

A Greenhouse Gas and Energy LCA for CRT Televisions: Data Availability and Trans-border Issues



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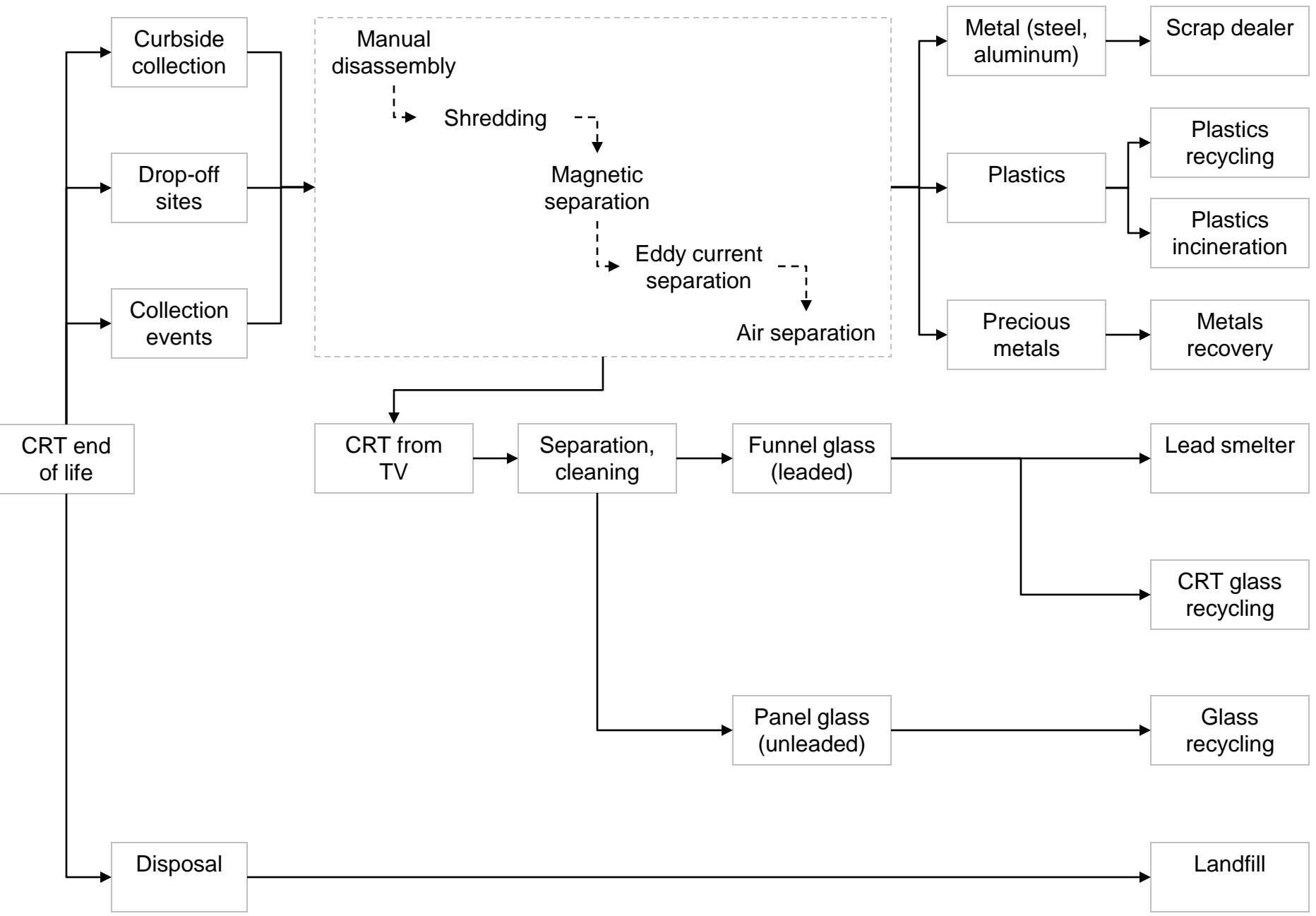


Overview

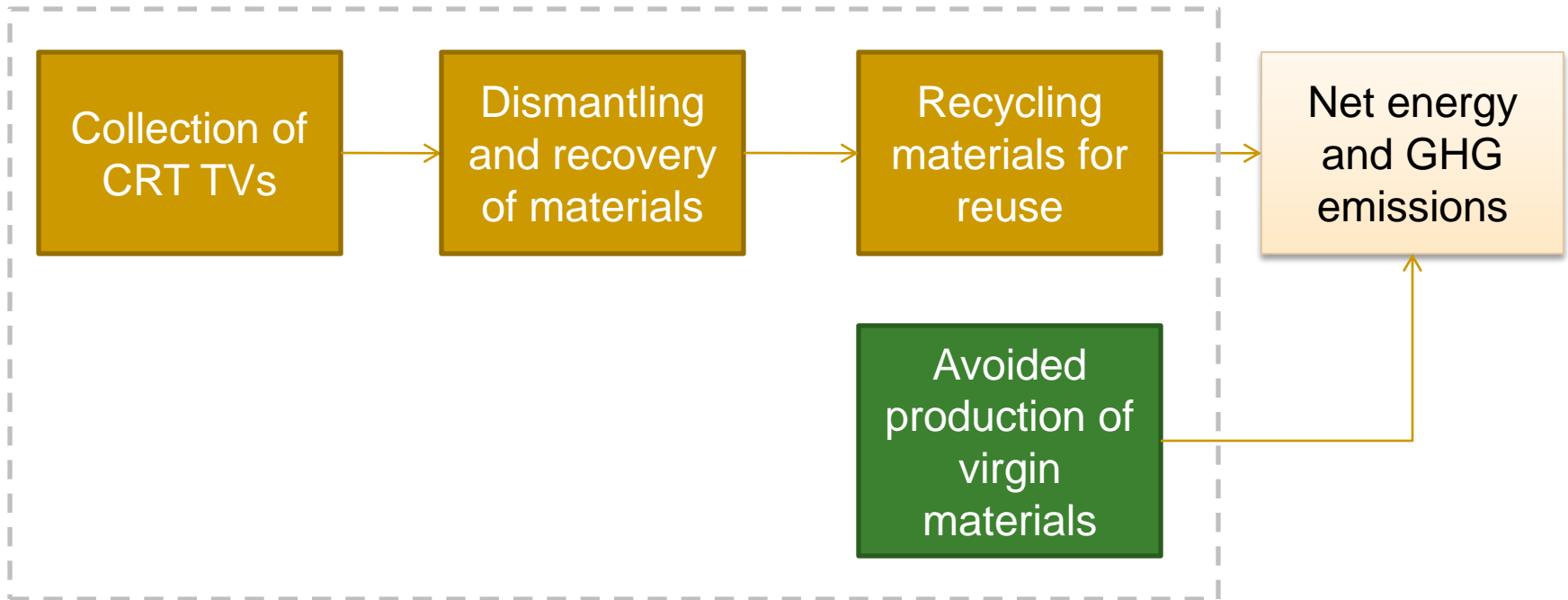
- Introduction
- Background
 - End-of-life pathways for CRT TVs
- Method
 - Overview and data sources
- Results
- Data Gaps and Limitations
- Conclusions

Introduction

- Motivation:
 - CRT TVs are an important electronic scrap component and offer opportunities for recovery
 - Disposals are expected to increase as they are replaced with flat panel models, particularly as result of the transition to digital television in 2009
- Goal:
 - Evaluate energy and GHG emission implications of recycling CRT TVs
 - Focus on processing and transport data reflecting the mix of current recycling end markets



Method: System Boundaries

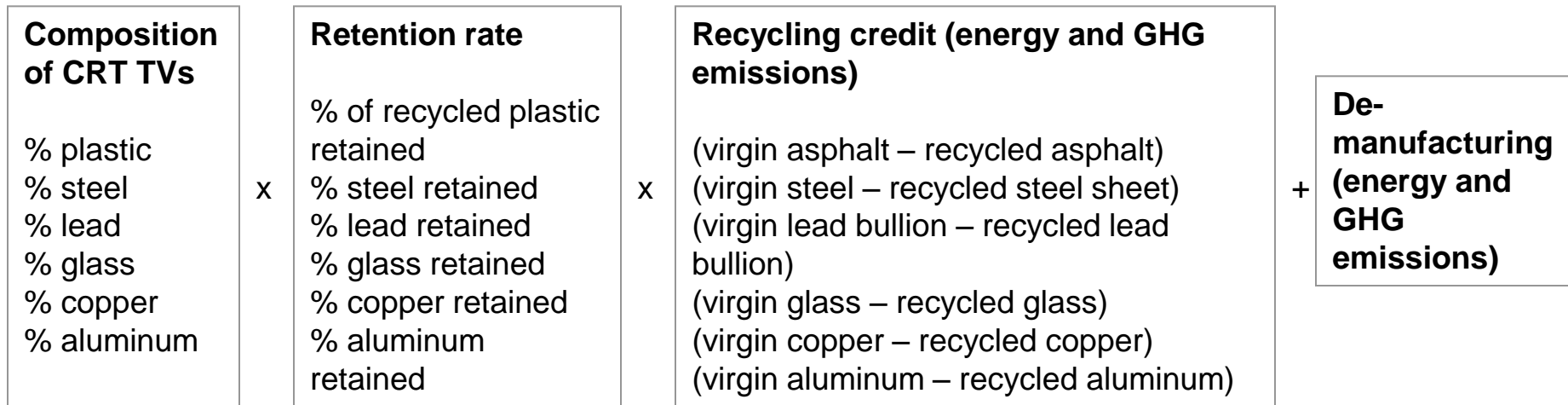


Note: Includes transportation, energy and GHG emissions associated with upstream production of fuels and electricity, and non-energy process GHG emissions.

Method: Overview

Recycling energy and GHG emissions factors for recycling CRT TVs
 Functional unit : 1 short ton CRT TVs recycled

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Results: Default Case

Variable

Assumption

CRT TV composition

Bang & Olfsen 28" CRT TV from RIS (2003)

CRT TV demanufacturing

Manual hand dismantling, automated sorting (Liu 2009)

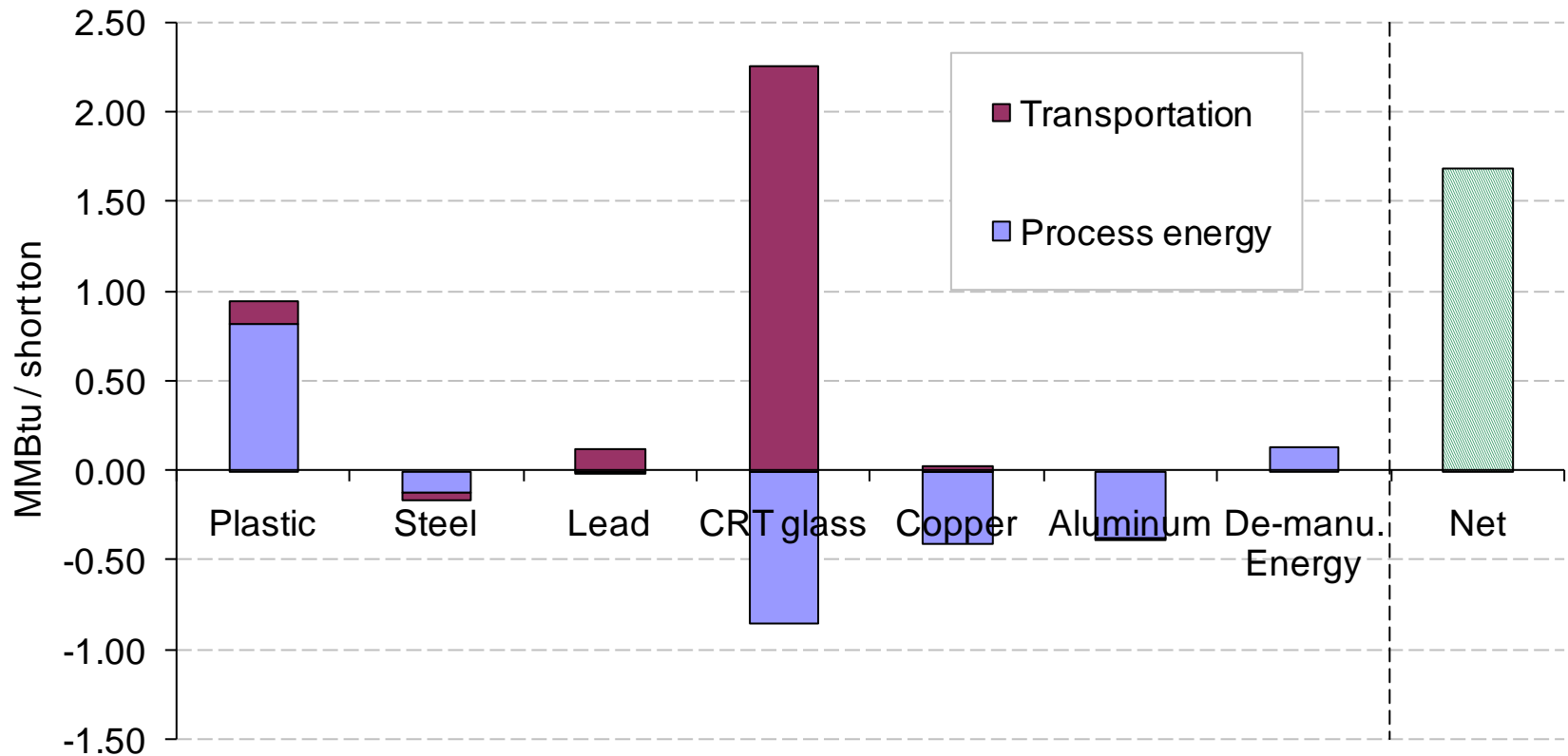
Plastics recycling pathway

Recycled into asphalt in the United States

CRT glass recycling pathway

Primarily recycled into CRT glass in Asia

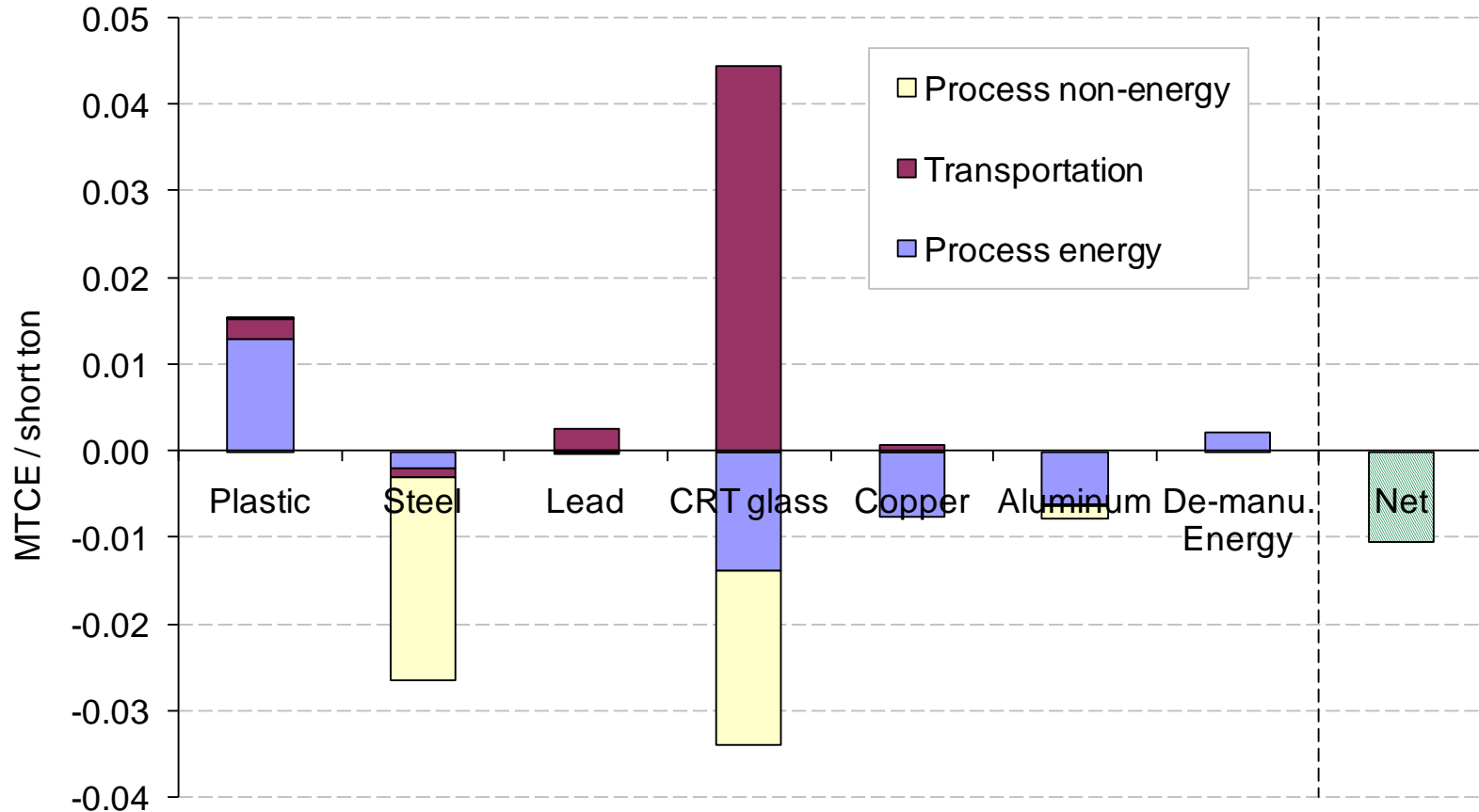
Results: Default Case – Energy Use



Process Energy	Transportation	Net
(0.80)	2.49	1.68

Note: Units are in MMBtu / short ton of CRT TVs recycled. Does not sum due to rounding.

Results: Default Case – GHG Emissions



Process energy

Transportation

Process non-energy

Net

(0.01)

0.05

(0.05)

(0.01)

Note: Units are in metric tons of carbon-equivalent (MTCE) / short ton of CRT TVs recycled.

Data Challenges: Recycling Pathways

- Recycling plastics into asphalt:
 - Likely not the common practice
 - Share of plastics recovered from CRT TVs, where they are sent, and what they are recycled into is unknown and LCI data was not located
 - Other plastics recycling applications may be more GHG favorable (i.e., lead to net reductions in GHG emissions)
- Share of CRT glass sent to smelters vs. CRT glass-to-glass recycling was not determined
 - It is likely that CRT glass-to-glass recycling will diminish with the market for CRT TVs

Other Data Availability Challenges

- Composition estimates for CRT TVs varied widely
- Locating sufficient LCI data on CRT TV recycling was difficult
- Quantity of CRT TVs exported and dismantled outside of the U.S. is poorly tracked
- Manual dismantling data based on Japanese electronic recycling plants

Conclusions

- Range of sensitivity to different assumptions:
 - Energy use: 1.7 to 2.4 MMBtu per short ton recycled
 - GHG emissions: slight increase (0.01 MTCE / short ton) to net reduction (-0.14 MTCE / short ton)
- Estimates when plastics combusted for energy:
 - Energy savings: 2.7 MMBtu saved per short ton of CRT TVs
 - GHG emissions: 0.1 MTCE emitted / short ton CRT TVs
- We estimate:
 - A net reduction in energy use & GHG emissions by recovering steel, copper, aluminum
 - Net energy use and GHG emissions from recycling plastics into asphalt, recovering lead from CRT glass, & recycling CRT glass into new CRT glass

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Thank You! <http://www.epa.gov/warm>

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