

U.S. Company Recycled Plastic Content Goals Analysis – Supply & Demand

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EXECUTIVE SUMMARY

As interest in the circular economy grows, an increasing number of companies have been setting goals to increase the recyclability and recycled content of their packaging. **AMERIPEN** – the American Institute for Packaging and the Environment – a policy-based trade association for the U.S. packaging industry, wanted to understand the relationship between these goals and domestic packaging supply and reprocessing capacity, and what, if any, additional policies or program supports could be leveraged to close potential gaps. Success with company goals for post-consumer recycled (PCR) content will require coordination across this value chain. Understanding where and why challenges may be occurring can provide further insight into effective interventions to ensure success.

When we began this study, we assumed that most goals would be developed for a broad portfolio of packaging formats and materials and that we would be able to drill down into demand and supply curves for all those materials. To our surprise, we found very few articulated quantifiable recycled content objectives beyond plastics. **AMERIPEN** therefore narrowed this study to evaluate the potential of meeting plastic PCR resin goals only.

Since this study was based on existing data and some estimates and assumptions were required, we caution that ***this data should be seen as general trends and not a complete assessment of available supply and reprocessing capacity for packaging-specific applications.***

Overall, our data indicates that only two plastic resins have enough collection and capacity to support goals – high density polyethylene (HDPE) and polyethylene terephthalate (PET). But despite their larger scale, they are still unlikely to provide sufficient material to meet the stated demand for PCR by 2025. Increases in collection, reprocessing capacity and quality across all materials, but particularly for HDPE and PET, will be needed. While other materials are emerging, and investments are being made, to date very few resins other than HDPE and PET have sufficient volume to help companies meet their PCR commitments.

Evaluating where the shortfalls exist across packaging-specific collection, reprocessing capacity and quality, **AMERIPEN** has also generated a list of suggested policies and program supports that warrant further dialogue as potential strategies to help increase domestic PCR processing to meet packaging PCR goals. These suggestions are intended to advance a dialogue on economic and environmental impact and do not necessarily reflect the positions of **AMERIPEN** or our members. Further dialogue with stakeholders across the packaging value chain is warranted to explore next steps.

It is our hope in providing an analysis of PCR demand, supply, and reprocessing capacity for plastic packaging specific PCR, we can advance a dialogue towards leveraging the most effective strategies to close the gaps and ensure success to meet everyone's goals.

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INTRODUCTION

As interest in the circular economy grows, an increasing number of companies have been setting goals to increase the recyclability and recycled content of their packaging. Companies are recognizing that robust domestic markets for recycled goods can reduce environmental impact, increase packaging value through reuse and recycling, and create economic opportunities. **AMERIPEN** - the American Institute for Packaging and the Environment - a policy-based trade association for the U.S. packaging industry, wanted to understand what the relationship between these goals and domestic supply and capacity is, and what, if any, additional policies or program supports might be needed to close potential gaps. Success with company goals for post-consumer recycled (PCR) content will require coordination across this value chain. Understanding where and why challenges may be occurring can provide further insight into effective interventions to ensure success.

AMERIPEN works with state and non-profit coordinators of recycling market development organizations to understand how the association can support recycling market development efforts and how we can increase communication between packaging providers and those managing packaging recovery. This report reflects our mutual interests in evaluating the opportunities and challenges facing increased domestic consumption of PCR.

AMERIPEN engaged [Circular Matters](#), a consulting firm with an emphasis on packaging and recovery systems, to help evaluate the demand and supply relationship in the U.S. We also circulated this report to key peers across the packaging value chain to ensure our findings were robust and bias free.

STUDY BACKGROUND AND METHODOLOGY

The purpose of this project was to:

- Evaluate the expected increase in U.S. PCR demand to meet company packaging commitments;
- Identify barriers to meet company commitments;
- Identify potential approaches and actions to overcome those barriers; and
- Identify opportunities for states and regions to invest in and grow their recycling infrastructure to create local economic activity and help companies meet their recycled content commitments.

We started with a comprehensive evaluation of publicly stated corporate sustainable packaging goals related to reuse and recycling. Using sources from the [New Plastics Economy Global](#)

[Commitment](#) and the [Sustainable Packaging Coalition's Goals Database](#), along with an **AMERIPEN** member survey and U.S. media scan, **AMERIPEN** compiled a list of 57 companies with U.S. sales and recycled content goals for their packaging.

Packaging was defined as primary, secondary, or tertiary packaging that would appear in a consumer's home through the purchase of fast-moving consumer goods. We did not examine foodservice packaging or business-to-business packaging. Packaging for household furnishings and appliances were also excluded – only because we found very few company goals in this category.

When we began this study, we assumed that most goals would be developed for a broad portfolio of packaging formats and variety of materials and that we would be able to drill down into demand and supply curves for those materials. To our surprise, outside of plastics goals, we found most goals were framed in an either/or context (recyclable or sustainably sourced) or, there were no recycled content objectives publicly stated. Since we found very few articulated quantifiable recycled content objectives beyond plastics, **AMERIPEN** restricted this study to evaluate the potential of meeting plastic PCR resin goals.

Finally, Circular Matters conducted a supply and demand analysis to identify the ability of the existing plastics recycling infrastructure to meet increasing packaging demand for PCR resins, and obstacles and opportunities to expand the recycling infrastructure across U.S. regions and states to meet the increasing demand for PCR resins. Data for this was pulled from existing literature.¹

EVALUATING PLASTIC PCR DEMAND

ASSUMPTIONS AND LIMITATIONS

Assessing demand was rather difficult given the way many company goals have been articulated. The first challenge was the non-specificity of some companies' commitments. For example, one company's goal was that "50 percent of product packaging portfolio to be either fully recyclable, compostable, biodegradable or made with recycled content." Such a broad statement does not commit it to any specific amount of recycled content. Companies with such goals that were not specific or quantifiable with respect to their PCR demand were not included in the analysis.

Commitments also span different levels of the packaging chain. Brand owners can make a commitment and their packaging supplier can also make a commitment. If all companies with commitments were included in this study, double counting of commitments would occur since both the brand owner and the

¹ A complete list of corporate packaging commitments is included in Appendix B of this report.

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packaging converter are making commitments about the same amount of plastic packaging used in the U.S. To avoid double-counting and overestimating future PCR demand, the research for this project focused on consumer packaged goods company brand-owners (CPGs).

Lastly, many companies sell their products globally. This project attempted to gather data on the U.S. portion only of packaging generated. Requested data, therefore, was specific to the U.S. market. Many companies however do not have data quantified specifically by the U.S. market only – sometimes it is North America (e.g., U.S. and Canada), or other times quantified by the Americas, including U.S., Canada, Mexico, and the rest of Latin America and the Caribbean island nations). In these cases, Circular Matters took their global commitment PCR tonnage and apportioned it to an estimate of their U.S. sales using the best available data.

After reviewing company commitments and excluding companies without clear PCR commitments and converter commitments to avoid double counting, Circular Matters settled on 36 companies for inclusion in this study.² Of the 36 companies we approached to provide data on their U.S. plastic packaging produced and use of recycled resin, only 15 percent provided data.³ Circular Matters estimated packaging generation by resin type for the companies that did not participate in our data request, as well as recycled plastic usage, using a variety of data sources.⁴

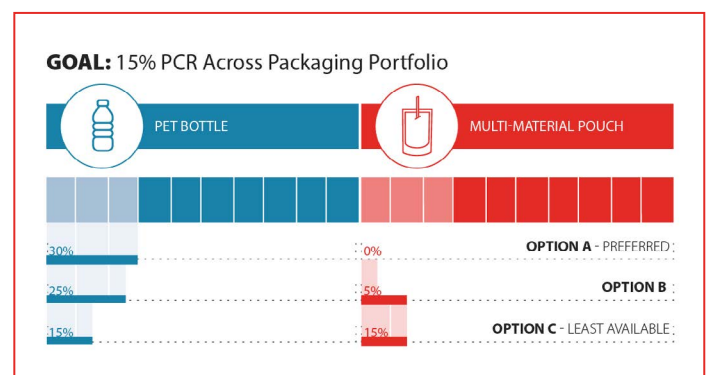
We note the future PCR demand estimates presented in this section are useful as order of magnitude estimates, but otherwise are not precise and should be considered as low and conservative estimates.

INTENTIONAL FLEXIBILITY OF PCR RESIN GOALS

Another challenge we found in estimating demand based upon company goals was the intentional flexibility with which goals were stated. Most goals were based upon a portfolio of plastic packaging and not specified by resin or packaging format type. This portfolio approach provides companies with the flexibility to meet these goals based upon available market supply and technical requirements.

For example, assume a company's packaging portfolio is composed of 50 percent polyethylene terephthalate (PET) water bottles and 50 percent multilayer flexible pouches. If that

company's commitment was to use "15 percent recycled content across all plastic packaging" it could meet its commitment by using 30 percent PET PCR in its water bottles and zero PCR in the pouch packaging, where they face increased technical challenges to include PCR and less availability of PCR resins. Using this strategy, the company average would be 15 percent overall and it would still meet its goal. For the purposes of our study, we assigned demand based upon those resins which currently have competitive PCR supply. We recognize that as recycling technology advances some of these demand curves could change to reflect new opportunities.



Additionally, some companies have stated their goals in terms of reducing their use of virgin petrochemical-based plastics using a combination of PCR content and plastics made from renewable resources. Because the amount of plastics made from renewable resources is currently limited and small in relative terms to petrochemical plastics, and only available for PET, low-density polyethylene (LDPE), high-density polyethylene (HDPE), and polylactic acid (PLA) in commercial quantities, Circular Matters assumed that at least 70 percent of company commitments must be met through the use of PCR where a goal is phrased as "renewable or PCR resin."

Because of the limitations we faced in quantifying goals, we believe the PCR demand estimates may be conservative. We also recognize that given the flexible approach of these goals, strategies to achieve goal realization may fluctuate as advancements in recycling are made and emerging strategies and solutions may reduce some of the pressures we identify today. **This should be seen as an initial attempt to quantify what should become an iterative process.**

² A list of the companies evaluated for demand can be found in Appendix A Companies Included in Analysis of Corporate Demand.

³ Companies approached who chose not to participate in this project cited a lack of U.S.-specific data versus global data or confidentiality as reasons for not participating.

⁴ Sources included:

- Ellen MacArthur Foundation (Nov 5, 2020) [Global Commitment 2020 Progress Report](#);
- World Wildlife Fund (June 2020) [ReSource Plastic Report](#) (note the report is no longer publicly available); and
- Company sustainability reports and annual financial reports (used to estimate U.S. versus global packaging generation).

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EVALUATING PLASTIC PCR SUPPLY AND PRODUCTION CAPACITY

ASSUMPTIONS AND DATA LIMITATIONS

In assessing supply, Circular Matters compiled data from existing public reports on plastics recovery within the U.S.⁵ Additionally, for the purposes of this study we attempted to restrict supply and capacity to U.S.-based processing only. We recognize U.S. manufacturers may rely on imports of PCR resins from Canada and Mexico which may slightly increase available supply or capacity beyond what is noted here. Lastly, in calculating an estimate of supply and capacity we did not account for fluctuations in demand between competing end use markets—rather we assumed we could not draw from other end users to meet increased demand. Nor did we address limitations because of technical and regulatory requirements. While we address this in our discussion around materials-specific challenges, calculating demand based upon other specific challenges and needs was beyond the scope of this study. As a result of these limitations, we caution that **this data should be seen as general trends and not a complete assessment of available supply and capacity for packaging-specific applications.**

END MARKETS FOR RESINS

In exploring interventions to help drive increased PCR content for packaging materials, it is important to understand the current end market uses for materials to ensure that interventions into the system do not inadvertently disrupt existing processes that work well. Should efforts to increase PCR content within packaging draw from other end markets we can anticipate instability across the system and a rise in costs for all parties competing for limited resins. Therefore, we wanted future PCR demand estimates to assume that increases for packaging would not be withdrawing PCR resins from existing end users.

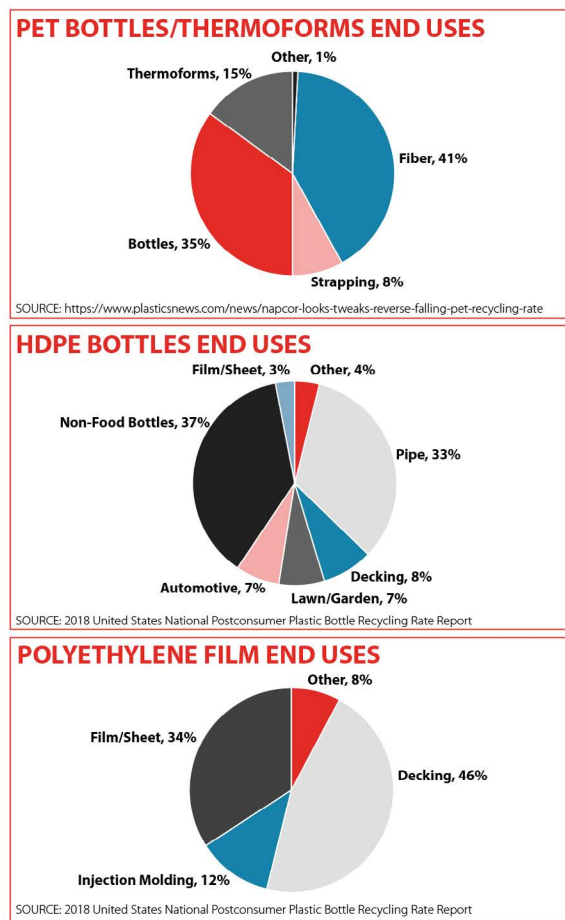
Figure 1: PCR Consumption by End Market Uses provides data on where volumes of resin collected through recycling programs typically goes after reprocessing.

Data were not available for consumption of PCR from polypropylene (PP) packaging that was recycled nor for LDPE. Industry data sources note that PP PCR is typically used as recycled content in pallets, crates, buckets, auto parts, and lawn and garden products. Packaging use for PP PCR is increasing but still in very early stages.⁶ Recycled LDPE film and sheet primarily goes into bags and sacks, such as trash bags.

The existing available data demonstrate that the packaging industry typically consumes less than 50 percent of the market for post-consumer plastic resins. At 50 percent, the packaging industry has the greatest influence on PET end markets. It drops to around 40 percent for HDPE, and at the time of this study virtually no recycled LDPE was believed to go into consumer goods packaging.

As we evaluate domestic capacity to help reach company packaging goals, we have not assumed that current markets will reduce their consumption of PCR to allow CPG companies to increase their consumption to meet their commitments. Our numbers are based upon the sum of current PCR sales into packaging applications plus unused capacity that could be used to recycle more collected post-consumer plastics for use as PCR in consumer packaging. The portion of current reclamation capacity and PCR resin production that goes to non-consumer packaging uses, such as PET PCR recycled into fiber and HDPE bottles which are recycled into pipe, are assumed to remain at current levels.

FIGURE 1: PCR Consumption by End Market Uses



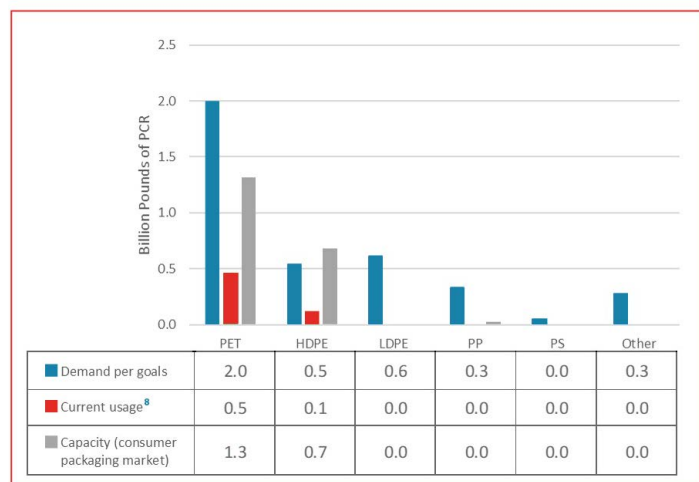
5 <https://www.plasticsnews.com/news/napcor-looks-tweaks-reverse-falling-pet-recycling-rate>, <https://plasticsrecycling.org/images/library/2018-postconsumer-bottle-recycling-report.pdf>, https://www.plasticsmarkets.org/jsfcontent/Non-BottleReport18_jsf_1.pdf, https://www.plasticsmarkets.org/jsfcontent/FilmReport18_jsf_1.pdf
6 The Recycling Partnership's Polypropylene Recycling Coalition.

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COMPARING DEMAND TO AVAILABLE SUPPLY FOR USE AND RECLAMATION CAPACITY

Across all plastic resin types, we found when we quantified the demand needed to meet company commitments for PCR, in all cases except HDPE, demand in the U.S. exceeds the availability of domestic supply available for packaging specific use and potential reclamation processing capacity. **This indicates that we will need to offer some interventions in the U.S. recycling system to help brands making PCR commitments achieve their goals.**

FIGURE 2: U.S. Annual Production Capacity, Current Usage, and Future Committed Use (Goals) for Consumer Packaging PCR⁷



SOURCES: Circular Matters LLC for commitment and PCR capacities, and the following reports for current usage amounts in packaging: <https://www.plasticsnews.com/news/napcor-looks-tweaks-reverse-falling-pet-recycling-rate>, <https://plasticsrecycling.org/images/library/2018-postconsumer-bottle-recycling-report.pdf>, https://www.plasticsmarkets.org/jsfcontent/Non-BottleReport18_jsf_1.pdf, https://www.plasticsmarkets.org/jsfcontent/FilmReport18_jsf_1.pdf.

As one can see from reviewing the results of Figure 2, recycling collection and reclamation quantities for all resins needs to increase over current levels for CPG companies to meet their goals. While our survey encompasses demand across all resins, we note that the portfolio approach of most company goals indicates that most of these companies will try to reach their commitments through increasing PCR usage for the most available resin types – PET and HDPE – until such time domestic capacity for reprocessing the other resin types can be increased. At the current time, we lack significant opportunity for recycling LDPE, (PS), and other resins back into packaging in the U.S., particularly for food contact packaging.

With a focus mainly on PET and HDPE we note that only HDPE may offer sufficient current reclamation capacity to meet company goals. However, that conclusion is simplified and does not address the additional complications inherent to supply and capacity once we consider technical specifications and other packaging design needs.

SUPPLY CONSIDERATIONS: BARRIERS TO PCR USE IN PACKAGING

In designing packaging, there are numerous technical and regulatory concerns which impact the use of PCR. These considerations further complicate the challenge of using PCR beyond what is simply stated as available supply for packaging and potential capacity as outlined in Figure 2: U.S. Production Capacity, Current Usage and Future Committed Use (Goals) for Consumer Packaging PCR. These limitations can further hinder availability of resin supply, by restricting where PCR use can best be directed. These packaging design specifications help clarify why some re-processors complain they have additional PCR available which packaging providers are not purchasing.

FOOD CONTACT REGULATORY CONSIDERATIONS

Use of PCR in food packaging is regulated by the U.S. Food and Drug Administration (FDA) and requires the receipt of a Letter of No Objection (LNO) to ensure safe use in certain food contact packaging. It's estimated that only 70 percent of PET reclamation plant locations in the U.S. have LNOs to be able to sell PET PCR for use in food and beverage packaging. This is further restricted when we consider that only a few HDPE reclaimers have LNOs. Considering that several CPGs with PCR goals sell food and beverages, the U.S. would need to add additional equipment to produce sufficient LNO resin for those CPGs to meet their packaging recycled content goals.

It should be noted that LNOs for other resins including LDPE, PP and PS are also required and there are also limited facilities to provide availability of these materials for food contact packaging. One promising technology offers the ability to purify PP to remove colorants and other contaminants, but at the current time the first commercial operation for this technology will not be ready until later in 2021.⁹ Access to LNOs for PP PCR will be limited until this technology begins operations and scales up.

⁷ Data on current usage taken from 2019 for PET and 2018 for the other resins. Capacity data is from 2020.

⁸ Current usage refers to PCR use in packaging - not total supply. There may be additional supply that could work for packaging but is not used due to demand for a specific viscosity, LNO for food contact etc.

⁹ [PureCycle Technologies](https://www.purecycle.com/)

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QUALITY CONSIDERATIONS

CPG companies build their brand identity using certain colors and scents. These can have a significant impact on PCR quality and their ability for reuse. At the current time, very few bottle reclaimers have installed the equipment needed to reduce odors in PCR. Additionally, there is currently no domestic purification capacity that can remove pigments from a mixed color stream.

Based upon current infrastructure, more sorting or reprocessing equipment investment is needed by, or on behalf of, reclaimers to address the limited capacity to produce color-sorted, color free and/or fragrance-free PCR that would be acceptable for consumer packaging use.

FURTHER TECHNICAL CONSIDERATIONS

To ensure a package performs properly, it is essential to have the correct melt index of viscosity. Additionally, each resin or packaging format will have different mechanical properties needed to ensure the package's integrity. Achieving these targeted specifications through PCR can be more challenging than from virgin resins which have been manufactured with targeted specifications in mind. This "fit for use" challenge further restricts available plastic supply for use in plastic packaging.

All three of these design constraints indicate that even with increased supply and capacity for packaging specific needs, packaging producers may still face barriers with integrating increased PCR content into packaging formats.

SUPPLY CONSIDERATIONS: ACCESS TO SCRAP MATERIAL

When we consider the availability of PCR and the brands who are making commitments on its use, PET appears to be the resin with the greatest amount of packaging demand. Approximately 70 percent of the brand commitments for U.S. PCR included in this study is for the beverage category, including bottled water, carbonated soft drink, juice, and other PET beverage bottles. Yet supply of and capacity to reclaim this material, as seen in *Figure 2: U.S. Production Capacity, Current Usage and Future Committed Use (Goals) for Consumer Packaging PCR*, is lacking.

COLLECTION CONSIDERATIONS

Approximately 1.8 billion pounds of PET bottles and 0.1 billion pounds of thermoforms were collected in the U.S. for recycling in 2018 out of more than 6.3 billion pounds of PET bottles sold.¹⁰ If the total domestic PET reclamation capacity were to be increased to 3.8 billion pounds of capacity and that capacity were to be utilized, **collection would need to increase to nearly double current levels** (i.e., the PET bottle recycling rate would need to increase from 29 to approximately 56 percent).

REPROCESSING CAPACITY CONSIDERATIONS

The U.S. capacity as of the end of 2020 to recycle PET bottles and post-consumer PET thermoforms to produce PCR for all uses, including non-packaging uses such as fiber, is over 2.6 billion pounds of incoming material per year. To meet the future demand for PCR, the PET reclamation capacity would need to increase to at least 3.8 billion pounds per year, accounting for yield loss from incoming purchased bottles.¹¹ **In other words, PET reclamation capacity in the U.S. would, at a minimum, need to increase by 50 percent from current capacity to meet CPG company brand commitments for their PET packaging**, assuming that there is no change in demand from other end markets for this material.

This data indicates that we will need significantly more capture and reprocessing of PET if we want to achieve company goals, and the collection and capacity figures presented above could be even higher if CPGs plan to meet their company-wide recycled content averages for all resins by increasing their usage of PET PCR. While we recognize goals could be achieved by targeting other resins, the overall message is the same. With most resins other than HDPE and PET lacking sufficient reprocessing capability for packaging recycling, we still lack sufficient domestic supply and capacity to achieve success. We will need to do more to capture and reprocess existing recyclables to increase plastic PCR supply.

ACCESS TO REPROCESSING TECHNOLOGIES CONSIDERATIONS

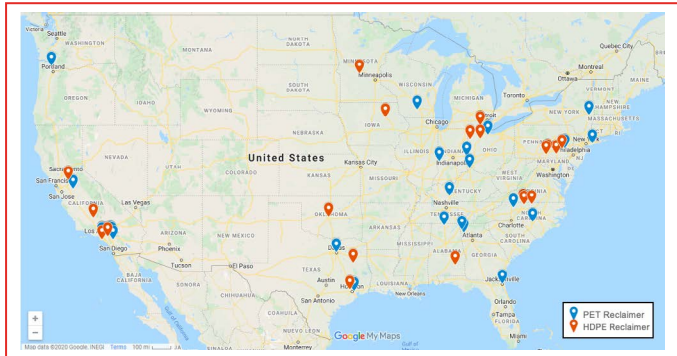
With PET and HDPE the most likely resins to utilize to meet company goals, evaluating capacity and access for those can help us understand the opportunity and role regional market development could play in helping increase PCR access to meet those goals.

¹⁰ This underestimates since the amount of PET packaging sold since it excludes PET thermoform quantities for which industry data does not publicly exist. Data were drawn from <https://www.plasticsnews.com/news/napcor-looks-tweaks-reverse-falling-pet-recycling-rate>.

¹¹ This assumes that the U.S. reclaimer PCR yield from incoming material continues to be approximately 70 percent, with yield loss due to caps, labels, contamination, residual contents, and loss of PET resin in the reclamation process, as reported by NAPCOR.

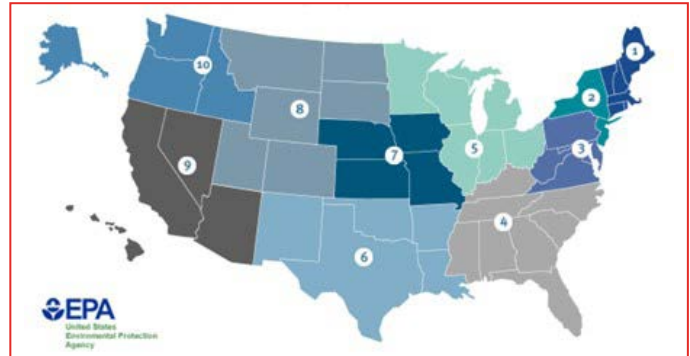
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FIGURE 3: **PET and HDPE Bottle Reclamation Plants**



SOURCE: Circular Matters, NAPCOR (PET Reclaimers) More Recycling (Plastics Markets)

FIGURE 4: **EPA Region State Groupings**



SOURCE: U.S. EPA

TABLE 1: **PET Bottle and Thermoform Reclamation Capacity Analysis by EPA Region State Groupings**

REGION	EXISTING PET PLANTS	EXISTING PET BOTTLE RECLAMATION CAPACITY (million pounds, all uses)	PET BOTTLE RECLAIM CAPACITY ALLOCATION TO MEET PCR PACKAGING COMMITMENTS (million pounds)
1	0	0	174
2	2	150	335
3	1	100	361
4	8	985	770
5	5	480	616
6	2	100	494
7	0	0	165
8	0	0	141
9	7	628	597
10	1	30	165

SOURCE: Circular Matters

Figure 3: *PET and HDPE Bottle Reclamation Plants* indicates that the regional access to PET and HDPE reclamation plants remains limited. The majority of reprocessing capacity for packaging specific needs is focused predominately in the Eastern United States. There are large portions of the country that need to transport their curbside materials significant distances for reclamation and remanufacturing.

Since earlier data demonstrated that PET reclamation capacity would need to be expanded to help meet goals, Circular Matters also compared regional PET reclaimer capacities to the populations in those regions to evaluate where expanded reclamation capacity could be supported through recycling market development efforts to better align recycling quantities with reclamation. For this comparison state groupings by U.S. Environmental Protection Agency (EPA) regions were used (Figure 4) and the results are shown in Table 1.

Basing demand upon stated company goals and little to no expected change in alternative end markets, then all regions could use more PET reclamation capacity and/or at least one more PET reclaimer than is shown in Table 1 to meet potential future demand for PCR content in PET bottles and thermoforms. When further assessing recycling market development opportunities, an efficient commercial-scale plant is typically

sized at 100 million pounds per year of incoming bottle recycling capacity.

Technical reprocessing capacity for LDPE, PP, PS, and other plastic resin types remains limited, suggesting a need for more investment in both research and development and the ability to scale for market for emerging technologies in this area, which could remove some tension on PET as the key resin to realize company goals.

APPROACHES AND ACTIONS TO ACHIEVING COMPANY PLASTIC PCR GOALS

Our current data indicates the domestic U.S. supply and capacity for plastic reprocessing is not sufficient to meet the demand outlined through company goals for packaging PCR use. We lack sufficient technologies to leverage some PCR resins for packaging-specific needs, requiring increased emphasis on PET and HDPE as the two resins with the greatest supply potential for packaging quality PCR. Yet these two resins, despite their more robust markets, also lack sufficient supply and domestic capacity to meet the stated demand. With HDPE this challenge is more around quality for packaging-specific needs, while PET is centered more around collection and reprocessing capacity. This

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study provides insight to help us look collectively at where the greatest opportunities are to drive change through investments, regulatory changes, and policy that could help close the gap.

The following recommendations point us in directions to consider, but the next steps will require the careful consideration of the opportunities and impacts of policy proposals by stakeholders across the packaging value chain. Costs, impacts, social will, and unintended consequences will all need to be evaluated. Additionally, material-specific strategies may need to be explored. These recommendations are not necessarily recommended policies from **AMERIPEN**, but rather are provided with the intention of opening dialogue among packaging stakeholders to help begin the process of evaluating strategies to close the gap between PCR demand and supply for U.S. plastic packaging markets.

CONSUMER EDUCATION

There are a number of existing studies that indicate a significant portion of recyclable materials are landfilled each year. Since we know we will need to increase collection of materials, particularly PET, working to help educate and simplify recycling for consumers could be a significant strategy to ensure recyclables are directed towards the recycling system.

Education may include simplifying access for the consumer and reducing contamination. Messaging around the value of recycling could also help, with the intention of driving increased consumer participation in recycling programs. South Carolina's campaign "[Your Bottle Means Jobs](#)" is a unique public education campaign designed to encourage increased participation in curbside recycling systems. Additionally, APR's new "[Buy Recycled](#)" campaign is another strategy designed to help inform consumers of the importance of recycling. Further evaluation of the impact of these programs on increasing consumer participation in recycling could help drive recommendations for further efforts.

CONTAINER DEPOSIT PROGRAMS

Circular Matters estimates that there are approximately 3.3 billion pounds of PET beverage bottles sold in the U.S. each year, approximately 0.6 billion pounds of which are currently collected through existing deposit-return programs in ten states. If a comprehensive national beverage container deposit-return program were to be implemented with a ten-cent deposit so that at least 75 percent of all beverage bottles nationwide would be collected through the deposit return program, Circular Matters

estimates that as much as an additional 1.6 billion pounds of PET bottles could be collected over 2020 levels, for a total of approximately 3.4 billion pounds of PET bottle collection per year. This approach alone still would still fall short to fill the expansion in both collection and reclamation capacity that would be required for CPG companies to meet their future commitments, but it would bring those companies a step closer to meeting their goals.

TARGETING MARKET DEVELOPMENT

As noted earlier, for many companies with PCR goals for their plastic packaging, they are pursuing strategies that provide for portfolio flexibility, permitting them to reach increased success based upon market access. Strategies include deselecting certain materials because they currently lack an adequate recycling infrastructure and substituting or increasing use of others that have higher market access or existing recovery pathways. We noted that companies that use a variety of packaging resins seem to be relying on their use of PET PCR at higher levels while their other packaging resins have little or no recycled content. This indicates that PET market development should be a key strategy. Additionally, where technologies are emerging that permit other PCR resins to be used in plastic packaging portfolios, the demand may be high as it creates an opportunity for companies to use these new resins to reach their goals.

EXPANDING REPROCESSING TECHNOLOGIES

Additional investment and technology development is needed in mechanical recycling, purification, and plastics-to-plastics chemical recycling technologies. The chemical recycling family of technologies offers the promise to produce virgin-equivalent quality in PCR resins, including for those resins that are not PET, especially if mass balance accounting¹² rules are accepted versus actual recycled content.

Chemical recycling of PET can also take post-consumer PET textiles, such as carpet, and upgrade it into packaging resins, which would help with the barrier of needing very high recycling rates for PET packaging to meet company commitments. Chemical recycling options are still emerging, and it will likely be at least five years before the technologies are considered economically viable and achieve scale, after which the collection and processing infrastructure would need to be restructured to collect plastics that are currently not being appreciably recycled through mechanical means.

¹² Mass balance accounting permits the measurement of materials entering or leaving a production process without having to account for an actual chain of custody of recycled resins. This can be important in plastic recycling where postconsumer feedstocks may be combined with non-postconsumer feedstocks for economies of scale. At the current time the use of mass balance accounting for PCR use has not been adopted.

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In the meantime, policies to support and expand support for these technologies may be needed to help scale and encourage investment. Market development agencies may want to consider their boundaries and the role they could play in expanding access to these technologies. State and federal policies may need to expand their definitions of recycling and the regulatory processes required to site new facilities.

EVALUATING HIGHEST AND BEST USE

This study has made the assumption that the end goal is to increase PCR use in packaging as a response to publicly stated company goals. After evaluating end market demand, quality and technical constraints, however, we would be remiss if we did not ask whether plastics recycling could drive better environmental outcomes if PCR materials were directed towards alternative end markets.

The paper industry has developed a process to help them evaluate highest and best use for post-consumer recycled content in paper remanufacturing. They have demonstrated, for example, that less energy, less pulp, and less chemicals are used when paper is recycled into lower quality products like corrugated boxes and paperboard over more refined products like office or magazine papers.¹³ Considering some of the investments needed to tackle color, scent and viscosity within plastic resin used for packaging, perhaps it may behoove the plastics industry to begin a process to help evaluate where the highest and best use for recycled plastic packaging would lay.

Although a slightly different concept, a program along these lines is APR's [Recycling Demand Champions Program](#) that encourages packaging producers to find increased ways to incorporate PCR demand across their packaging value chain. If they can't use resins in packaging, for example, Demand Champions challenges them to add it to their shipping pallets, recycling carts, shelving or other materials essential to their business.

Data to help inform these strategies may help drive further environmental value through highest and best use strategies.

RECYCLED CONTENT MANDATES

Perhaps the one strategy that has been most promoted in policy circles is the application of recycled content mandates. California recently enacted into law a new mandate for plastic beverage containers, initially requiring 15 percent PCR and eventually advancing towards 50 percent by 2030.¹⁴ New Jersey, New York and a number of other states are also exploring recycled content mandates as a policy approach. While mandates may help increase demand, evaluated data encourages caution in defining the parameters of such mandates. Minimum content mandates must consider supply and reprocessing capacity to ensure adequate PCR supply, and also consider package integrity.

CONCLUSION

This study sought to understand the relationship between company packaging goals for post-consumer recycled (PCR) content and available supply and current demand. Circular Matters' evaluation of domestic supply and capacity for plastic resin concludes that based upon demand stated through public commitments for plastic PCR, the U.S. currently lacks the available supply and, in some cases, domestic reclamation capacity to meet those goals. Depending on the resin, restrictions may be a supply or a technical specification challenge and less about volume. This means strategies to help close those gaps may vary depending on resin and end use need.

In undertaking this study, it was **AMERIPEN's** objective that the data within could help align packaging providers with recycling market development strategies to ensure success. This study was born out of a collective desire from the packaging industry and state recycling market development organizations to help understand the barriers behind the commitments so we could help one another with our recycled content objectives. We are hopeful this data will help ensure we collectively design policies, programs, and initiatives to help drive the best outcomes for all involved.

¹³ American Forest & Paper Association. (August 2013). "EPA Product Specific Mandates for Recovered Fiber Content Ignore Paper Industry Economic and Environmental Realities"

¹⁴ California AB 793: [Recycling: Plastic Containers: Minimum Recycled Content](#)

APPENDIX A

COMPANIES INCLUDED IN ANALYSIS OF COMPANY DEMAND

The final list of companies evaluated to assess demand for U.S. plastic PCR resins were:

- Albertsons
- Anheuser-Busch InBev
- Beiersdorf
- Campbell Soup Company
- Church & Dwight
- Clif Bar & Company
- The Clorox Company
- The Coca-Cola Company
- Colgate Palmolive
- Costco
- Danone
- Dell
- Diageo
- Estee Lauder Companies
- FedEx
- Henkel Corporation
- The J.M. Smucker Company
- Johnson & Johnson
- The Kellogg Company
- Keurig Dr. Pepper
- Kroger
- L'Oréal
- Mars Incorporated
- McCormick
- McDonalds
- Molson Coors
- Nestlé
- Panera Bread
- PepsiCo
- Premium Waters
- Procter & Gamble
- Reckitt Benckiser
- SC Johnson
- Starbucks
- Unilever
- Walmart

APPENDIX B

COMPANY SUSTAINABLE PACKAGING SOURCING GOALS

This appendix provides a summary of all goals related to companies with U.S. sales who have articulated packaging recycling and recycled content goals. This helped inform the boundaries of the report by focusing on what goals could be quantifiable. Data was eventually restricted to plastic resins given the limited statements and difficulty in quantifying goals around other materials.

PACKAGED GOODS COMPANIES	GOAL
Albertsons	<ul style="list-style-type: none"> 100% recycled or certified fiber packaging. 20% recycled content by 2025 across brand owned plastics packaging.
Anheuser-Busch InBev	<ul style="list-style-type: none"> By 2025 100% of products will be in packaging that is either returnable or made from majority recycled content.
Biersdorf	<ul style="list-style-type: none"> 30% recycled materials in plastics packaging by 2025.
Campbell Soup Co.	<ul style="list-style-type: none"> 25% PCR in PET bottles by 2030.
Chobani	<ul style="list-style-type: none"> Making every piece of our packaging either fully recyclable, compostable, biodegradable, or made with recycled content.
Church & Dwight	<ul style="list-style-type: none"> Global plastics portfolio made from a minimum 25% PCR by 2025.
Cisco Systems Inc.	<ul style="list-style-type: none"> We are working to reduce our use of plastic in the designs of our products and packaging and where this is not viable, use PCR content instead. We are committing to decrease our use of virgin plastic by 20% by 2025, using FY18 as our base year.
Clif Bar & Co	<ul style="list-style-type: none"> 25% of plastic in packaging portfolio will be renewable or recycled material by 2025.
Clorox Company	<ul style="list-style-type: none"> 50% combined reduction in virgin plastic and fiber packaging by 2030. Double plastic PCR in packaging by 2030 (+50% by 2025).
The Coca-Cola Company	<ul style="list-style-type: none"> Aspire to create packaging that contains at least 50% recycled content by 2030.
Colgate Palmolive	<ul style="list-style-type: none"> Increase recycled content in our packaging to 50% on average (2020) and our 2025 goal focuses on increasing recycled content for plastic to 25%.
Costco	<ul style="list-style-type: none"> All plastic to be recyclable PET or made from recycled plastic.
Danone North America	<ul style="list-style-type: none"> By 2025 we will reach 25% of recycled material on average in our plastic packaging, 50% on average for our water and beverage bottles and 100% for Evian bottles.
Dell	<ul style="list-style-type: none"> By 2030 100% of our packaging will be made from recycled or renewable material.
Diageo	<ul style="list-style-type: none"> Achieve 40% average recycled content in our plastic bottles by 2025 and 100% by 2030.
Estee Lauder Companies	<ul style="list-style-type: none"> Increase the amount of post-consumer recycled material in its product packaging by up to 50%.
FedEx	<ul style="list-style-type: none"> FedEx Branded Packaging will be composed of 45% recycled content.
General Mills	<ul style="list-style-type: none"> Fiber packaging made from 100% recycled content, from virgin wood fiber regions that do not contribute to deforestation, or from Forest Stewardship Council (FSC) mix or better.
Happy Family Organics	<ul style="list-style-type: none"> 25% recycled content in all rigid plastic packaging.
Henkel Corporation	<ul style="list-style-type: none"> 20% PCR in all plastic packaging by 2025.
JM Smucker	<ul style="list-style-type: none"> 100% of fiber is recycled or certified. 30% PCR or renewable sources in plastic packaging by 2030.
Johnson & Johnson	<ul style="list-style-type: none"> 15% recycled content across all plastic packaging.

APPENDIX B - CONTINUED

The Kellogg Company	<ul style="list-style-type: none"> • 100% recycled or certified content for fiber. • 10% recycled content for plastic.
Keurig Dr Pepper	<ul style="list-style-type: none"> • 30% PCR across plastic packaging portfolio by 2025.
Kroger	<ul style="list-style-type: none"> • At least 20% PCR in store brand packaging and products.
L'Oreal	<ul style="list-style-type: none"> • 30% recycled content across all plastic portfolios.
LG Electronics	<ul style="list-style-type: none"> • Corrugated boxes made from 50% minimum recycled content and 80% recycled content across packaging papers.
Lush Brands	<ul style="list-style-type: none"> • The paper bags we use in stores are made with 100% post-consumer recycled paper. • Shipped items are packed in biodegradable plastic bags, recycled paper and/or biodegradable filler. • Our pots and bottles are made from 100% PCR plastic.
Mars Incorporated	<ul style="list-style-type: none"> • Use on average 30% recycled content in plastic packaging by 2025.
McCormick	<ul style="list-style-type: none"> • 50% recycled content in all plastic packaging by 2025.
McDonalds	<ul style="list-style-type: none"> • 100% of guest packaging will come from renewable, recycled, or certified sources by 2025.
Microsoft	<ul style="list-style-type: none"> • Increase recycled content in paper packaging to 90%. 10% year over year individual program increase in recycled content.
Molson Coors Beverage Company	<ul style="list-style-type: none"> • 30% recycled content across all plastics.
Nestle USA	<ul style="list-style-type: none"> • 15% PCR across all plastic packaging and 50% in North American water bottles.
Panera Bread	<ul style="list-style-type: none"> • Increase recycled content by 2%.
PepsiCo	<ul style="list-style-type: none"> • 25% recycled content across all packaging by 2025. 35% reduction in virgin plastics.
Premium Waters	<ul style="list-style-type: none"> • 20% average recycled content in all bottles by end of 2020.
Procter & Gamble	<ul style="list-style-type: none"> • Reduce virgin petroleum plastics by 50% across all plastic packaging by 2030.
Reckitt Benckiser	<ul style="list-style-type: none"> • 25% average recycled content across all plastics packaging portfolio.
SC Johnson	<ul style="list-style-type: none"> • 15% PCR over full plastic packaging portfolio. • 40% PCR in U.S. and European bottles by 2025. • Ecover line to be 100% recycled content by 2020.
Seventh Generation	<ul style="list-style-type: none"> • 100% of products and packaging to be either PCR or biobased content by 2020.
Starbucks	<ul style="list-style-type: none"> • Double the recycled content, recyclability, and reusability of coffee cups by 2022. • Use 5-10% recycled content across all plastic packaging used by 2025.
Unilever	<ul style="list-style-type: none"> • Increase PCR content in plastic packaging portfolio to at least 25% by 2025. 100% of fiber to be certified or recycled content by 2020.
Walmart	<ul style="list-style-type: none"> • At least 20% PCR in store brand packaging by 2025.
Yum Brands	<ul style="list-style-type: none"> • 100% recycled or certified content in all fiber-based packaging by end of 2020.



APPENDIX C

OBSTACLES AND APPROACHES/ACTIONS LISTED BY CPGS TO MEETING THEIR SUSTAINABLE PACKAGING GOALS

CPGs surveyed for this study identified barriers to their achieving their recycled content plastic goals and potential approaches or actions that could be taken to help them achieve their goals. Their comments are listed below verbatim as provided to Circular Matters.

BARRIERS TO ACHIEVING GOALS

- Quantity of suitable quality recycled resin, especially for drug-registered products.
- Clean feedstock from mechanically recycled resin for food packaging.
- Low materials availability for our technical needs (food contact).
- Limited sources who can convert PCR to meet the FDA requirements for food packaging.
- Reliable sources of “food grade” post-consumer recycled material of consistent quality at a relatively stable price.
- One of our primary challenges regarding using recycled content for primary packaging is ensuring food safety.
- Quality of mechanically recycled resin to use in flexible film.
- Cost to implement vs. using virgin resin.
- Lack of standardized recycling in the U.S.
- The relatively low recycling rate of plastic packaging (much remains in the waste stream).
- Low bottle recycling/collection, driven by lack of incentive (economic/legislative, cultural, other).
- Recycled resin suppliers are generally small and cannot meet our purchasing needs.

APPROACHES/ACTIONS TO ACHIEVE GOALS

- Improved sorting and cleaning of mechanically recycled resin.
- Scale up production of chemically recycled resin and acceptance for drug product packaging.
- Commercializing chemical recycling for broader use.
- Chemical recycling supply chains that can deliver recycled content plastic (via mass balance) that is approved for food contact.
- Help to obtain recyclable accreditation from SPC to use How2Recycle label.
- Price of PCR needs to decrease to be on par with virgin resin.
- Increased availability of materials.
- Expansion of the current recycling infrastructure to produce a reliable, consistent, economical, high-quality source of food grade post-consumer recycled content resin for PET, PP and HDPE materials.
- Incentives to increase recycling rates AND infrastructure to enable recycling.
- Establishment of a robust system to collect and recycle mono-polymer flexible material from consumers to reach recycled goal for our plastic packaging.