# STEEL CAN RECYCLED CONTENT WHITE PAPER
## SUMMARY FOR POLICYMAKERS

*This document summarizes the findings of the Recycled Content White Paper produced by RRS on behalf of Can Manufacturers Institute (CMI)and provides additional information that underpins why minimum recycled content requirements and extended producer responsibility (EPR) fee structures that incentivize greater amounts of recycled content in steel cans create food safety concerns and are counterproductive to decarbonization ambitions.*

### EXECUTIVE SUMMARY

Aiming to increase the supply of recovered materials and drive end-market development for recycled inputs, the number of U.S. states with bills, standards, or procurement guidelines requiring or incentivizing high amounts of recycled content for packaging is growing. Research for this paper on the steel can production process establishes three key reasons why legislation and regulations that exceed or incentivize going beyond technical limits for recycled content in steel cans would have the perverse outcome of negatively impacting the food safety and environmental performance of steel cans and needlessly increasing costs to consumers.

1. **Quality Requirements:** To meet food safety and formability requirements, steel cans must be manufactured in adherence to strict limits for residual materials[1]. Steel cans are produced with high quality rolled steel known in the industry as can sheet. When can sheet is made with high levels of recycled steel scrap, undesirable residual material in the scrap lowers the quality of the steel below limits that are in place to ensure package safety.
2. **Energy Use:** Steel makers adjust the amount scrap used in the furnace based on the amount of excess heat generated from the process. Adding scrap beyond the optimized volume that can be melted by the excess heat requires adding energy. This supplemental energy increases the release of greenhouse gases per unit of steel produced.
3. **Market Distortion:** Considering that the demand for steel scrap far exceeds available supply, requiring steel cans to contain a minimum level of recycled content is an unnecessary distortion of the market. Policy interventions to increase recycled content in steel cans would only shift recycled steel between end-markets; it would not increase the amount post-consumer scrap available to go back into the production process. Virtually all steel cans collected by the nation's curbside recycling system and robust scrap processing network return to steel mills as inputs into other steel products.

Given the negative safety, environmental and economic consequences, it's counterproductive to mandate recycled content minimums or incentivize greater use of recycled content for steel cans that comes with including it as an eco-modulation factor in EPR fees. Policies that focus on increasing the recycling rate of steel cans would be a more successful approach to meet the decarbonization ambitions that recycled content legislation and similar initiatives are intended to address.

### OVERVIEW

The intent of this summary is to make clear that emerging eco-modulated EPR fees and similar policies that penalize steel can makers for not increasing recycled content would harm the environment, increase costs, and compromise package and food safety. CMI commissioned a "Steel Can Recycled Content White Paper" to provide fact-based insights to policymakers regarding environmental and economic implications of recycled content policies on the production of steel can sheet.

The first section provides a brief description of the steel production process and industry composition that informs the research findings. Next, factors such as safety, energy efficiency and market dynamics, which limit recycled content in steel cans is

[1] Tinplate products must comply with standard ASTM A623M – 03 where the non-ferrous content of the steel substrate is limited to the specifications of Type L or Type MR sheet steel.

discussed. Finally, this summary concludes by recommending that policies aimed at increasing the recycling rate would be more effective in reducing carbon emissions.

## OVERVIEW OF STEEL CAN PRODUCTION AND RECYCLING

To understand the factors that limit recycled content in steel cans, it is helpful to be familiar with steel production and the composition of the steel making industry.

### Steel Production

Most steel is produced using one of two primary processes: a Basic Oxygen Furnace (BOF) or Electric Arc Furnace (EAF). BOFs use pig iron[2] and small amounts of scrap, generally less than 30%, as their main inputs. Oxygen is blown into the molten iron, which reduces the carbon content, converting the molten material into steel. Excess heat is generated from the reaction of oxygen with iron and other elements. Scrap, which acts like a coolant, absorbs the excess heat by melting scrap, thereby reducing greenhouse gas emissions. Alternatively, EAFs use high-voltage electric arcs to melt materials such as scrap steel, direct reduced iron (DRI), or pig iron into molten steel. Also known as sponge iron, DRI is produced by using a reducing gas to remove oxygen from iron ore without melting the iron.

Whether produced by the EAF or BOF process, the resulting liquid steel is then further processed. For example, to produce can sheet, the steel is cast into a slab, which is then hot and cold rolled into a thin sheet that is annealed[3], tempered, and finally electrolytically coated, usually with tin, chrome, or zinc depending on the applications. The rolls are then shipped to the can manufacturer.

### Industry Composition

Since Nucor Steel entered the U.S. market in 1969 with a mini mill that featured an EAF[4], the technology has continued to gain share in many market segments against BOF facilities due to having a lower energy intensity and lower capital and labor costs per ton produced. BOF production remains more common in most of Europe and Asia[5], but production in the United States has shifted rapidly from BOF to EAF. In fact, the share of steel produced by BOFs in the United States decreased from 40% in 2012 to 29% in 2022[6] (Figure 2 in Appendix C). This trend is expected to continue though a 100% conversion is unlikely. A June 2020 article by the management consultant McKinsey and Company states "shifting to EAF-based steel production requires the future supply of renewable electricity to be commercially available, as well as a sufficient supply of high-quality steel scrap. High quality scrap is necessary to produce high-quality products, which are nowadays mainly produced through the integrated [BOF] route.[7]"

While BOFs and EAFs produce different quality steel and have different limitations when it comes to their ability to use scrap, today essentially all can sheet is produced with BOF. Current U.S. capacity at BOF facilities can only meet 50% of can sheet demand. Roughly half of the supply of can sheet must be imported.

## FACTORS LIMITING RECYCLED CONTENT IN STEEL CANS

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[2] According to the International Iron Metallics Association, "pig iron is the product of smelting iron ore (also ilmenite) with a high-carbon fuel and reductant such as coke, usually with limestone as a flux. Charcoal and anthracite are also used as fuel and reductant. Pig iron is produced by smelting or iron ore in blast furnaces or by smelting ilmenite in electric furnaces."

[3] The cold rolling process changes the crystal structure of steel, resulting in a product that is brittle/not suitable for manufacturing processes requiring the steel to stretch or draw. To reset the internal crystal structure (improve the formability) of the steel, the coils must be heat treated. Annealing is the process of heat-treating steels.

[4] History of Nucor Steel

[5] World Steel Association "World Steel in Figures 2023"

[6] U.S. Geological Survey. "Iron and Steel Statistics and Information Annual Publications." Iron and Steel Statistics and Information. Accessed August 1, 2023. https://www.usgs.gov/centers/national-minerals-information-center/iron-and-steel-statistics-and-information.

[7] Decarbonization Challenge for Steel, June 3, 2020

**Quality and safety**

In 2021, the American Iron and Steel Institute (AISI) estimated the average proportion of scrap used in BOF production was 23% versus an average of 82% for EAFs[8]. EAFs can accept higher levels of recovered scrap; however, they produce steel of lower technical quality than the BOF process[9]. Therefore, BOFs maintain a competitive edge in higher quality grades of steel such as the ones typically used in the automotive industry and in can sheet manufacturing.

To protect the quality of the can's contents, can manufacturers reject steel that fails to meet rigid quality and safety standards[10]. Scrap steel frequently includes residual elements such as tin or copper. Due to the high quantities of scrap used, steel produced by EAFs does not meet the quality standards needed in the can manufacturing industry because the high percentage of unwanted residual material affects the metal's mechanical properties.

**Energy Inefficiency**

In addition to concerns about impurities in the steel due to residual material, melting higher amounts of scrap requires more energy. As mentioned previously, BOFs blow oxygen into the scrap/pig iron mixture to remove carbon from iron and produce steel. That action releases a large amount of heat. Steel makers seek to match the excess heat generated with the amount of heat needed to melt the scrap. Scrap levels between 20% and 30% are generally used to optimize the process. If the amount of scrap falls below this optimum level, the mill must manage the excess heat. Alternatively, if the amount of scrap exceeds the optimal level, additional energy would be required to melt the scrap. In theory, the BOF process could increase the amount of scrap well beyond the optimum level, but if done regularly, the extra energy required would significantly increase costs without reducing emissions.

**Supply and Demand**

Even with high steel product recycling rates, the demand for steel scrap far outweighs supply. AISI calculated high industry recycling rates from short-term steel products like packaging (58%)[11] and durable goods like construction products (74%), cars (96%), and appliances (78%). Despite these high recycling rates, which demonstrate that steel is one of the most robust examples of a circular economy, the demand for steel continues to grow faster than the rate at which scrap steel becomes available. Scrap from steel can packaging, which makes up less than 3%[12] of the production of the U.S. steel industry[13], is only a small fraction of the demand for steel scrap.

According to the World Steel Association[14], annual global steel production consumes 650 million tons of scrap, which is only about one-third of the total 1,900 million tons of steel produced each year. Although all new steel could theoretically be made from recycled steel, this is not achievable due to the lack of scrap available. The lifespan of steel is a key reason why the gap between the demand for steel and the supply of scrap continues. Steel packaging often finds its way back into the recycling system within weeks, but other goods made with steel, such as appliances and automobiles, stay in use for

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[8] American Iron and Steel Institute and Steel Manufacturers Association. 2021. Technical Report - Determination of Steel Recycling Rates in the United States. Accessed July 27. https://www.steel.org/wp-content/uploads/2021/08/AISI-and-SMA-Steel-Recycling-Rates-Report-Final-07-27-2021.pdf.

[9] 2018. Path to 2060: Decarbonizing the Industrial Sector. Duff, Rebecca & Lenox, Michael. Accessed June 26, 2023. https://www.researchgate.net/figure/US-Steel-Production-BOF-vs-EAF-Process_fig2_329810198.

[10] Tinplate products must comply with standard ASTM A623M – 03 where the non-ferrous content of the steel substrate is limited to the specifications of Type L or Type MR sheet steel.

[11] 58% refers exclusively to the recycling rate for End of Life (EOL) scrap, which is post-consumer waste steel that is captured for recycling at the end of life. The collection rate would naturally be higher for "Home scrap"– waste steel generated either from within a steel production facility and captured prior to exiting the facility or "New scrap" – waste steel generated by the manufacturing steel-containing products and do not go through end-use as compared to EOL scrap. For steel containers, the overall recycling rate (i.e., inclusive of EOL + New Scrap) is 62%.
2021. Technical Report - Determination of Steel Container Recycling Rates in the United States. Accessed July 27. https://www.steel.org/wp-content/uploads/2021/08/AISI-and-SMA-Steel-Container-Recycling-Rates-Report-Final-07-27-2021.pdf.

[12] American Iron and Steel Institute. Steel Profile Book 2020. Accessed August 1, 2023. https://www.steel.org/wp-content/uploads/2020/12/2020-AISI-Profile-Book.pdf.

[13] Steel food cans are included in the steel container category that also comprises sheet for paint and aerosol cans. American Iron and Steel Institute. Steel Profile Book 2020. Accessed August 1, 2023. https://www.steel.org/wp-content/uploads/2020/12/2020-AISI-Profile-Book.pdf.

[14] World Steel Association Article – "Raw Materials: Maximizing Scrap Use Helps Reduce CO2 Emissions"

years. Steel for buildings and infrastructure can last more than 100 years, which stretches the average lifespan of steel products to 40 years. As a result, there is a delay between the amount of steel produced and the supply of steel scrap released at the end of its useful life.

Helping to answer the demand for steel is a well-developed scrap processing infrastructure accessible to thousands of communities across the United States. According to IBIS World market research, there are 565 scrap metal recycling businesses in the United States that supply mills with steel scrap[15]. Another important link in the steel recycling chain is material recovery facilities (MRF), which supply steel scrap sorted from the mixed material that they collect from businesses and residences. Once steel scrap enters a MRF, magnets easily separate steel from other materials. The ease of sorting steel scrap contributes to exceptionally high capture rates in the MRFs, often above 90%[16]. Whether from cars, cans, construction, or another source, virtually all scrap steel that reaches a MRF or a metal recycling facility gets recycled.

Beyond the quality, safety, and energy concerns, given the scarcity of scrap steel available, policies directing can makers to increase recycled content only results in shifting material from one product stream to another. This shifting of scrap created by a policy mandate would add cost and greater environmental impact to can production without increasing the amount of steel cans recycled.

## POLICIES SHOULD FOCUS ON INCREASING STEEL CAN RECYCLING.

There is no need for recycled content minimums or eco-modulation factors around recycled content that apply to steel cans given there are already robust end markets for steel cans. Steel scrap, as a necessary ingredient in new steel production, is already in high demand. Given the wide gap between the demand for scrap and the insufficient supply, the challenge is not finding a way to add available scrap into products and packaging. The difficulty is getting more scrap metals returned to MRFs and metal processors so more is available to be recycled.

With an estimated national recycling rate of 58%, steel cans have the highest recycling rate among packaging types. Steel producers and can manufacturers are keen to build on that success and even surpass the commendable 85% recycling rate for steel cans in Europe. With policies that incentivize investments in infrastructure, both for collecting and sorting metal recyclables, and with smart policies that stimulate consumers to recycle, higher recycling rates are attainable.

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## ABOUT CAN MANUFACTURERS INSTITUTE (CMI)

Can Manufacturers Institute (CMI) is the national trade association of the U.S. metal can manufacturing industry and its suppliers. CMI actively participates in dialogues regarding legislative, regulatory, and administrative policies of interest to can makers by providing objective data and analysis related to the sustainability of its products and advancing product stewardship efforts to protect human health and environment. Efficient production of steel cans with the lowest environmental footprint is a shared goal across the steel and metal can industries.

[15] IBISWorld Industry Reports. "Scrap Metal Recycling in the US - Number of Businesses 2004–2029." IBISWorld Industry Reports. Accessed August 1, 2023.
[16] Source: RRS material flow studies

## APPENDIX

### APPENDIX A: RESOURCES AND REFERENCES

| Type | Organization |
|---|---|
| Steel Can Manufacturer | Crown Holdings, Inc. |
| Steel Can Manufacturer | Silgan Containers |
| Steel Producer | ArcelorMittal Dofasco |
| Steel Producer | Tata Steel |
| Metal Scrap Aggregator | AMG Resources |
| Trade Association | American Iron and Steel Institute |
| Trade Association | APEAL (The Association of European Producers of Steel for Packaging) |

### APPENDIX B: STATES WITH EPR POLICES ON PACKAGING OR DEPOSIT BEVERAGE CONTAINERS

| State | Policy | Description |
|---|---|---|
| CA | SB 54 | Enacted EPR policy covering packaging with minimum recycled content requirements for plastic. |
| CO | HB 1355 | Enacted EPR policy covering packaging with minimum recycled content requirements for plastic, glass, paper, and metal.[17] |
| ME | LD 1541 | Enacted EPR policy covering packaging with no minimum recycled content requirements. |
| OR | SB 582 | Enacted EPR policy covering packaging with no minimum recycled content requirements. |
| NY | A05322<br><br>S00237 | Proposed EPR policy covering packaging with minimum recycled content requirements for glass containers, paper carryout bags and plastic trash bags. States that content requirements will be established for other materials.<br>Enacted deposit beverage container policy that includes soft drinks (i.e., aluminum can) but does not cover minimum recycled content requirements. |
| HI | HB179 HD1 | Enacted deposit beverage container policy states a deposit beverage distributor that sells, offers for sale, or distributes deposit beverage containers in or into the State shall meet incremental annual minimum percentages of either postconsumer recycled content or minimum non-petroleum materials content on average for the total quantity of deposit beverage containers that are sold, offered for sale. |

### APPENDIX C: U.S. RAW STEEL PRODUCTION BY PROCESS (EAF VS. BOF)

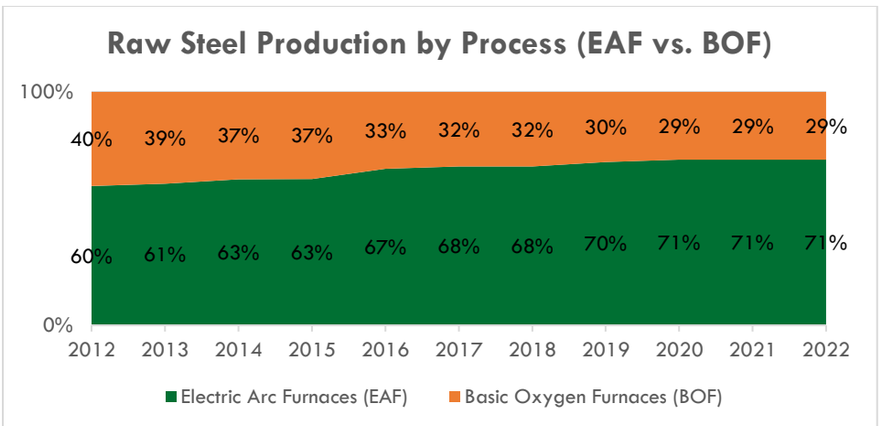


*Figure 1: Raw Steel Production by Process (EAF vs. BOF)*

[17] While the bill does not set minimum recycled content requirements for producers, the PRO is to include minimum post-consumer recycled content for metal (and the other material types). The state will strive to achieve goals set out by Jan. 1, 2030. and Jan. 1, 2035.