

NPE 2024 | **MADE
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The Plastics Show

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INDUSTRY ASSOCIATION



Defining Sustainable Polymer Technologies in Packaging:

Building Your Personalized Pathway to Eco-Friendly Solutions



**Bamberger
Amco Polymers**

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Amco Polymers**



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A Member of the Ravago Group

9,000+ Employees

More than 30% are dedicated local sales employees

53,000+ Customers Worldwide

Large loyal customer base

325+ Locations Worldwide

Across 65 countries

6.8 mln MT Volume

42,000+ Product References

Diverse portfolio



**Top 35% In our Industry
for Sustainable Practices
– 3rd Party Verified
through Ecovadis**



ISCC PLUS Certificate

Certificate Number: ISCC-PLUS-Cert-US201-115542023

SCS Global Services
2000 Powell Street, Emeryville, CA 94608, USA
certifies that

Ravago Americas
Summit Tower Blvd Suite 900 1900
Orlando 32810
United States

complies with the requirements of the certification system

ISCC PLUS
(International Sustainability and Carbon Certification)

This certificate is valid from 23.11.2023 to 22.11.2024.

The site of the system user is certified as:

Collecting Point
Trader with Storage

The scope of the certificate includes the following chain of custody options:
(not applicable for paper traders)

Mass Balance

Emeryville, CA, USA
20.11.2023

Place and date of issue

Stamp, Signature of issuing party

The issuing Certification Body is responsible for the accuracy of this document.
Version / Date: 1 (no adjustments) / 20.11.2023

BAMBERGER AMCO POLYMERS

ISCC+ Certified

- Chain of Custody is critical in every phase of production, re-packaging and delivery.
- Must be handled under ISCC+ Protocol and Documentation Collection
- Dedicated and Segregated Mass Balance Accounting
- Necessary for End-User Claims of Recycled Content and Transparent Traceability.
- Provision of Self-Declarations to certify materials contain Circular, Bio-Circular, Bio Based or Derived from Renewable Energy.
- Scope of Materials Covered: PE to PEI

Active in plastic distribution & Compounding since 1955. We partner with the world's leading resin suppliers providing the most complete line card and selection of plastics materials in the industry, including:

- Engineering Thermoplastics
- Commodity Thermoplastics
- High Performance Thermoplastics
- Elastomers
- Specialty Resins & Custom Compounds
- Recycled / Sustainable Materials



**A Leader in Specialty
Plastic Distribution**



**150+ Talented
Commercial Team**



**4 Market-Specific Business
Development Managers**



**7 Field-based Engineers
Best in Class Technical Expertise**



**8 Regions
Nationally**



**Fully Integrated Supply
Chain Solutions**



**30+ Warehouses
Nationally**



**4000+
Customers**



**250+
Employees**

Consumer Sentiment, Legislation and Decarbonization

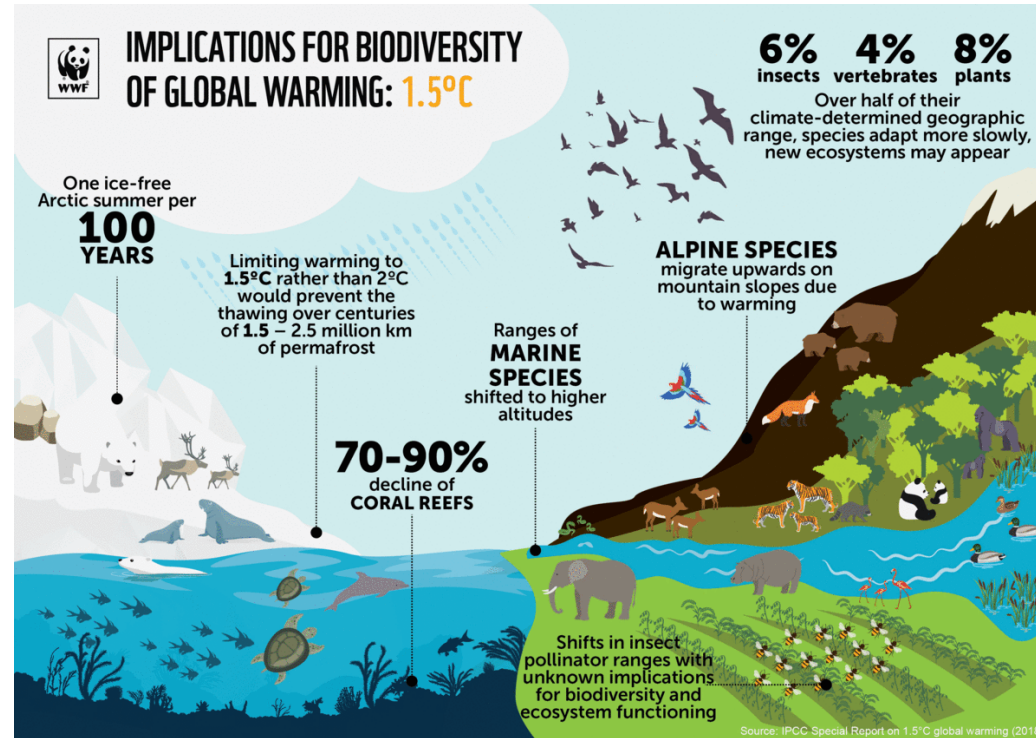
Driving Factors for Sustainability

75%

of consumers indicated that they would be more likely to purchase a product if the producing company is making an effort to be sustainable.

92%

of people are concerned about the negative impact that plastic pollution in the oceans will have on future generations



Legislation

EPR, Mandatory Minimum Recycled Content Laws are driving cases for sustainable packaging

78%

of people want to reduce their use of single plastic

>25%

Of Brand Owners expect public disclosures on emissions. Less than 2 years ago this was below 10%

17 GOALS to transform our world

Our engagement for a better and sustainable world

The United Nations 17 Sustainable Development Goals address the global challenges we face. The Goals interconnect and in order to leave no one behind, it is important that we achieve each Goal and target by 2030.



WHAT ARE THE SCOPES OF CARBON EMISSIONS:

Scope

Greenhouse Gas Emissions:

Scope 1 emissions encompass direct greenhouse gas (GHG) emissions stemming from sources controlled or owned by an organization, such as emissions resulting from fuel combustion in boilers, furnaces, and vehicles. SOURCE: EPA.gov



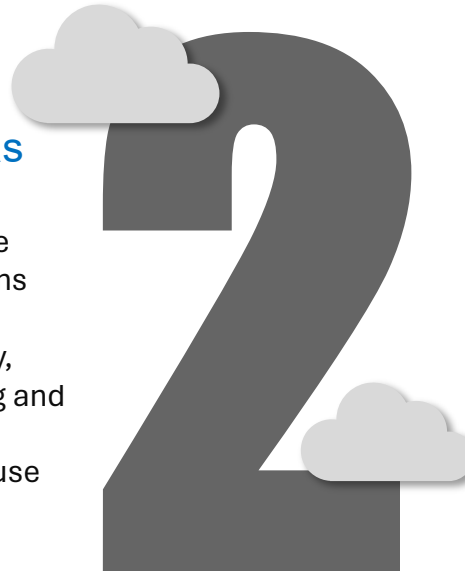
Direct Emissions from the Reporting Company

Scope

Greenhouse Gas Emissions:

Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling and are the result of the organization's energy use

SOURCE: EPA.gov



Indirect Emissions from Upstream Activities

Scope

Greenhouse Gas Emissions:

Scope 3 emissions are all indirect emissions, not included in scope 2, that occur in the value chain of the reporting company, including both upstream and downstream emissions.

SOURCE: EPA.gov



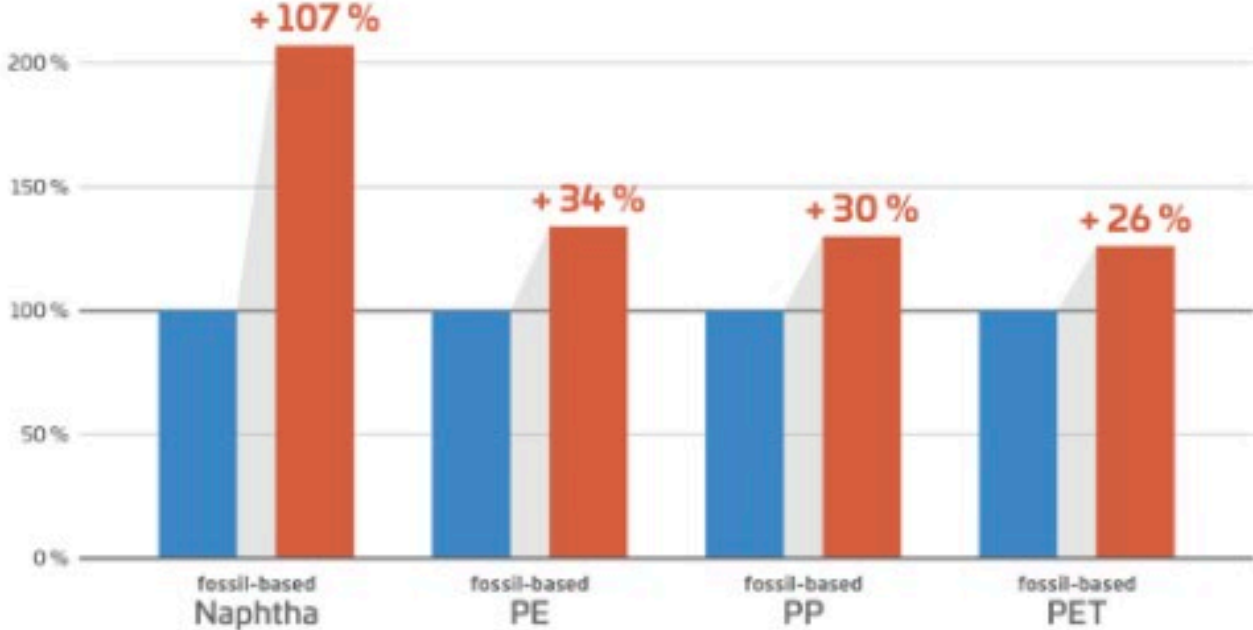
Indirect Emissions from Upstream Purchased Goods and Services, Transportation and Distribution, Waste Generated in Operations, Business Travel, Employee Commuting and Leased Assets.

Downstream Activities from Transportation and Distribution, Processing of Sold Products, Use of Sold Products, End-of-Life Treatment of Sold Products, Leased Assets, Franchises and Investments

Carbon Footprint Scope Emissions Evolve

ecoinvent 3.8 vs. ecoinvent 3.10

Carbon Footprint Change of Selected Fossil-Based Chemicals and Polymers



This will be favorable towards and improve LCA and PCF values of all recycled pathway technologies

ecoinvent 3.10
ecoinvent 3.8

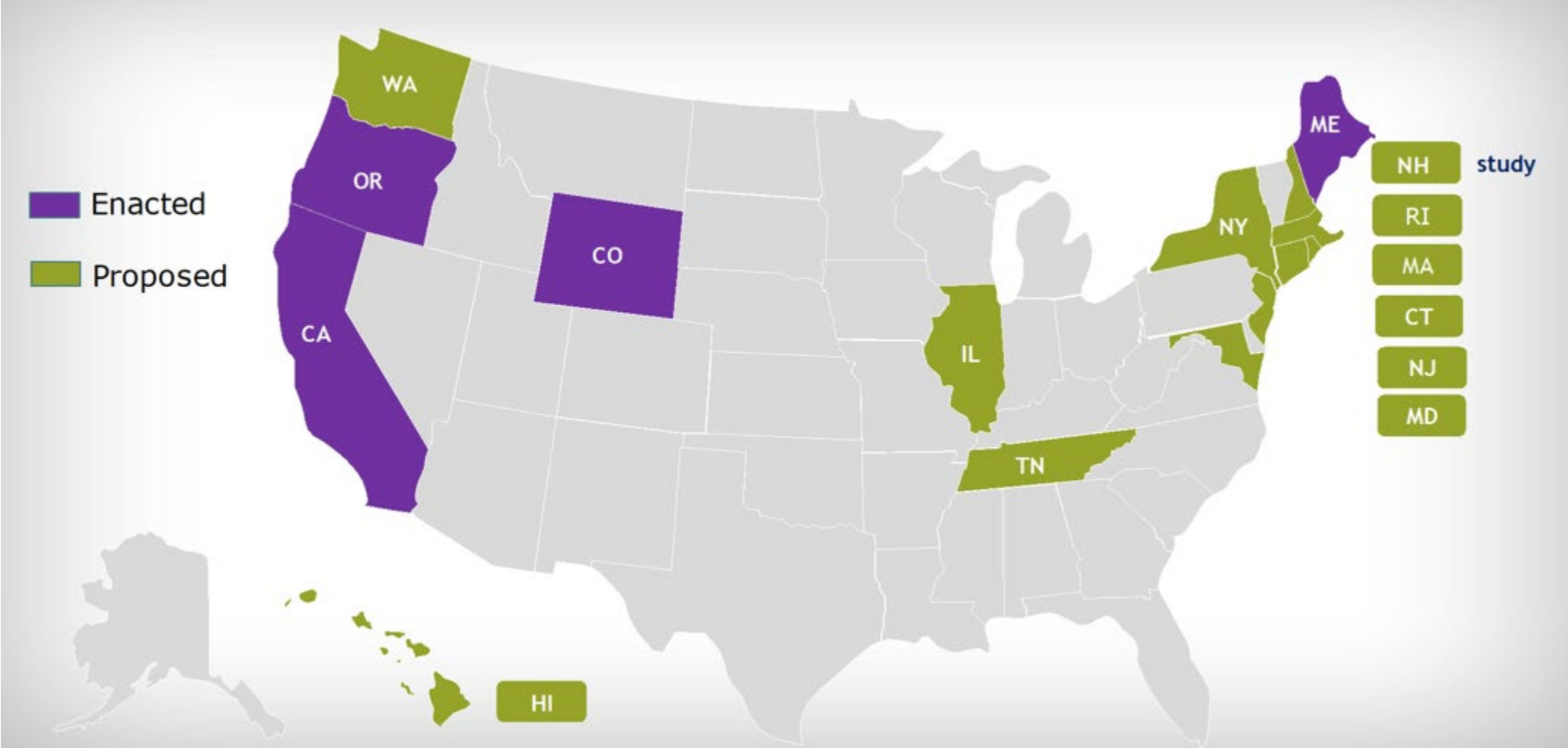
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European Plastics Taxes

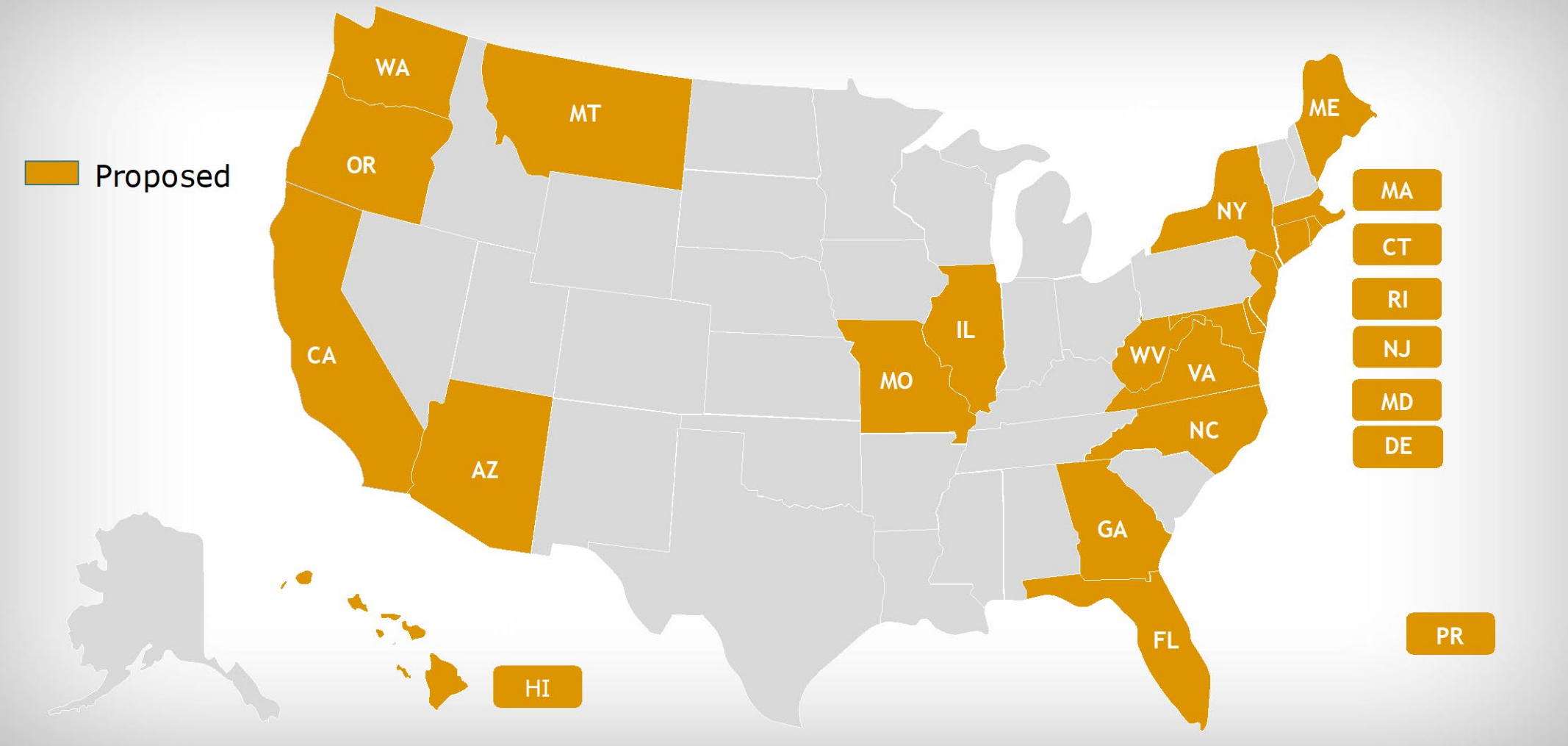
- UK - \$250/ton (£200/ton)
- \$300 Million Estimated for 1st year
- Spain and Italy - \$465/ton (€450/Ton)
- Italy Estimated revenue 1st year \$484 Million (€470 Million)
- Spain Estimated Revenue 1st year \$745 Million (€724 Million)
- Exemptions granted to applications with 30% PCR Content



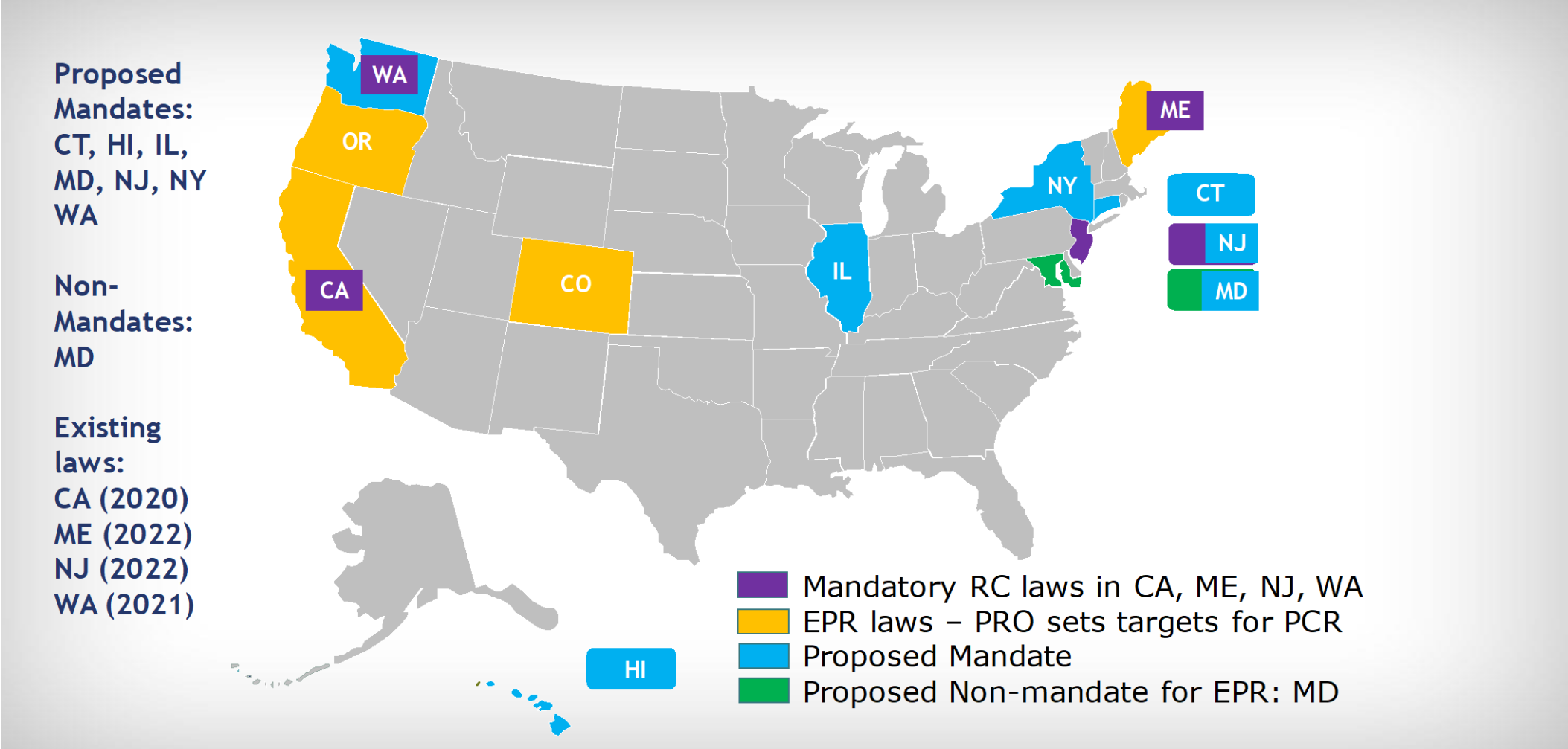
2023 Extended Producer Responsibility Laws



2023 Packaging Restrictions



2023 Recycled Content Legislation



United States Packaging Legislation

California (AB 793) Beverage containers, glass and plastic	1/1/2022 – 15% 1/1/2025 – 25% 1/1/2030 – 50%	Maine (LD 1467) Beverage containers, plastic	1/1/2026 – 25% 1/1/2031 – 30%
California (SB 270) Reusable grocery bag made from plastic film (2.25 ml minimum thickness)	1/1/2016 – 20% 1/1/2020 – 40%	1. Beverage containers, plastic	1. 1/1/2023 – 15% 1/1/2026 – 25% 1/1/2031 – 50%
Connecticut (HB-6664) Beverage containers, plastic	1/1/2027 – 25% 1/1/2032 – 30%	2. Plastic wine containers (287 ml) and dairy milk containers	2. 1/1/2028 – 15% 1/1/2031 – 25% 1/1/2036 – 50%
1. Beverage containers, plastic	1. 1/1/2024 – 15% with 5% increases every 3 years up to 50%	Washington (SB 5022) 3. Plastic household cleaning and personal care product containers	3. 1/1/2025 – 15% 1/1/2028 – 25% 1/1/2031 – 50%
2. All other rigid containers	2. 1/1/2024 – 10% with 10% increases every 3 years up to 50%	4. Plastic trash bags	4. 1/1/2023 – 10% 1/1/2025 – 15%
New Jersey (\$2515) 3. Plastic carryout bags	3. 1/1/2024 – 20% 1/1/2027 – 40%	Washington (SB 5323) Reusable grocery bag (Plastic film at least 2.25 ml thick until 12/31/25; at least 4 ml beginning 1/1/26)	7/1/22 – 40%
4. Plastic trash bags	4. 1/1/2024 – 5-20% 1/1/2027 – 10-40%		

Legislation – Global Trends

	SEC Disclosures	CSRD	ISSB	California Climate Corporate	EPR SB54 California
Status	Mandatory for listed companies	Mandatory Public and Private	Voluntary as of now	Mandatory Public and Private	Mandatory Public and Private
Scope	US	EU (Some US)	Global	Statewide SB 253 & SB 261	SB 54 establishes a new extended producer responsibility (EPR) single-use plastic food ware products
Disclosure category	<ul style="list-style-type: none"> • Scope 1,2,3 • Risk Management • Climate-related risks • Identification procedures • Transitions plans • Scenario analysis • Carbon prices • Performances toward targets <p><u>Climate Related</u></p>	<ul style="list-style-type: none"> • Encompass SEC + • Workforce • Consumers & end users • Affected Communities • Business Conduct • Audits <p><u>Global ESG Scope</u></p>	<ul style="list-style-type: none"> • Established by IFRS to develop a global baseline for sustainability disclosure for the financial market • Investor focus • Prioritizing climate approach 	<ul style="list-style-type: none"> • Companies with annual revenue over \$1B • Scope 1,2,3 • Data management • Aligned with SEC 	<ul style="list-style-type: none"> • Cut Single-use plastic by 25% • Recycle 65% of Single-use Plastic • Make 100% of single-use packaging and food ware recyclable or compostable • The law shifts the plastic pollution burden from consumers to the plastics industry by raising \$5 billion from industry members over 10 years. • Cuts plastic pollution and Supports disadvantaged, low-income, and rural communities hurt most by the impacts of plastic waste.
Timeline	Disclose Year: 2025	Disclose Year: 2025	Voluntary Today	Disclose year: 2025	Requirements by 2032

Pathway to Sustainable Design for Packaging

Pathway to Sustainability



MASS BALANCE
POLYMERIZATION
AND PRODUCTION



ISCC CERTIFIED



ECOVADIS
REGISTERED



ADVANCED
MOLECULAR
RECYCLING



PIR POLYMER
FORMULATIONS



BIO-DEGRADABLE
POLYMER
ADDITIVES



BIO-BASED
POLYMERS



BIODEGRADABLE
MATERIALS



CIRCULARITY
PROGRAMS



STREAMLINED
DELIVERY
SYSTEMS



RECOVERY OF PIR
PRODUCTS



RECOVERY OF PCR
PRODUCTS



PCR
FORMULATIONS



LIGHT WEIGHTING



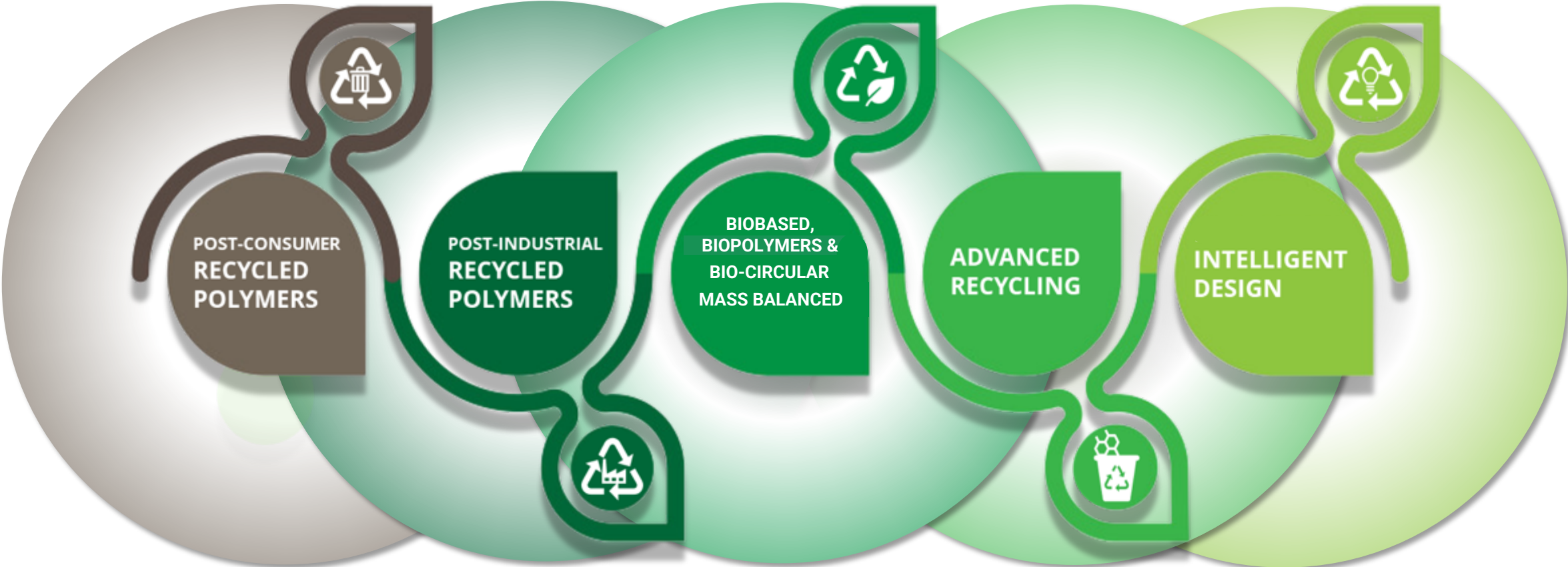
OCEAN BASED
PLASTICS



COMPOSTABLE
POLYMERS



Complimentary Sustainable Pathway Technologies



Reduce, Re-Use, Recycle and **Re-Circle**

- Transformative change will require utilization the most efficient complimentary technologies
- Most plastics possess inherent limitations (can only be mechanically recycled 5 to 7 times)
- The principles of reduce, reuse, and recycling, including Mechanical PCR, PIR, and Bio-Circular solutions ultimately lead to a linear approach.
- Introducing the concept of "re-circling" – the fourth 'R' – is essential, allowing us to reintegrate these materials back into the system, moving us closer to achieving infinite circularity through Advanced Molecular Recycling.

Understanding the Technologies

“We must empower a transformative approach that encourages us to rethink how we design, produce, consume and dispose of the goods we develop and market.”

Sustainable Pathway Technologies



Post-Consumer Resin (PCR):

Post-consumer Waste plastic that has met its intended use and has reached its end of life and can no longer be used for its intended purpose .



Blue Polymers is a joint creation of *Republic Services*, a leader in the environment services industry, and *Ravago*, a leader in polymer recycling and distribution.

- Co-locate four facilities with Republic Services polymer centers
- 300+ million pounds per year of PCR resin capacity
- Post-consumer rHDPE, rPP, rPET
- Both food-grade & Non-food-grade
- Natural and custom color sortation



Materials Discarded into Wasted Streams and destined for Landfill

- Consumer Waste at end of Life
- Land and Ocean Derived
- Must be Mechanically Recycled

Different Quality Levels

- Limited Natural Availability
- Dark Colors
- Lower Properties vs. Prime Materials
- High Demand for Consumer Circularity
- Can mix virgin and regrind %
- Cost vs. Quality Balance
- New Technologies allowing for re-introduction into FDA LNO compliant products.
- Most Formulations are Non-FDA



Post-Industrial Resin (PIR):

Pre-consumer Waste plastic recovered from industrial and manufacturing processes that can no longer be used for its intended purpose.

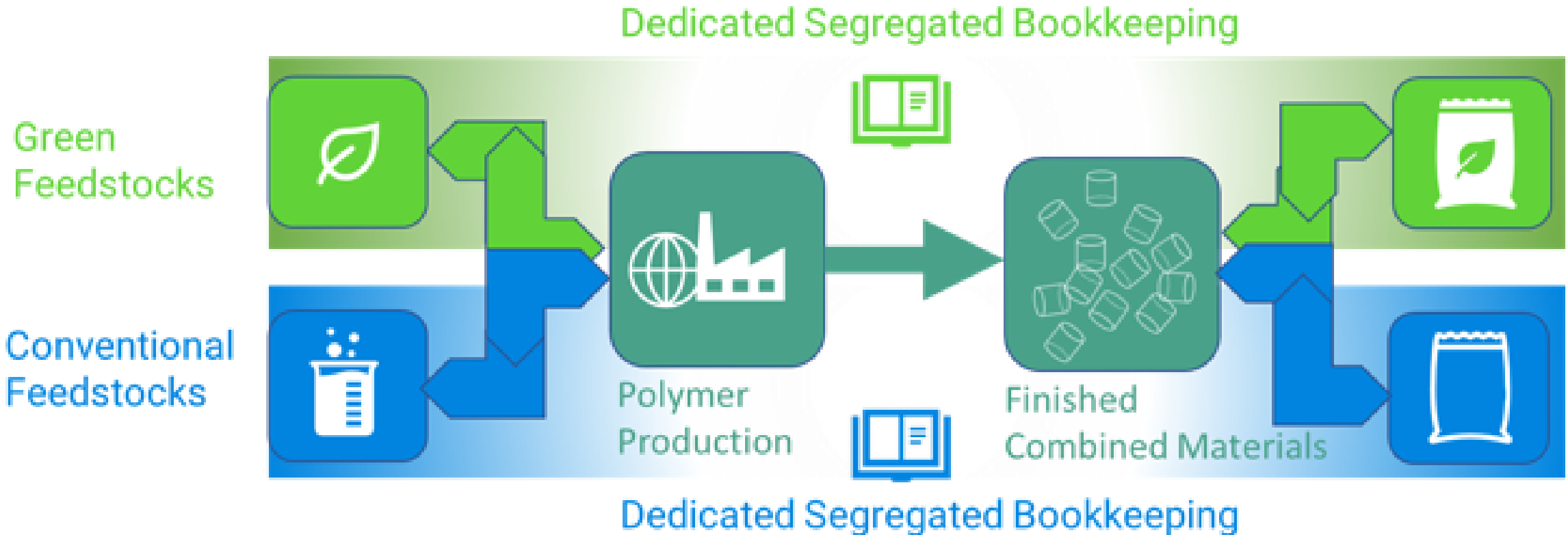
- Pre-Consumer Production Over-Runs, Scrap, non-compliant products
- Production Site Waste
- Off-Specification Materials
- Improved Physical Properties vs. PCR
- Natural Availability
- Some FDA
- Improved Consistency vs. PCR
- Yarns, Ropes, etc....
- Carpet over runs
- Limited Chain of Custody Certification
- Not Recognized by most Legislation on Recycled Content



Bio-Circular Mass Balanced Polymers:

Bio-Circular feedstocks are waste and residues of biological origin from agriculture, forestry and related industries. The mass balance approach makes it possible to track the amount and sustainability characteristics of circular and or bio-based material in the value chain and attribute it based on verifiable bookkeeping.

Bio-Circular/Bio-Attributed Mass Balanced



Bio-Circular Mass Balanced Recycled

- Sourced from Bio-Attributed/Bio-Circular Resources
 - Cooking Oil
 - Methane
 - CTO (Tall Oil – Wood Waste)
 - Landfill Off-Gas
- Prime Properties
- Compliant to all regulatory specifications
- ~25-100% bio-attributed feedstock
- CO2 reduction ~25-100% of CO2 per kg of polymer on average
- Identical Chemical Fingerprint to Prime Materials
- Free Attribution utilized with segregated bookkeeping
- ISCC+ Managed
- Not recognized in state recycling bills
- Recognized in Extended Producer Responsibility (EPR) Legislation

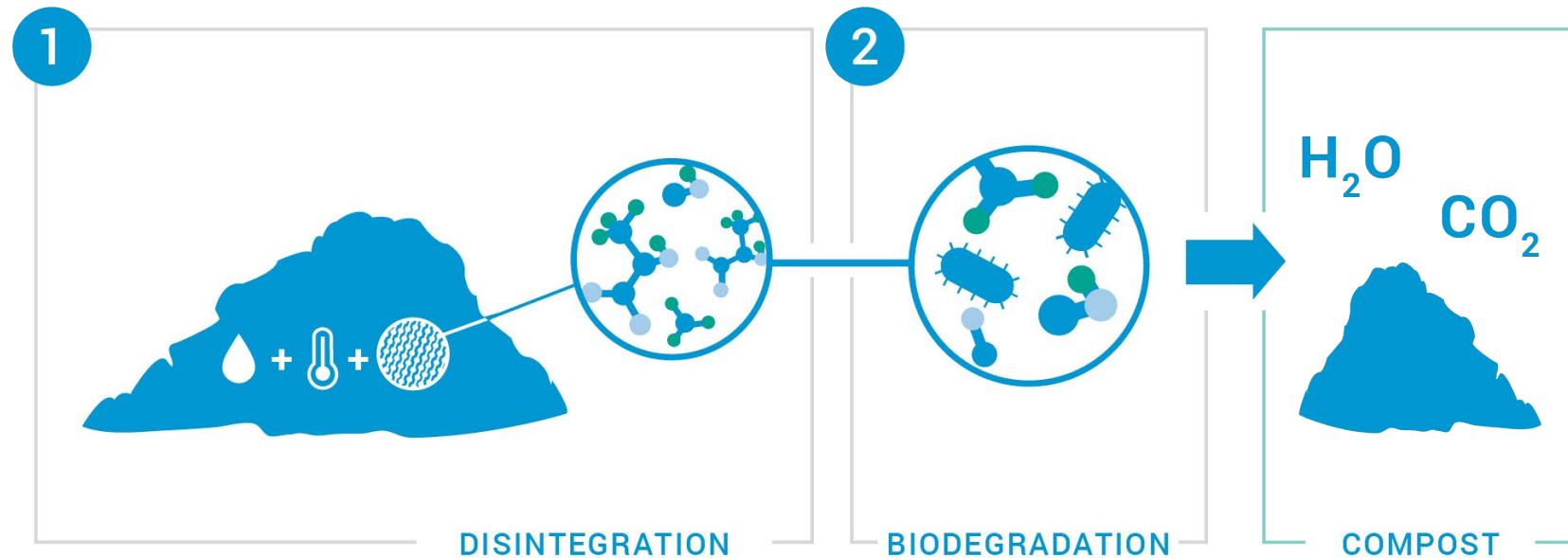


Bio-Polymers

Bio-Based Polymers or Biopolymers are created with biological origin from agriculture, forestry and related industries. They can be biodegradable and compostable and are fully or partially made from biological resources, rather than fossil raw materials.

How Composting Works - PLA

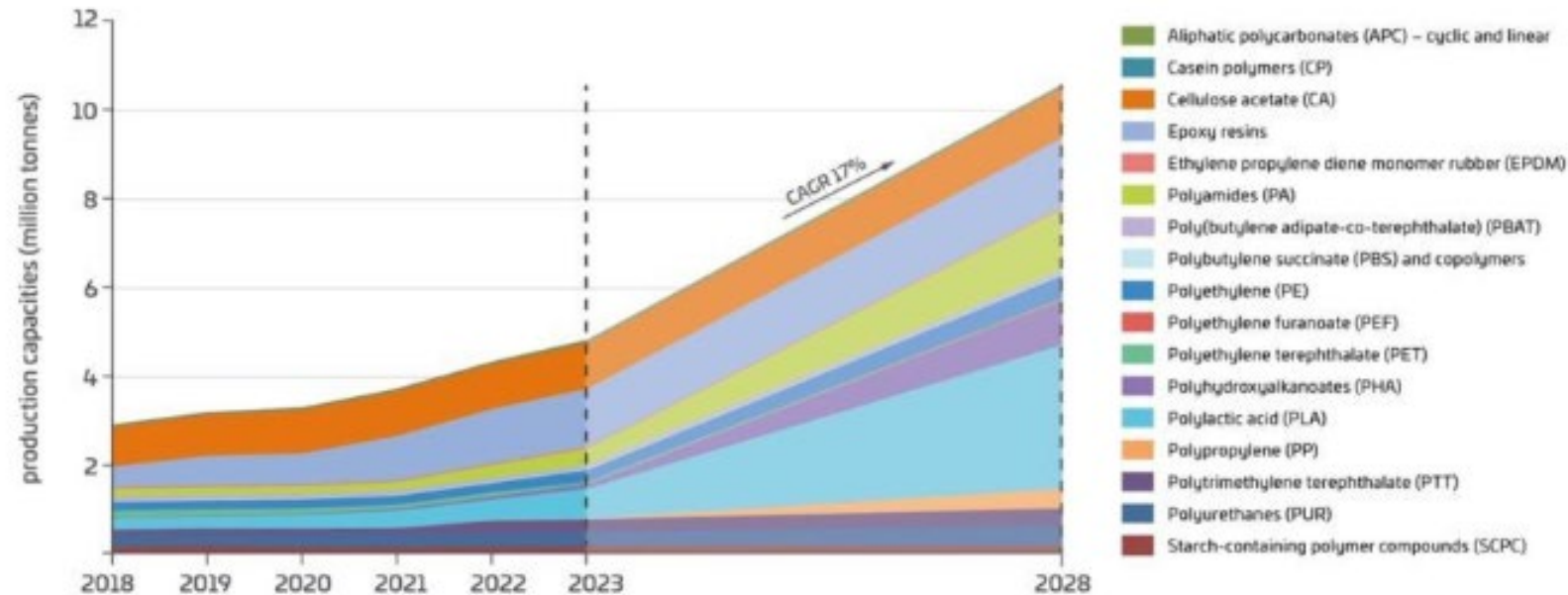
1. **DISINTEGRATION:** The moisture and heat in the compost pile split the polymer chains apart, creating smaller polymers, and finally, lactic acid.
2. **BIODEGRADATION:** Microorganisms in compost and soil consume the smaller polymer fragments and lactic acid as nutrients. Since lactic acid is widely found in nature, a large number of organisms metabolize lactic acid. The end result of composting is carbon dioxide, water and humus, a soil nutrient. This degradation process is temperature and humidity dependent.



Source: NatureWorks

Bio-Based Polymers Capacities

Bio-based Polymers Evolution of Worldwide Production Capacities from 2018 to 2028



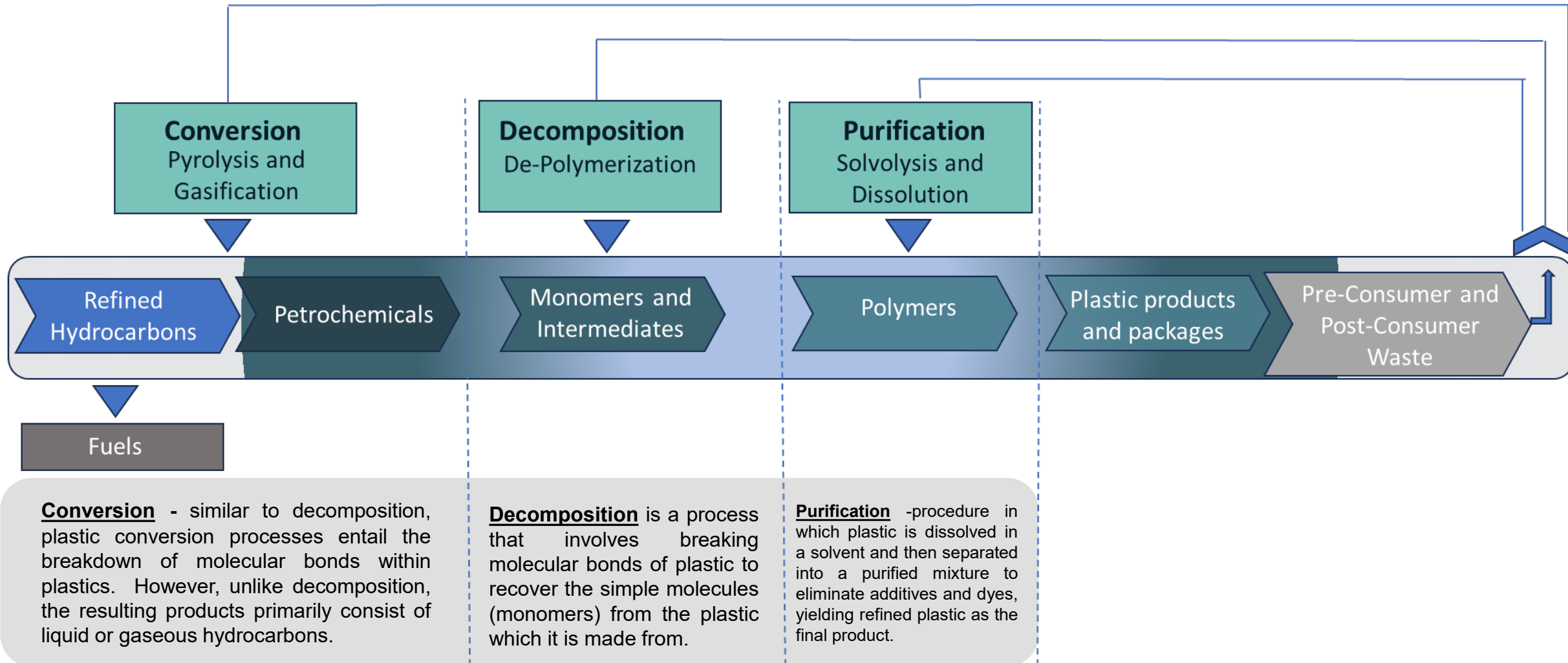
available at www.renewable-carbon.eu/graphics

  nova-Institute.eu | 2024

Advanced Molecular Recycling

Also referred to as chemical recycling...encompasses dozens of technologies that use solvents, heat, enzymes, and even sound waves to purify or break down a wide range of hard-to-recycle plastic waste to create polymers, monomers, oligomers or hydrocarbons.

Advanced Molecular Recycling










<https://www.cpchem.com/AdvancedRecycling>

Advanced Molecular Recycling

- Derived from Circular Mixed Waste Post Consumer and Post-Industrial Waste Streams
- Can Process and Convert hard to recycle mixed streams of feedstocks... i.e. Mixed PP, PE, PS and PA flexible films
- ISCC+ Certified Chain of Custody – Verifiable Claims and Recycled % content
- Same as Prime - Highest overall Physical Properties
- Global capacity for Advanced Recycling in 2022 was 928kt and has the potential to grow up to 9,957kt by 2030
- Limited from various states due to classification as a thermal destruction process
- High cost of entry versus traditional fossil-based materials

Sustainability Strategy Guidelines

Recycled Content Source	 POST-CONSUMER RECYCLED POLYMERS	 POST-INDUSTRIAL RECYCLED POLYMERS	 BIO ATTRIBUTED MASS BALANCED POLYMERIZATION	 ADVANCED RECYCLING	 INTELLIGENT DESIGN
Natural	Some-Limited	Some-Less Limited	Yes	Yes	Yes
FDA	Limited/Varies	Limited	Yes	Yes	Application Specific
UL	Some	Some	Yes	Yes	Application Specific
USP, ISO10993, NSF, DMF	Limited to None	Limited to None	Yes	Yes	Application Specific
Chain of Custody Certification	Green Circle, RecyClass, AIM, GRS	Limited	ISCC+	ISCC+	Application Specific
All Colors and Tight Color Tolerance	Difficult	Improved	All Colors	All Colors	Application Specific
Physical Properties	Less than Prime	Closer to Prime	Equal to Prime	Equal to Prime	Application Specific

CO2/GHG Reduction Potential and Properties Comparison by Recycling Pathway

	Mechanical Recycling	Post Industrial Recycling	Bio-Attributed Mass Balanced	Advanced Recycling - Purification	Advanced Recycling- Depolymerization	Advanced Recycling - Gasification	Advanced Recycling - Pyrolysis
Examples of CO2/GHG Reduction Potential (See Reference Key)	~67 to 71% ¹	~30 % ⁷	~25 to 100% ²	~35% ³	~29% ⁴	~20 to 50% ⁵	~19 to 63% ⁶
Reduced Quality Plastic	Yes	Yes	No	No	No	No	No
Sustainable Fuel	No	No	No	No	No	✓	✓
Recycled Content	✓	✓	Food Waste, Wood Waste, Bio-Waste	✓	✓	✓	✓
Virgin Quality Plastics/ Prime Properties	Limited	Limited	✓	✓	✓	✓	✓
Natural or Clear Color	Limited	Limited	✓	✓	✓	✓	✓
Regulatory Compliance	Limited	Limited	✓	Some	✓	✓	✓
Recaptures Waste from Landfill or Reaching Landfill	✓	Some	Food Waste, Bio-Waste	Hard to Recycle Mixed Waste	Hard to Recycle Mixed Waste	Hard to Recycle Mixed Waste	Hard to Recycle Mixed Waste

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Questions?



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Amco Polymers**

Sources:

- 1 APR: 2018-LCI-Report rPET, rHDPE, rPP: <https://plasticsrecycling.org/images/library/2018-APR-LCI-report.pdf>
- 2 Covestro, Celanese, Evonik, Ineos Styrolution, SABIC -Bio-Attributed materials PCF
- 3PureCycle (purification): <https://www.purecycle.com/blog/purecycle-process-expected-to-use-less-energy-lower-carbon-emissions-than-new-plastic-production>
- 4Eastman (methanolysis): <https://www.eastman.com/Company/Circular-Economy/Resources/Documents/PRT-Methanolysis-LCA-OnePage-Overview.pdf>
- 5Eastman (gasification): <https://www.eastman.com/Company/Circular-Economy/Resources/Documents/CRT-Technical-LCA-report.pdf>
- 6Argonne National Lab (pyrolysis): https://greet.es.anl.gov/files/lca_postuse_plastic_pyrolysis
- 7BASF Nypel 6235G vs. Ultramid B3EG6 PCF Comparison