



Annual conference



**PET Depolymerisation
Working Group**








February 7 and 8th 2024

www.petcore-europe.org
Annual Conference - Depolymerization group

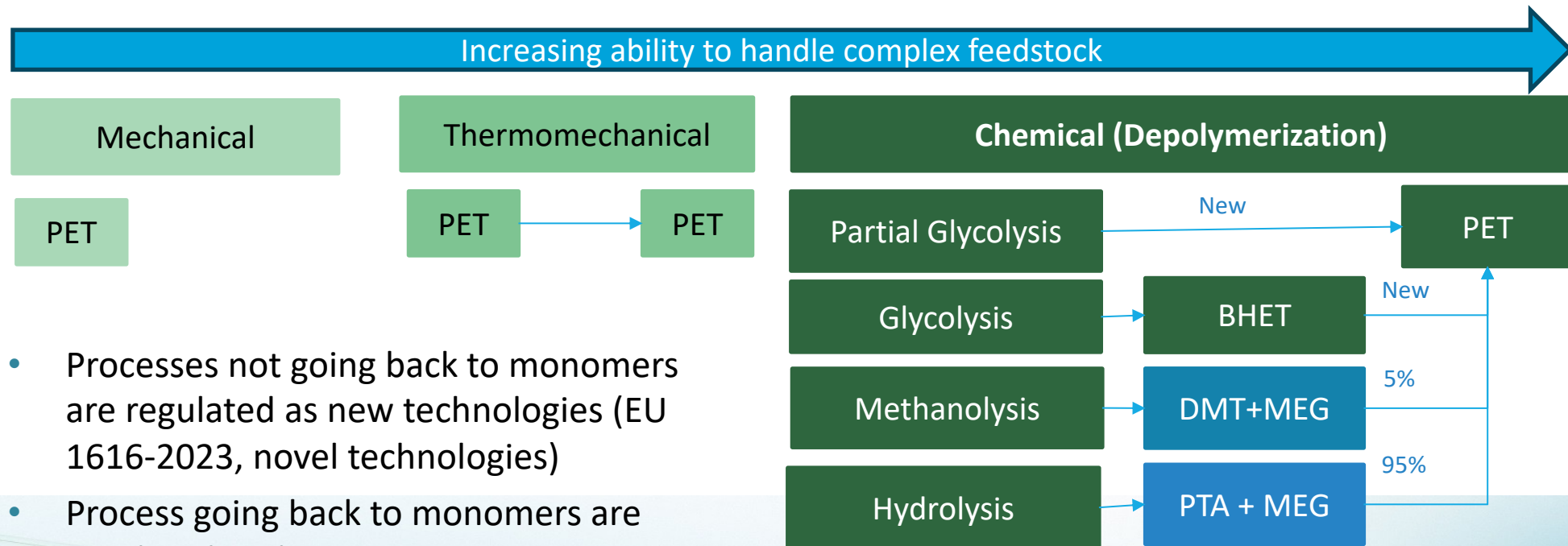


Who are we ?



-  Representing all the technologies that depolymerize PET
-  Depolymerization uses a major **chemical or biological reaction** in one solvent (hydrolysis, methanolysis, or glycolysis) to produce a finite number of monomers or shorter polymer chains (oligomers), that are stable, that can be isolated, quantified and traceable.
-  This is different from pyrolysis and gasification
-  Depolymerization has high yields and produces easily traceable materials, virgin quality recyclates
-  We have all the technologies represented within the group : we will zoom on methanolysis (EASTMAN)
-  In 2023 we welcomed new members: Depoly (Hydrolysis) and Polymetrix (Glycolysis)
-  All working to serve the market as early as 2025 and beyond

Depolymerization a range of processes



- Processes not going back to monomers are regulated as new technologies (EU 1616-2023, novel technologies)
- Process going back to monomers are regulated under EU n°-10-2021, existing routes to make PET

- **BHET taskforce**

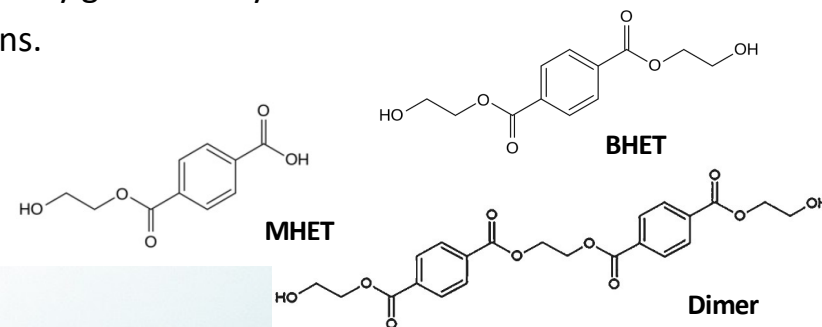
- 9 members; 6 technology developers, 3 resin producers, 1 converter, 1 brand-owner (2 members have double roles)
- Co-chairs: Frederic Favre (IFPEN/Axens), Jesper van Berkel (Indorama)
- PETcore manager: Raphael Jaumotte, PMC BHET REACH and PET Europe Flake injection group: Keith Kilmartin
- Regulatory support E&ACT: Suzanne de Cort, Leonor Garcia

- **EU10/2011**

- ✓ Last year completed AMES and Micronucleus testing with negative result; BHET does not show any genotoxicity
- Datasets are being finalized using BHET samples with commercially representative compositions. Main limitation is availability of reliable & experienced NIAS test labs (see also EU2022/1616)
- Target dossier building and filing in 24H2; listing not expected before 2025

- **EU2022/1616**

- ✓ Submitted a Notification on December 10th 2022 for a commercial Novel Technology
- ✓ Published a report with detailed information as required by Article 10(3) on April 10th 2023
- ✓ BHET operators and installations were added to the EU 2022/1616 registry
- First datamonitoring report published on October 10th 2023, but actual data is delayed due to significant delay by the testing laboratory – it will be amended once the data is in

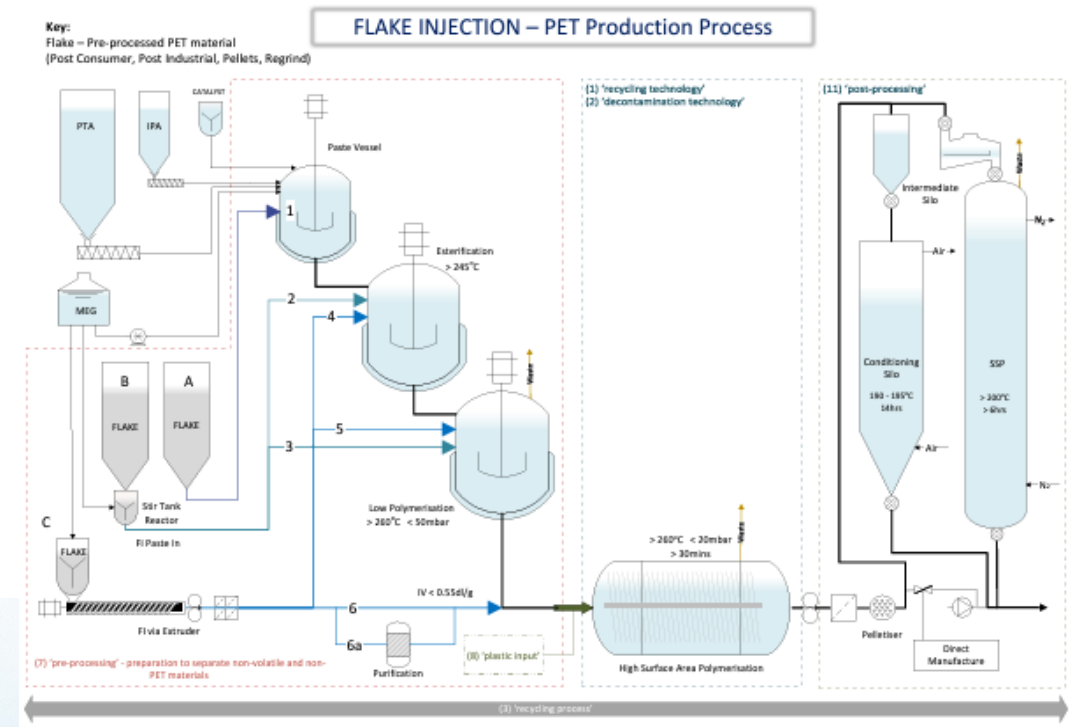


- **Flake Injection taskforce**

- 10 members;
- Consortium manager: Keith Kilmartin

- **EU2022/1616**

- ✓ Submitted a Notification on December 10th 2022 for a commercial Novel Technology (Article 10(3)).
- First data monitoring report (article 13 of EU 1616/2022) published on October 10th 2023, next testing cycle in preparation





Monomer processes (methanolysis & hydrolysis)

- No registration required, directly fall under regulation n° 10-2011
- Monomers are REACH registered, and acceptable purity to make a food contact PET
- Depolymerization group working on monitoring SUP implementing act 2, to ensure that the polymers coming from these recycling routes are counted toward recycled content (certified value chains and calculation method)

Accelerating a Circular Economy with Polyester Renewal Technology

Eastman's depolymerization drives system change

A materials innovation company

Eastman is a materials innovation company that is:

- A Fortune 500 company with approx. 9.2 billion USD in revenue and more than 100 years of vital innovations
- Dedicated to enhancing the quality of life in a material way
- Celebrating the inclusion of its diverse global workforce; 14,000 employees
- Committed to mitigating climate change, mainstreaming circularity and caring for people and society



EASTMAN

A rich history of polyester innovation

Eastman has 70 years experience as a PET producer and 30 years experience in depolymerization



1940's

Eastman first produces PET during WWII as a nylon substitute



1960s

Eastman expands in Columbia, SC to meet demand for polyester textiles



1979

Eastman produces its first PET for bottles.



2006

Eastman launches next-gen PET ParaStar



2007

Tritan™ copolyester enables BPA-free, dishwasher safe durable products

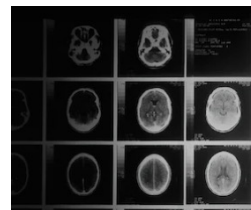


2020

Using molecular recycling technologies, Eastman Renew is launched

Eastman introduces Kodel, a thin-film polyester fiber.

1958



1976

Eastman opens its first methanolysis plant to recycle X-ray film.

2010

Eastman sells PET business to DAK Americas

Now

Kingsport methanolysis material-to-material recycling facility

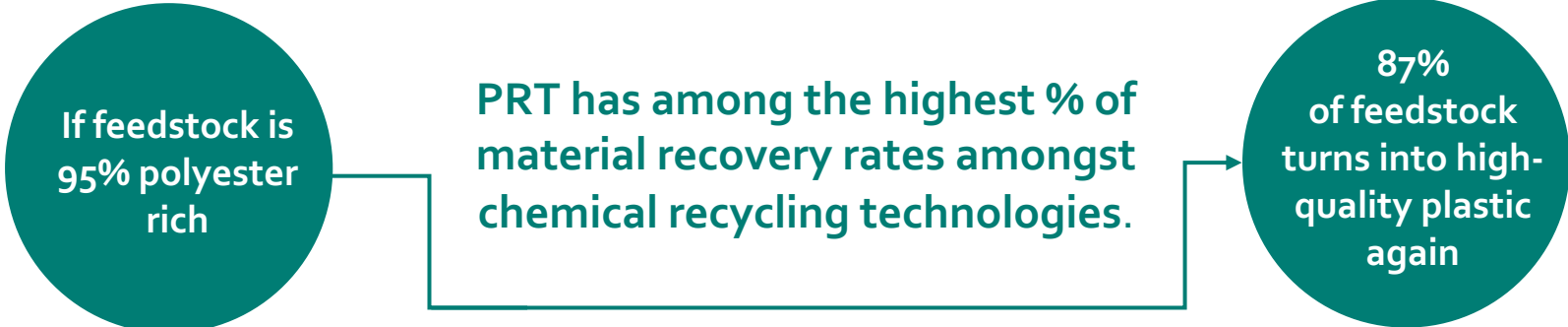
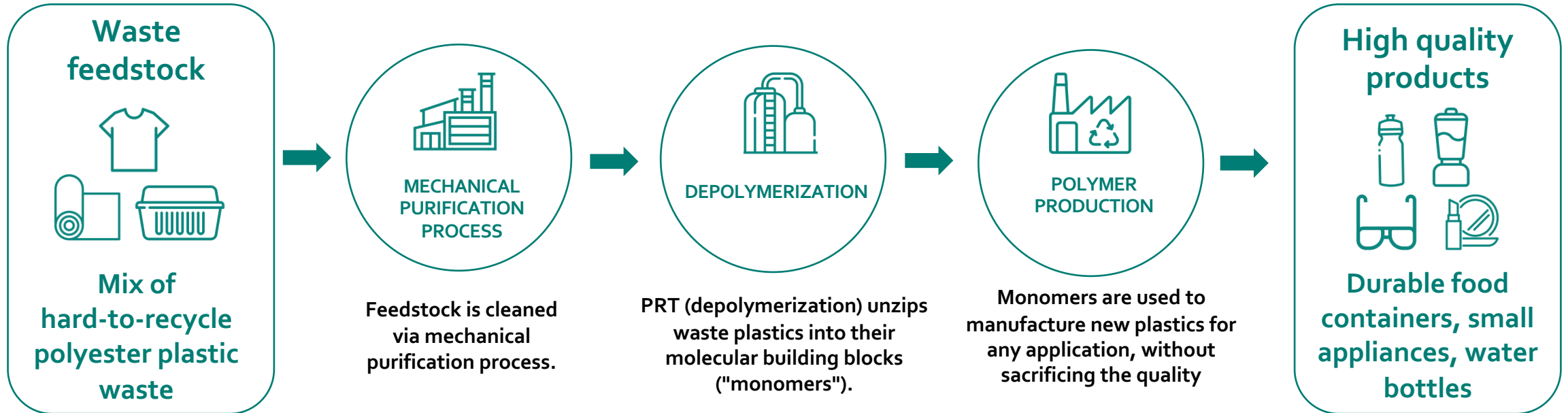


EASTMAN

Methanolysis – Polyester Renewal Technology (PRT)

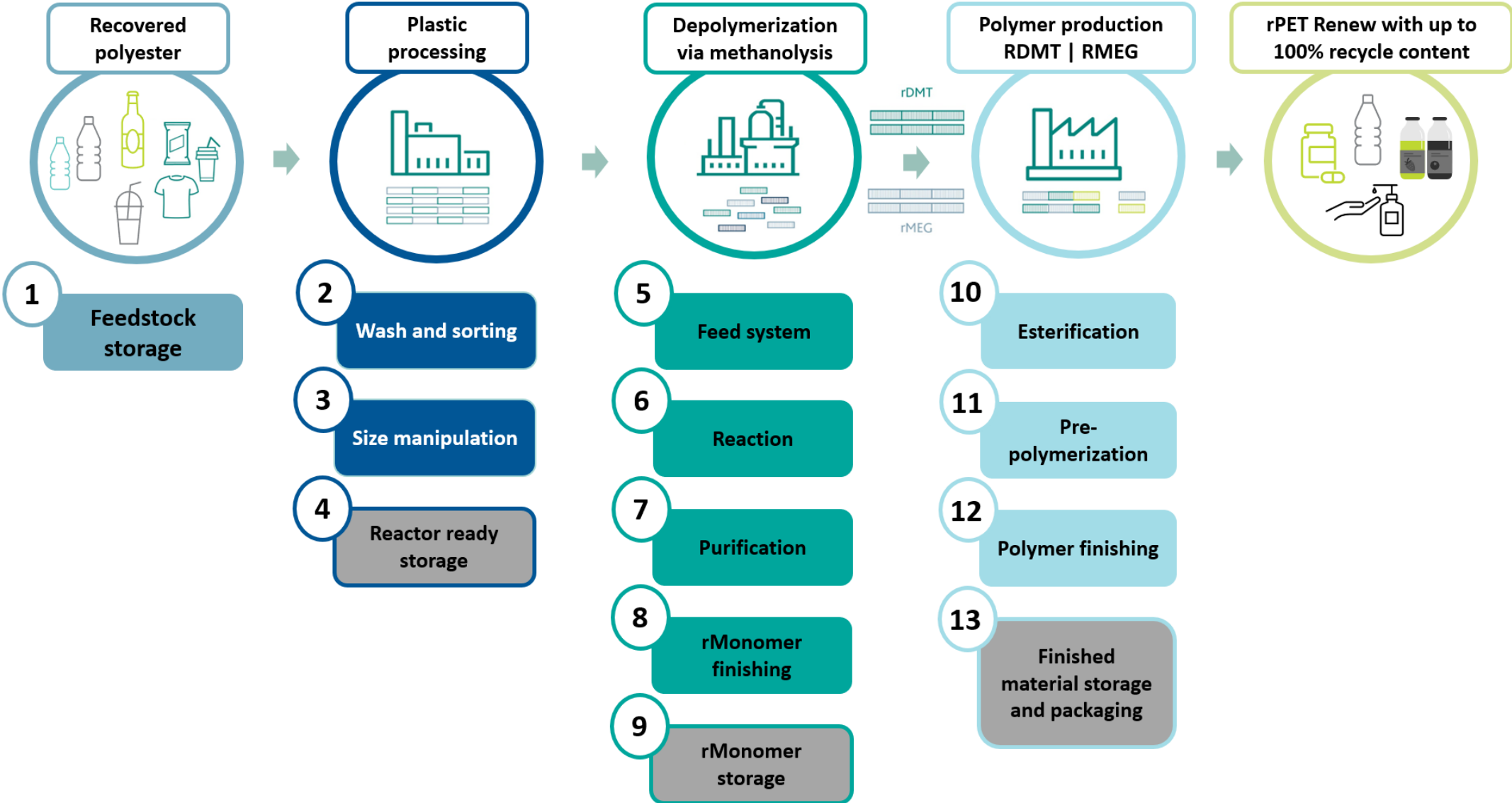
What is PRT?

PRT does not turn plastic waste into fuels.

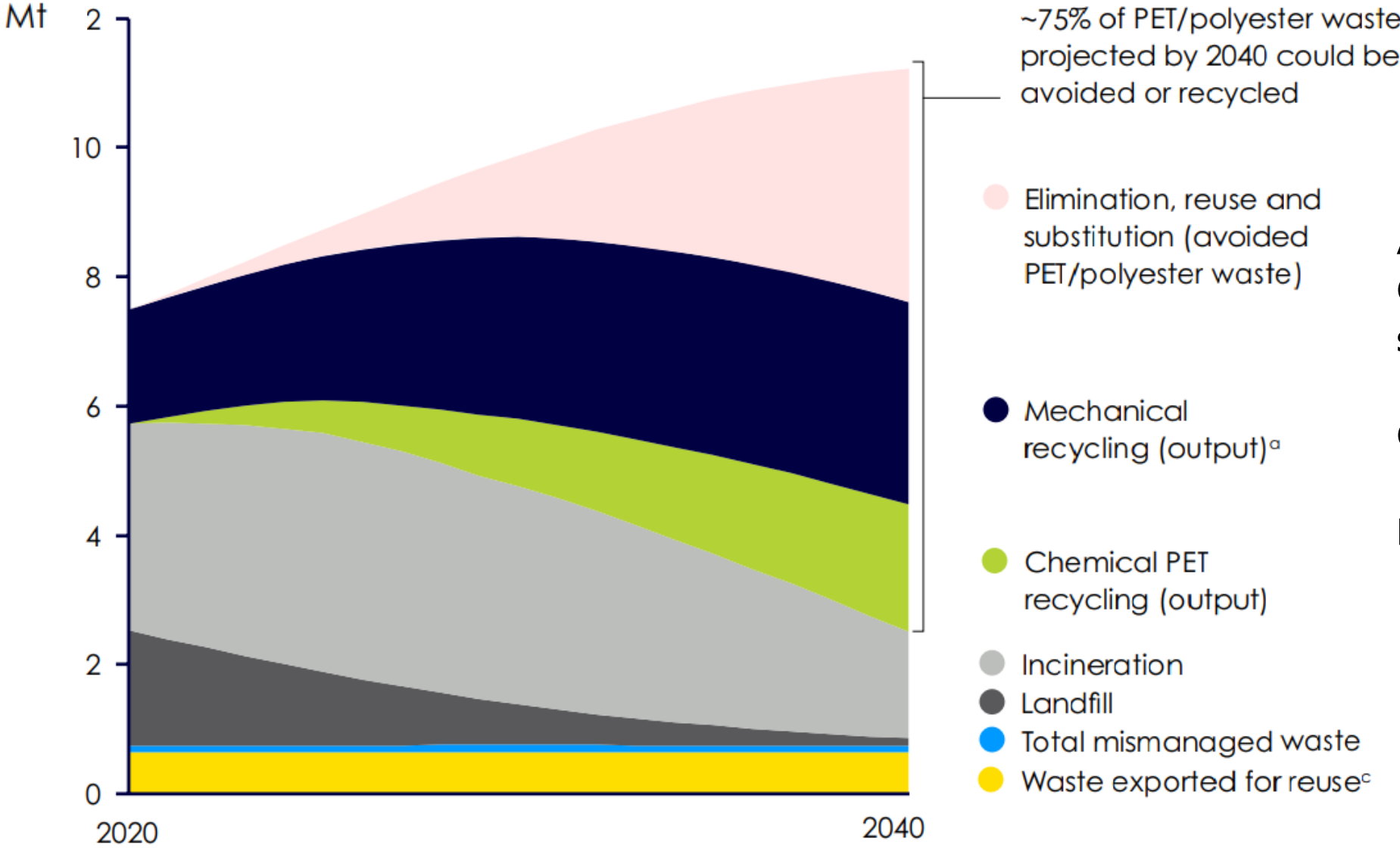


EASTMAN

Understanding Eastman's polyester renewal technology



Polyester waste - Scenario for 2040



**Ambitious
Complementarity
scenario:**

**Chemical recycling
+
Mechanical recycling**



Input: Diverting hard-to-recycle material from landfill



Colored rejects from mechanical recyclers



Post consumer purge from mechanical reclaimers



Green strapping
Used strapping that held items to pallets.



PET trays
Curbside collected consumer waste.



Textile purge
Waste from the textile industry making dyed polyester fiber.



Pre-consumer fiber
Waste generated in the textile value chain.

Output: Molecular recycling enables virgin-quality



Eastman
Tritan™ Renew

Eastman **Renew**
Circular Solutions for packaging



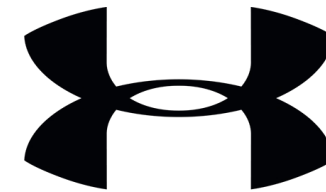
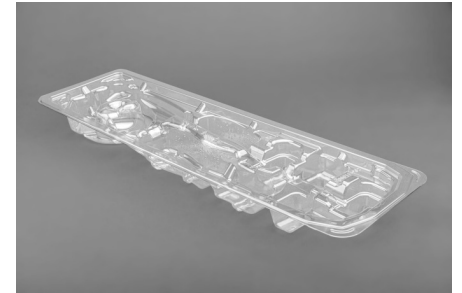
Eastman
Cristal™ Renew

Eastman
Eastar™ Renew 6763



Apparel | Appliances | Automotive | Cosmetic Packaging | Electronics | Eyewear | Food & Beverage Packaging | Healthcare Packaging | Hydration | Personal Care Packaging | Serveware & Storage | Textiles

Strong customer engagement for Renew materials across broad range of markets and applications



Building a better circle

Eastman is investing over \$2 billion in three new molecular recycling facilities globally.



2023-2024

KINGSPORT, TN

Processing 110K metric tonnes plastic waste annually

Now

Port Jérôme, NORMANDY FRANCE

Processing 110K metric tonnes annually, Phase 1 & 200K metric tonnes after phase 2

Expected on-line
2026/27

U.S., location TBD

Processing 110K metric tonnes annually

Expected on-line
2026/27

The world's largest molecular recycling facility

Kingsport, Tennessee, USA



Status Update - February 2nd 2024:

Commissioning of facility completed

Introduced plastic waste to the facility – achieving a significant milestone

Expect to produce on spec material soon

EASTMAN

25,000 MT of plastic waste has been pre-processed and ready for depolymerization.



When fully ramped, we will process 110 kMT each year.



EASTMAN

Questions?

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*Eastman's molecular recycling facility in
Kingsport, Tenn.*



Technical Readiness Level

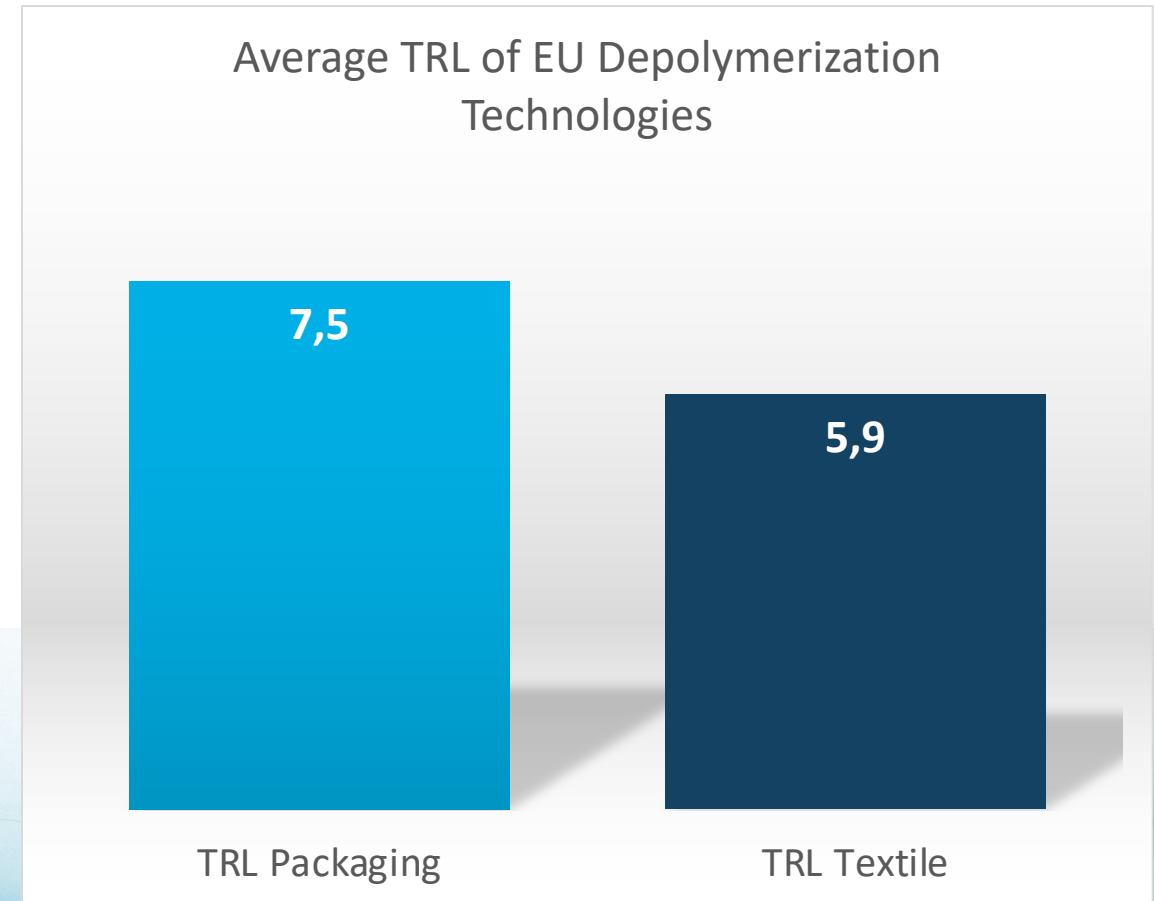
TRL 5 – Technology concept proven

TRL 6 – Technology demonstrated in relevant environment

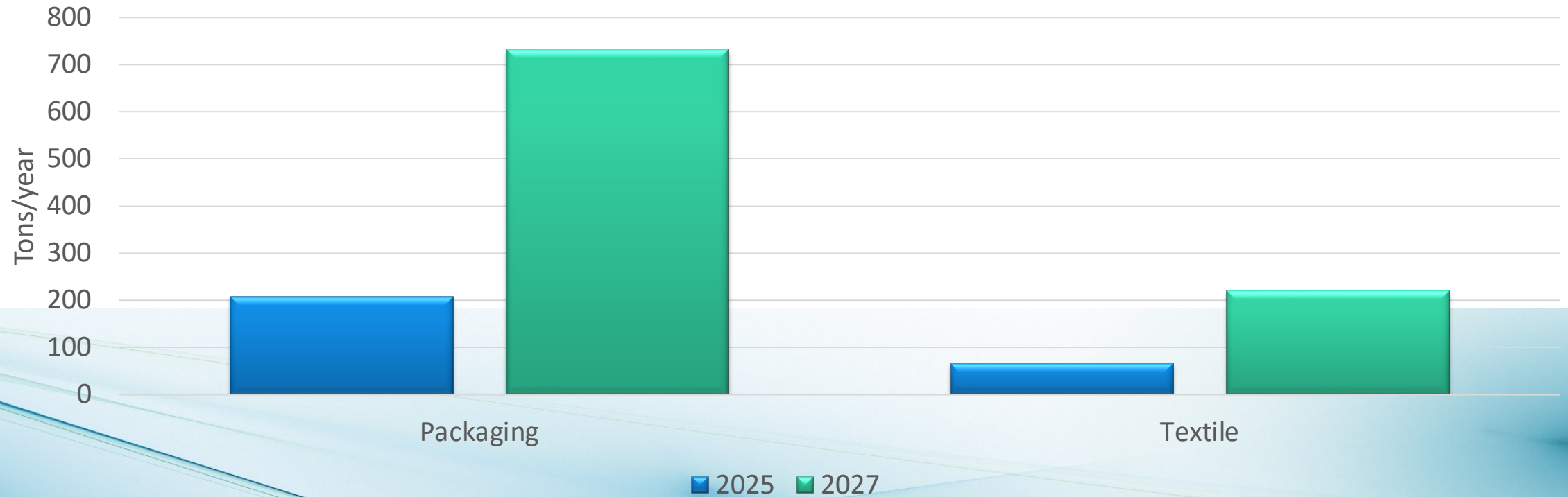
TRL 7 – System prototype demonstration in operational environment

TRL 8 – System complete and qualified

TRL 9 – Actual system proven in operational environment



Input Capacities Forecast of EU Depolymerization Technologies



Depolymerization contribution to circularity

Depolymerization is key to meet recycle content for the packaging



The depolymerization group is focusing on feedstock that cannot be recycled by thermomechanical processes to be circular and are complementary to them



New regulation 1616-2022 cleared the way for some technologies (suitable & novel technologies) but it is still unclear for the ones coming back to monomers falling under EU n°-10-2011



Monitoring the supplementing act 2 of SUP – recycle content measure for technologies falling under EU n°-10-2021



BHET Task Force to address authorization and registration of the oligomers to make food contact material
Flake injection process : registration of novel technology to recycle PET



Revised position paper of the benefits of depolymerization and its contribution to increase the recycling of PET (multilayers, opaque and colored packaging... and textile)



- Comments from our group
- Legislative clarity needed to accelerate investments:
 - Novel Technology status
 - Recycled content calculations (SUP 2nd IA)
 - EoW