

# Solutions for a Circular Plastics & Lower Carbon Economy



Solutions for a better tomorrow

June 5, 2024



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# LYB at a glance

#1

largest producer of polyethylene (PE) and polypropylene (PP) in Europe

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~6,000

patents and patent applications worldwide

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340,000+ Tons

of recycled and renewable-based polymers produced and marketed by LyondellBasell since 2019\*

#2

largest producer of PP worldwide

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20

countries with manufacturing sites and joint ventures

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50MM+ Tons

capacity across our global production footprint

Industry-leading sustainability goal:

2MM+ tons

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of recycled or renewable-based polymers annually by 2030\*



\*Million metric tons. Production and marketing includes: (i) joint venture production marketed by LYB plus our pro rata share of the remaining production produced and marketed by the joint venture, and (ii) production via third-party tolling arrangements.



# Why Colorado?

- Access to collection & recycling systems and desire to increase recycling rates
- First mover on EPR scheme implementation (benchmark)
- Feedstock supply opportunity to regional and integrated hubs



# Megatrends are aligning to drive the packaging industry toward more sustainable solutions

## Political factors

State-level EPR and PCR mandates



## Economic factors

Value lost through lack of collection/reprocessing infrastructure



## Social factors

Population growth increasing plastic waste



## Technological factors

Companies investing in technology

# 1 *Circulen Products to help customers achieve Circularity and lower carbon footprint*

# LYB *Circulen* Product Portfolio enables brand owners to improve the sustainability of consumer products



Polymers made from plastic waste through a **mechanical recycling process**



Polymers made by converting plastic waste into feedstock to produce new polymers using an **advanced (molecular) recycling process**



Polymers made from **renewable feedstocks** such as used cooking oil

# LYB *CirculenRecover* single pellet solutions offer multiple benefits over dry blending



Polymers made from plastic waste through a **mechanical recycling process**

## Benefits of Single Pellets:

- Enhanced product consistency and quality
- Higher PCR incorporation
- Regulatory/product safety assessment by LYB
- Improved converter operations and efficiency



# LYB *CirculenRevive* products are complementary to mechanical recycling to address hard-to-recycle items



Polymers made by converting plastic waste into feedstock to produce new polymers using an **advanced (molecular) recycling process**



## Benefits:

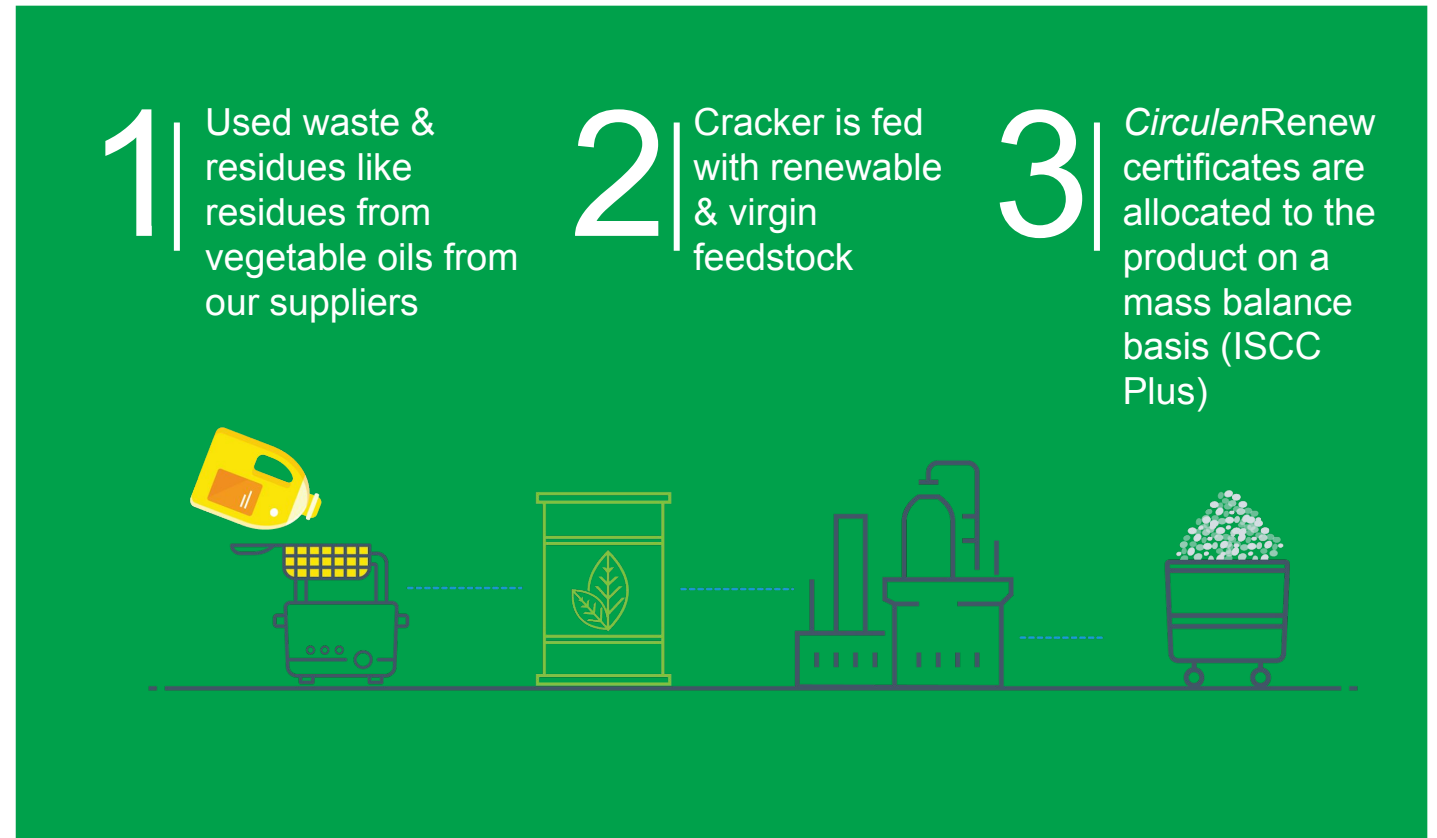
- Drop-in solution: No resin requalification needed
- Up to 100% recycled content on mass-balance basis
- LCA underway

*ISCC PLUS certified mass balance approach*

# LYB *CirculenRenew* products helps brand owners meet the growing demand of low carbon products



Polymers made from **renewable feedstocks** such as used cooking oil

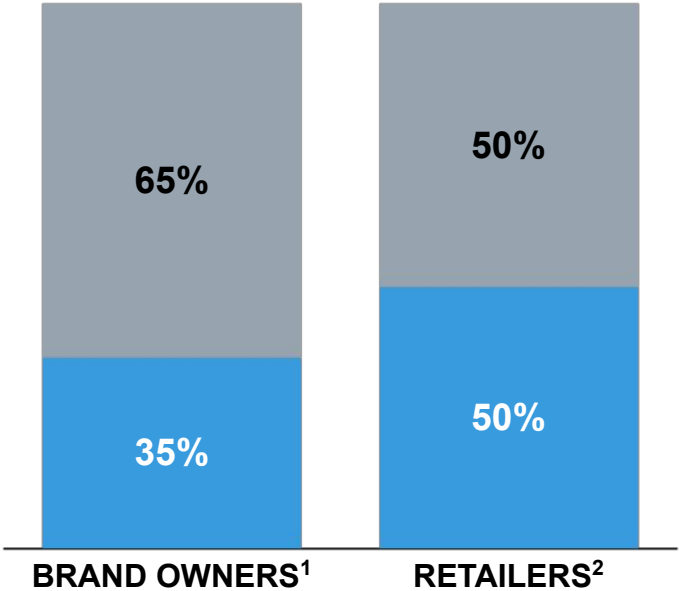


# 2 Feedstock supply Scalable technologies

# Urgent demand for recycled and renewable-based packaging

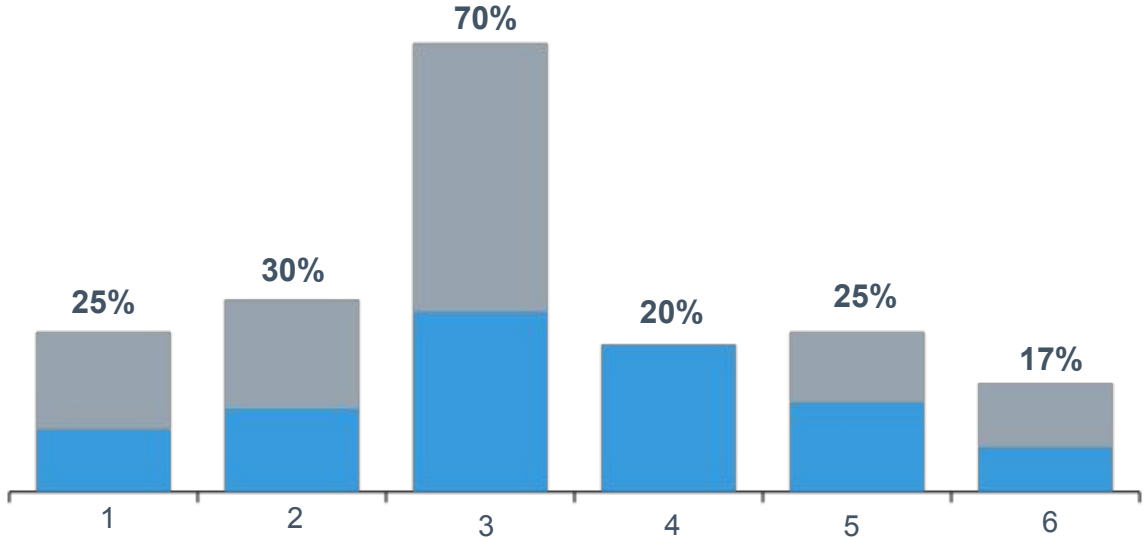
## Brand owners and retailers facing substantial gaps to 2025 targets

### SUBSTANTIAL SHORTAGE TO MEET 2025 TARGETS



### RETAILER COMMITMENTS<sup>2</sup>

Major Retailer Recycled Content Targets by 2025  
*% of total packaging content*



2021 recycled content

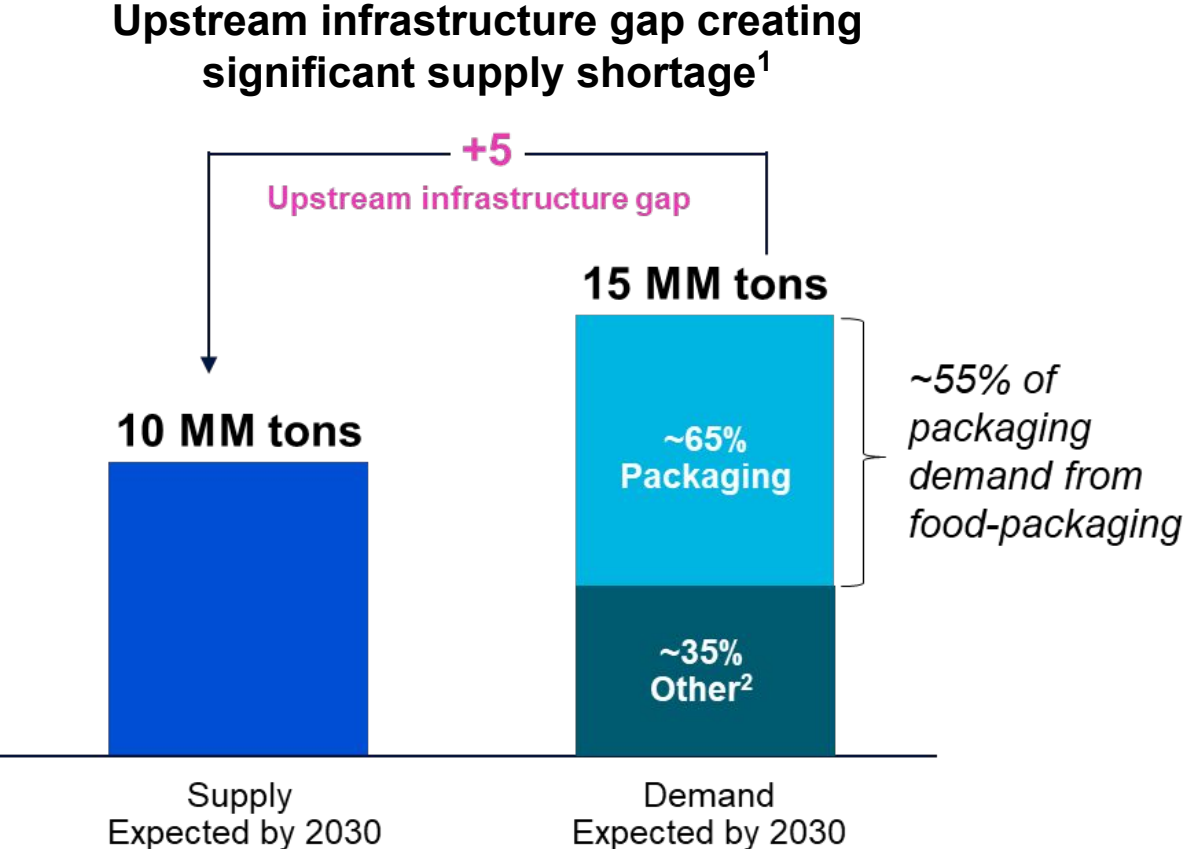
Gap to 2025 target



1. 10 top brand owner's commitments represent ~12% of total recycled content demand in packaging by 2025  
2. Leading retailers including Ahold Delhaize, Carrefour, El Corte Inglés, Kesko, Schwarz Gruppe, Walmart  
Source: Ellen MacArthur Foundation Global Commitment 2022 Progress Report

# Persistent supply shortage creating strong business case for investment

Brand owners and retailers facing substantial gaps to 2025 targets

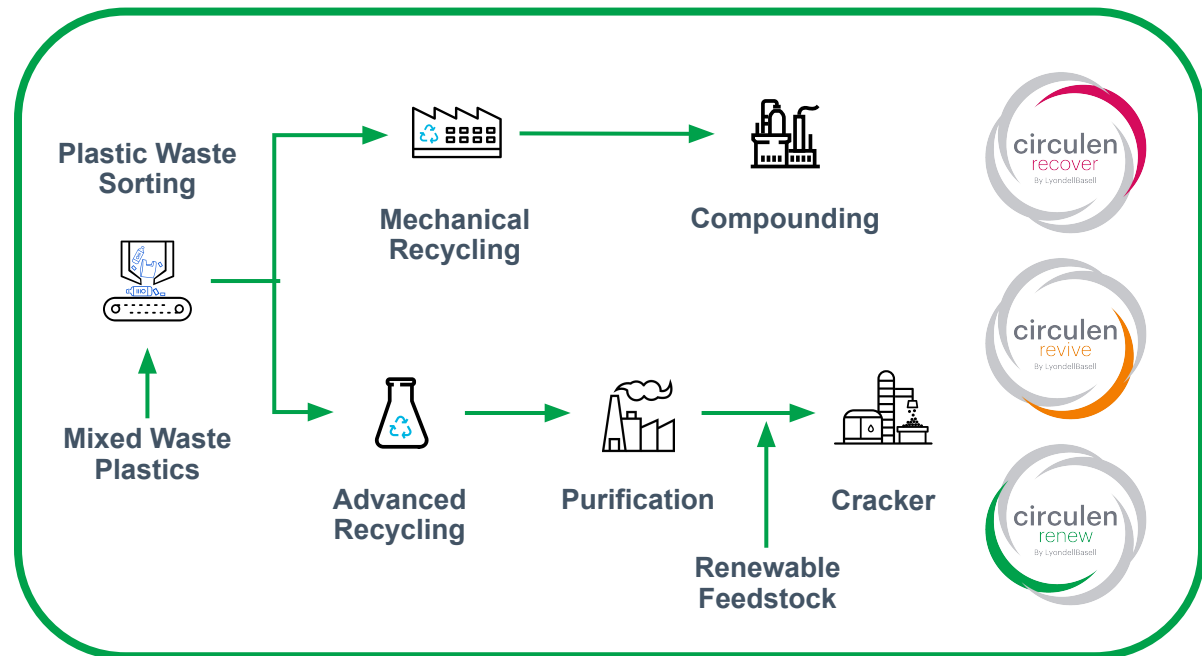


1. Sources: McKinsey Chemical Insights, IHS Markit. Supply and demand for recycled and renewable-based polyethylene and polypropylene in North America and Europe.  
2. Other includes automotive, durable goods and construction.



# LYB integrated hub model provides advantage

Building scale, reducing cost and capturing value to establish leadership in circular solutions



- Regional hubs to access/supply feedstock
- Preferred strategic partner to feedstock owners
- Leveraging existing capabilities at Cologne/Houston sites
- Differentiated, advantaged technologies (*MoReTec*)
- Brand-owner collaborations via *Circulen* brand portfolio

# Houston hub: Cyclyx Circularity Center, advanced recycling plans



## **Cyclyx JV between Agilyx, ExxonMobil and LYB key for Houston hub**

Strong waste industry background

Access to wide range, low-cost waste feedstock streams

Capacity of 1st commercial scale Circularity Center: 330MM lbs./yr.

Expected startup: 2025

## **Investment aligns with purpose of creating solutions for everyday sustainable living**

Helps LYB meet demand for sustainable solutions

Aligns with strategy to advance and scale plastic waste feedstock and recycling infrastructure

Supports existing and future planned assets in Houston area

# Standing up mechanical recycling capability in North America



- Located in Jurupa Valley, east of Los Angeles
- 152k sqft. of manufacturing & logistics space
- 2 rigid plastic recycling lines
- Expecting to begin operations in 2025

# MoReTec advanced recycling technology

**MoReTec Technology:** differential, advanced catalytic recycling technology maximizing plastic-to-plastic yield at scale

- Scalable and high-yield continuous technology
- Ability to process low quality and mixed plastic waste feedstock streams
- Novel catalyst technology can reduce energy consumption and may yield lower carbon footprint
- Designing technology to be powered by renewable electricity



Ferrara,  
Italy



**Mechanical completion of first of its kind commercial scale 50 KTA unit in Wesseling, Germany planned by end of 2025**



# *Circulen* product portfolio is delivering sustainability wins for converters and brands in market today

*Circulen* delivers sustainable solutions across a broad array of product categories



Drinking Cup  
*CirculenRenew*



Newell Brands-Nuk  
*CirculenRenew*



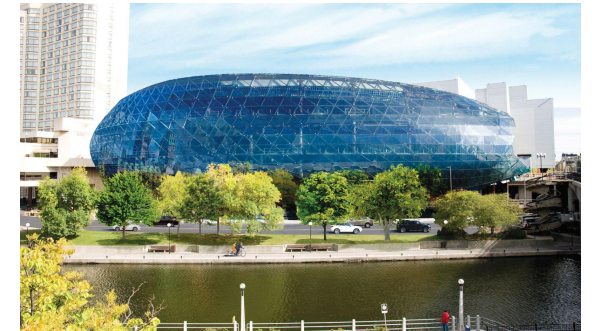
Cereal Bag  
*CirculenRecover*



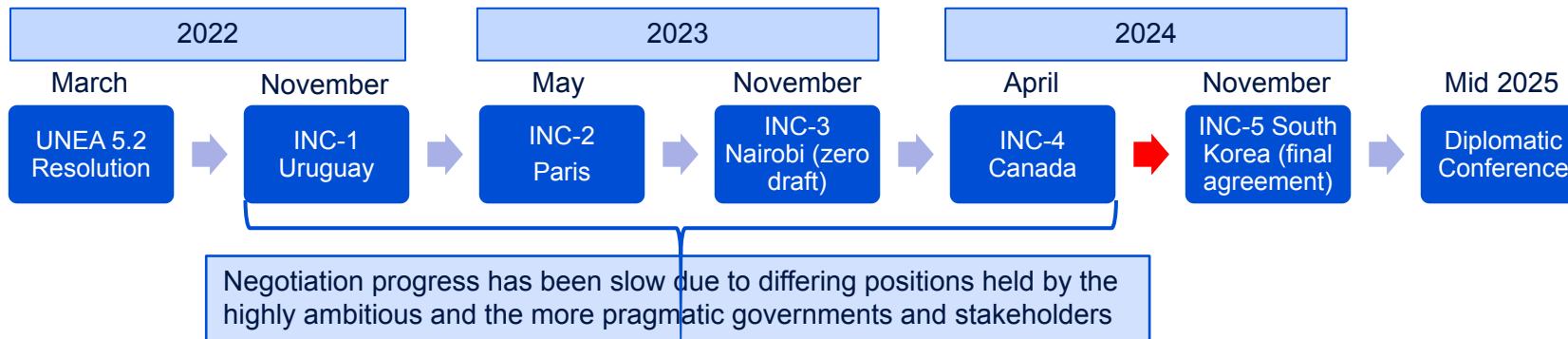
# Global Treaty on Plastic Pollution

UNEA 5.2 Resolution 14 set the stage:

- Develop an “internationally legally binding” agreement to address plastics pollution
- National action plans to address local circumstances
- Multiple approaches needed to address the full lifecycle of plastics
- Promote sustainable production and consumption of plastics
  - environmentally sound waste management
  - enable a circular economy for plastics
  - product design to reduce, reuse, recycle



## INC Negotiations Timeline



# INC-4 Highlights

- Plastics industry delegation of ~160 representatives
- Alliance to End Plastic Waste Solutions Showcase
- INC created 2 contact groups, 5 subgroups created to streamline zero draft, begin textual negotiations
- Negotiations moved at varying paces, some issues more contentious
- HAC and Like-Minded Group countries often clashed
- Some confusion and complaints on streamlining process
- Issues of convergence – waste infrastructure buildout, financing/EPR, just transition, recycled content requirements
- Issues of divergence – scope of treaty, production caps, criteria/regulation of chemicals of concern and problematic plastics, design standards, microplastics regulation, legacy plastic pollution
- Stronger than expected emphasis on primary plastic production caps (Bridge to Busan Declaration)
- INC intersessional work – two expert groups will work on:
  - implementation and financial mechanisms
  - criteria for chemicals of concern and problematic plastics, product design standards
  - production caps were not included
- One intersessional in-person meeting of expert groups, no observers but INC will invite some technical experts



# What Could the Global Plastics Treaty Mean for Colorado?

- Expect years of addendums via COP process to strengthen treaty
- More impactful if U.S. can join treaty
- Implemented at the national (and state?) level through national action plans
- Should provide guidance, standards, policies to drive circularity
  - infrastructure financing, recycled content targets, product design standards, problematic plastic criteria
- Primary plastic production caps unlikely
- Could serve as a model for complementary state legislation
- Hopefully complementary and not duplicative to International, U.S., Colorado regulations (Basel Convention, EPR, TSCA)
- Technology agnostic – diverse technology solutions to enable plastics circularity



# LYB is enabling a circular and lower carbon economy

