</td>
<td>Typically carpet underlay, moving cloth</td>
<td>Goodwill in Duluth MN, selling cotton to a manufacturer who processes it to use as an oil filter in diesel engines</td>
<td>Difficult to separate materials, may not be cost effective</td>
</tr>
<tr>
<td>Wood from box spring</td>
<td>Biomass fuel, mulch, animal bedding</td>
<td>Can be burned at a waste to energy plant</td>
<td>Nails and staples limit the value of mulch and animal bedding</td>
</tr>
</tbody>
</table>

**Disposal**

Local governments and institutions face increasing costs to dispose of mattresses. Landfill tipping fees are typically determined by weight. Mattresses and box springs have a larger volume and are relatively less dense than other forms of solid waste. Therefore, mattresses
take up a larger volume of landfill space as compared to their weight than other items. This means that mattresses generate relatively less revenue for landfill operators as compared to other common items found in the waste stream. As a result, some landfill operators have refused to accept mattresses and box springs. In a 2004 report released by ISPA, Conigliaro Industries, a recycler, estimated that the “opportunity cost” that a landfill incurs by accepting mattresses in its waste stream is equivalent to $15 a mattress. In other words, it would be more profitable for the landfill operator to pay someone else up to $15 to dispose of each mattress.

PSI conducted an email survey in April 2010 of its state and local government members to better understand the extent of the problems with mattress disposal. The survey generated more than 80 responses, with many local government officials and university representatives noting mattresses were a nuisance, if not their top priority. Judging by the response received, they pose a significant problem for certain communities, particularly those where many mattresses are disposed of at one time, including universities and seasonal communities (due to the large number of hotels and camps), and areas with limited disposal capacity. In fact, many local governments are paying a per mattress disposal fee, ranging from $9 to $30 a mattress.

Mattress and box spring disposal poses operational challenges as well. Due to their bulkiness and relative flexibility, mattresses are difficult to compact and keep buried in landfills. Furthermore, the steel springs can damage compacting and shredding equipment. As a result, certain disposal facilities require the removal of mattresses and box springs from the solid waste stream, leading to increased costs for municipalities. Other facilities are charging higher tipping fees for mattresses or are refusing to accept them altogether. In addition to disposal costs, the collection and transport of mattresses and box springs poses an expense for local governments. Some municipalities have expressed concern that higher disposal fees might be encouraging illegal dumping.

IV. Overview of Issues and Potential Solutions

PSI identified key issues, solutions, and potential strategies based on interviews with key stakeholders and other input received (see Table 4). During the meeting phase of the dialogue, participants will jointly determine which strategies show the most promise and develop specific
steps to pursue the highest priority strategies. The potential strategies listed below are intended to launch discussion at the first national dialogue meeting.
### Table 4. Issues and Potential Strategies for Consideration by Stakeholders.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Potential Strategies</th>
</tr>
</thead>
</table>
| **#1 Significant cost to local governments and institutions to manage used mattresses and box springs.** Governments face large tipping fees as well as high collection and transportation costs to dispose of mattresses. Due to the high cost, there is a lack of collection, consolidation, and dismantling infrastructure across the country. | a) Develop and introduce Extended Producer Responsibility (EPR) legislation (see below).  
    b) Develop and introduce legislation to include an Advanced Recycling Fee (see below) |
| **#2 Lack of standardized definition for what constitutes mattress and box spring “recycling” and a lack of consumer awareness about recycling options.** There is a perception that recycling means reuse and not the dismantling of a mattress and box spring to recycle the unit’s materials. In addition, consumers are not made aware that mattress recycling options exist. | a) Develop a standard definition for recycling that governments and all those in the mattress industry can agree on.  
    b) Statewide or national education campaign. |
| **#3 Lack of data on how many mattresses are being recovered, and how many of those are being recycled.** Mattresses are discarded by residents, retailers, renovators, municipalities and institutions. It is difficult to determine how many mattresses are being recovered and how many are being recycled. | a) Create a database for local governments and institutions to track the management of mattresses.  
    b) Require retailers to report on their methods of discarding mattresses. |
| **#4 Lack of recognized standards that prevent fraudulent refurbishment operations and prevent bed bug contamination, and a lack of consumer education about risks associated with unsafe refurbishment.** Although refurbishment standards exist in 13 states, some in the mattress industry believe that establishing standards that guarantee safe refurbishment would be unfeasible. Despite some states’ labeling requirements, consumers are often not made aware that a mattress they are purchasing from a renovator is not new. There is also a lack of resources to enforce such standards. Furthermore, the rise in bed bug infestations poses a risk to consumers buying refurbished mattresses. | a) Develop nationally recognized standards for mattress refurbishment (e.g., Code of Conduct).  
    b) Require that all refurbished mattresses must be sterilized to prevent the spread of bed bugs.  
    c) Ensure effective enforcement.  
    d) Require retailers to provide information to consumers upon purchase of a refurbished mattress. |
| **#5 Lack of understanding of the lifecycle impacts of mattresses and box springs.** The lifecycle of a mattress and box spring includes everything from the pesticides used to grow cotton and other fabrics to the chemicals used in the sterilization process. | a) Conduct further research to study the lifecycle impacts of all materials that make up mattresses and box springs. |
**Sustainable Financing**

Most waste management costs in the United States (e.g., collection, reuse, recycling, and disposal) are largely borne by state and local agencies through government programs, and are paid for through taxes. Other ways of funding programs are through solid waste utility rates, direct charges to individual households, or fees charged to consumers when they return a product for recycling or disposal. There are two basic types of product stewardship financing systems that seek to cover waste management costs by incorporating these costs into the purchase price of a new product: (1) Advanced Recycling Fees and (2) Cost Internalization (or “producer responsibility”).

Europe and Japan have developed systems that share financial responsibility. In those countries, producers usually are financially responsible for the portion of the process on which they have influence, namely transportation and recycling of scrap products. Municipalities and retailers often pay for the collection of products at municipal depots or at retail, parts of the process on which they have most influence. In the U.S., producer responsibility systems are by far the dominant financing mechanism, and have been implemented for electronics, thermostats, rechargeable batteries, auto switches, and other products. For each of these products, manufacturers have taken responsibility for the collection, transportation, and recycling of the products by creating an industry-run stewardship organization to contract for services, collect payments from producers, and manage the overall system.

**Advanced Recycling Fee**

An advanced recycling fee (ARF) is a separate charge placed on a new product and paid by a consumer at retail to cover the cost of the product’s eventual end-of-life management. An ARF is paid in advance so that when a consumer is ready to recycle the product, there is no extra cost to collect, transport, and manage it. Buying a product and paying an ARF is like buying that product’s recycling service in advance. In reality, the ARF paid on a current product pays for the recycling of a product bought years before. One advantage of ARF systems is that the fund created can immediately cover the costs of recycling these past products.

An ARF can be either visible or invisible to the consumer. In the U.S., many state governments have placed visible ARFs on products such as tires, motor oil, and lead acid batteries. California’s 2003 electronics scrap recycling law, the first electronics product stewardship system in the U.S., is also based on a visible ARF. Some Canadian ARFs, however, are invisible to the consumer.
Funds collected in ARF systems usually go into a government-managed fund, with producers playing a minor role in managing the system. A key disadvantage of government managed funds is the possibility of state legislatures seizing these dedicated funds for other funding purposes. Another downside is the need for additional government staff to manage the fund collection, grant distribution, contractor services, and other operational functions. Many people believe that, for a program to be considered as a product stewardship system, funding must be handled by industry, and that industry must play a significant role in managing the system.

Those supporting industry-managed funds believe that these functions can be provided more cost effectively when managed by the private sector. Some in Europe, however, believe that paying into a single organization – whether public or private – provides little incentive to improve efficiency since central funds act as monopolies. These proponents believe that the most efficient systems are ones that provide competition among private organizations. In the U.S., one of the first product stewardship systems to be implemented (in California in 2004) used the ARF approach to fund electronics management. Since then, ARFs have been largely opposed by the retail industry, as well as government agencies, in favor of producer responsibility systems.

**Cost Internalization**

A second type of financing system involves manufacturers and importers that internalize end-of-life management costs into the cost of doing business so that they are invisible to the consumer, even though the costs may be passed on to the consumer. These are called “producer responsibility” systems. By internalizing end-of-life management costs, manufacturers and importers have direct management ability to increase efficiency, improve service, and cut costs. The ability to control management decisions is the biggest advantage for a producer responsibility system compared to an ARF, which does not become part of a company’s profit and loss statement and therefore does not result in company actions toward greater efficiency.

The two most common voluntary industry-wide programs in the U.S. are run by Call2Recycle (operated by the Rechargeable Battery Recycling Corporation) and the Thermostat Recycling Corporation (TRC). Both of these programs were developed by manufacturers to fund collection and recycling programs that are free to consumers, who can bring their rechargeable batteries and thermostats to participating public and private collection sites. These products do not have to be sorted by brand since the programs accept all manufacturer brands. Manufacturers’ costs to collect and recycle the batteries and thermostats, and to publicize the programs, are included in the purchase price of the products. The entire program is paid for by funds derived from manufacturers that pay according to a formula based on market share and established by
RBRC and TRC. Of the 24 scrap electronics recycling laws enacted in the U.S., all but one follow the producer responsibility model.

In most European countries, the Waste Electrical and Electronic Equipment (WEEE) Directive is implemented through cost internalization, which fosters competition among several stewardship organizations in one country. For example, the establishment of four stewardship organizations in Austria in 2005 has reduced the take back cost from 75 cents per kilogram of electronic product placed on the market to 8 cents per kilogram within a 6-month period.27
## Appendix A. List of Stakeholders Consulted

<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sherill</td>
<td>Baldwin</td>
<td>CT Department of Environmental Protection</td>
</tr>
<tr>
<td>Marilyn</td>
<td>Cruz-Aponte</td>
<td>City of Hartford, CT</td>
</tr>
<tr>
<td>Peter</td>
<td>Egan</td>
<td>CT Resources Recovery Authority</td>
</tr>
<tr>
<td>Maggie</td>
<td>Fields</td>
<td>MI Department of Environmental Quality</td>
</tr>
<tr>
<td>Henry</td>
<td>Fisher</td>
<td>MN Pollution Control Agency</td>
</tr>
<tr>
<td>Bob</td>
<td>Gedert</td>
<td>City of Austin, Texas</td>
</tr>
<tr>
<td>Doug</td>
<td>Jewett</td>
<td>Project for Pride in Living (PPL) Industries</td>
</tr>
<tr>
<td>Joan</td>
<td>Jordan</td>
<td>CT Consumer Protection</td>
</tr>
<tr>
<td>Mark</td>
<td>Lennon</td>
<td>Institutional Recycling Network</td>
</tr>
<tr>
<td>CJ</td>
<td>May</td>
<td>Yale University</td>
</tr>
<tr>
<td>Tom</td>
<td>Metzner</td>
<td>CT Department of Environmental Protection</td>
</tr>
<tr>
<td>Jean</td>
<td>Michaud</td>
<td>Connecticut College</td>
</tr>
<tr>
<td>Doug</td>
<td>Morris</td>
<td>Crow Wing County, MN</td>
</tr>
<tr>
<td>Joe</td>
<td>Paviglianti</td>
<td>Spare Our Landfills (SOL), Inc</td>
</tr>
<tr>
<td>Gale</td>
<td>Ridge</td>
<td>CT Agricultural Experiment Station</td>
</tr>
<tr>
<td>Ryan</td>
<td>Trainer</td>
<td>International Sleep Products Association</td>
</tr>
<tr>
<td>John</td>
<td>Waffenschmidt</td>
<td>Covanta Energy</td>
</tr>
</tbody>
</table>
ENDNOTES

1 Of these 40 million mattresses, about 60% sold by three companies.


5 16 CFR 1633 and 16 CFR 1632.


8 Interview with Cyril May, Yale University, March 3, 2011.

9 Interview with Cyril May, Yale University, March 3, 2011


11 California, Connecticut, Delaware, Massachusetts, Michigan, North Carolina, Ohio, Pennsylvania, Texas, Utah, Virginia, and West Virginia.


Interview with Dr. Gale Ridge, Connecticut Agricultural Experiment Station, February 8, 2011.


Using a tipping fee of $75 per ton, and estimating that mattresses would at most weigh 250/lbs/cubic yard, tipping revenues would only amount to $9.38/cubic yard from mattress disposal. Efficient landfills compact garbage at a rate of 1500 lbs/cubic yard which would generate $56.25 in tipping fee revenues. The landfill incurs an opportunity cost of $46.87 to accept lighter mattresses. Assuming 125 mattresses of various sizes with about 10,000 lbs, and can be compacted at a rate of 250lbs/cubic yard, 125 mattresses would take up 40 cubic yards, and each compressed mattress would contain 3.123 mattresses. Taken from “Used Mattress Disposal and Component Recycling: Opportunities and Challenges,” International Sleep Products Association, Mattress Disposal Task Force, available at http://www.sleepproducts.org/Sustainability/docs/UsedMattressesDisposalReport.pdf.

The City of Hartford, Connecticut, negotiated a per unit mattress disposal cost down from $30 to $25 a mattress for fiscal year 2011. Interview with Marilynn Cruz Aponte, City of Hartford, March 9, 2011.

It cost municipalities in Massachusetts anywhere from $9-$15 per mattress for disposal (source: Claire Sullivan, South Shore Recycling Cooperative, whereas the City of Hartford paid $30 per mattress for disposal at the Connecticut Resources Recovery Authority (source: Marilynn Cruz-Aponte, City of Hartford, CT).