gpca Plastics Conference
مؤتمر البلاستيك

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Fairmont Hotel, Riyadh, KSA

PLASTICS REIMAGINED
A CIRCULAR FUTURE AWAITS

Achieving full circularity through innovative plastics recycling technology: Hydro-PRT℠

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KBR®

The global plastic waste challenge

Less than 10% of the plastics produced globally ever recycled…

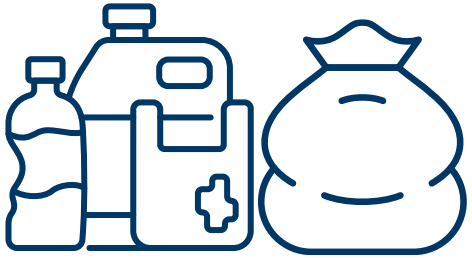
…with the rest sent to landfill…

…or incineration[1]

Approximately
8 million tonnes of plastic
waste in the oceans every year[2]

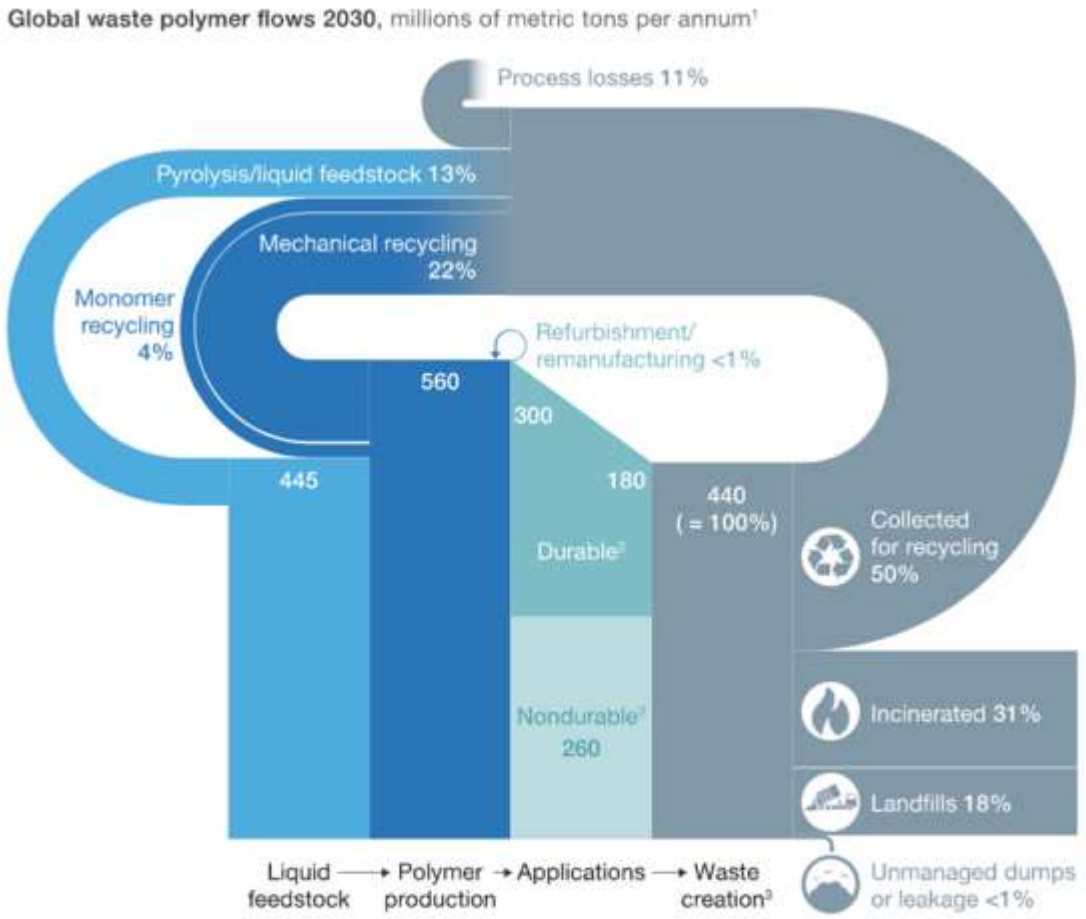
The market value
of global plastics to reach **$750 billion** per 2025[3]

$120 billion lost through
plastic waste annually[4]



1. Production, use, and fate of all plastics ever made, R. Geyer, J. R. Jambeck and K. Lavender Law, Science Advances, 19 Jul 2017, Vol 3, Issue 7
2. The Ellen McArthur Foundation – The New Plastics Economy: Catalyzing Action - 2017
3. Statista - 2019
4. World Economic Forum - 2019

Plastics Recycling Landscape 2030



Push factors

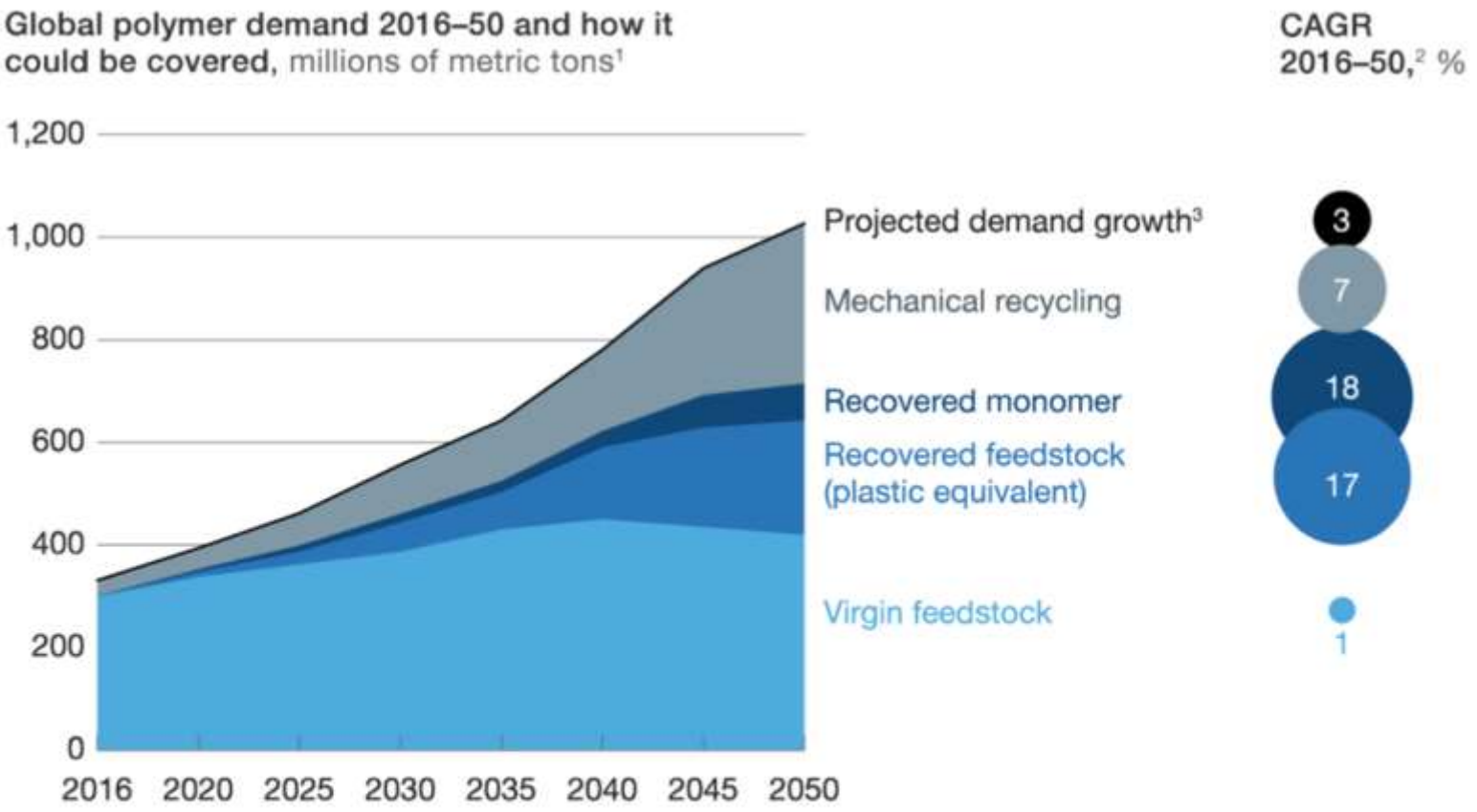
- Regulations (GHG emissions & recycling targets)
- Non-government organizations (NGOs)
- Consumers
- Venture capital

Pull factors

- Petro/chemical (plastics) industry
- Brand owners
- Packaging converters

Plastics Reimagined:
A Circular Future Awaits

Plastics Recycling Landscape



[1]Scenario based on a multi-stakeholder push to boost recycling, regulatory measures to encourage recycling, consistent progress on technologies, and $75-per-barrel oil price.
[2]Compound annual growth rate. Mechanical recycling limited by downcycling and applicable materials, monomerization limited by applicability to condensation polymers only, pyrolysis limited by likely rise in input costs.
[3]After demand reduction, assuming annual global GDP growth of 3.1%.

KBR – Mura alliance

Who?

- Mura Technology (UK)
- The technology studied for over 10 years
- Demo plant operated since 2014 (8kta capacity)
- ReNew ELP – 20 kta – first commercial unit in 2022

Why?

- Multi year, **exclusive alliance** to deliver and develop plastics recycling technology on a global basis
- Differentiated plastics recycling technology with **super-critical water** as a depolymerization agent
  - **Feedstock flexibility**
  - **Scalable!**
  - High yields
  - Stable and valuable products

Example Plastic Feedstock

Hydro-PRT℠
Plastics Recycling Technology

MURA

KBR

Naphtha Distillate gas oil Heavy Gas Oil

Example Products from Plastics

Hydro-PRT^{SM}: a holistic approach from KBR

Feedstock Preparation

Feedstock analysis/optimization

supporting feedstock selection and optimizing the sorting process to protect the equipment and to minimize contaminants

Plastic Recycling Technology

Hydro-PRT^{SM}

Conversion: Hydrothermal Liquefaction (HTL)

the enabler of true circular economy - scalability, feedstock flexibility and product quality.

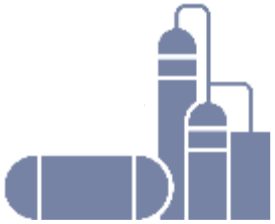
Modular design:
saving time & cost + reducing risks

Product Upgrading

Product separation, refining and offtake

improving product quality via hydroprocessing/other techniques + preparing for downstream assets

Asset Integration

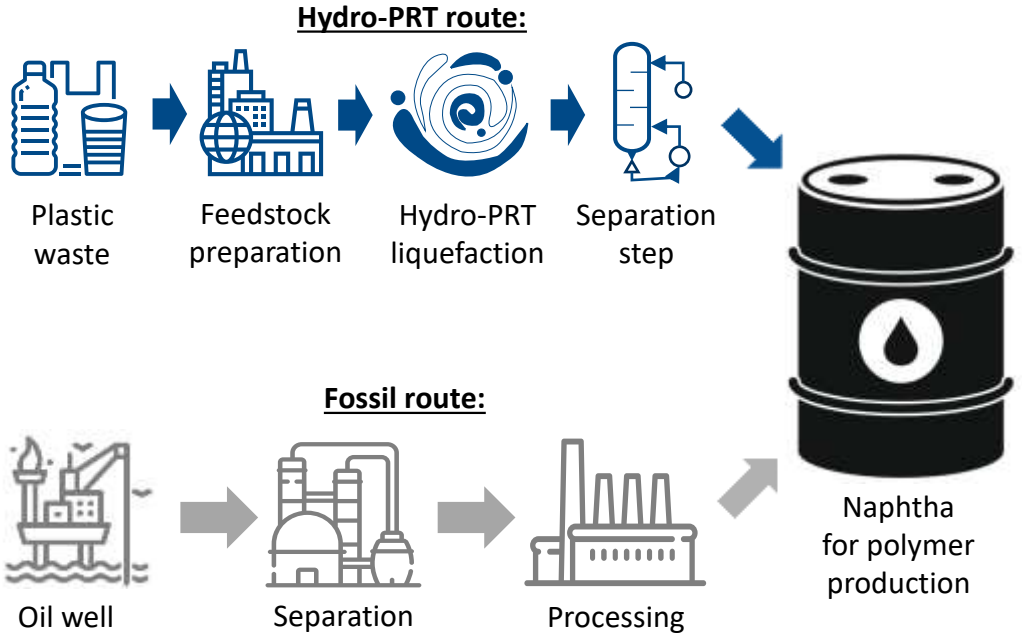


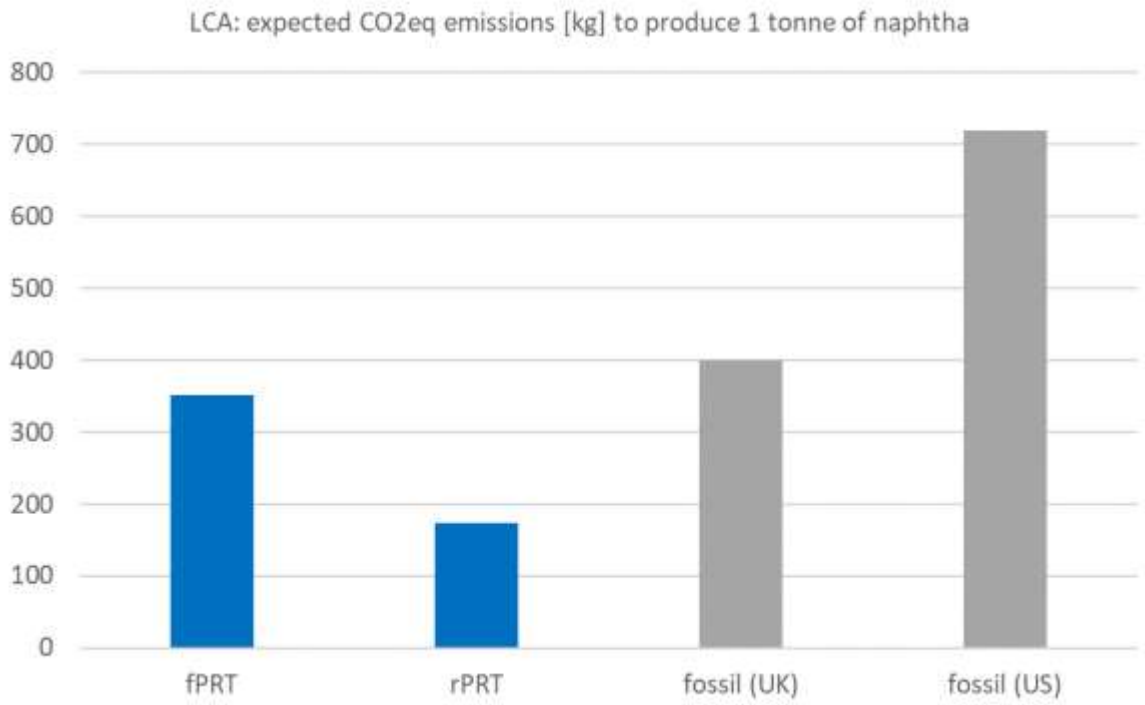
Integration of the Hydro-PRT products

support for integration into assets for the production of new plastics, fuels and chemicals: crackers, refining units and others

Through a licensing business model, KBR's Hydro-PRT solution allows customers to design, build and operate an all-encompassing plastic recycling plant taking plastic feedstock and integrating it into existing assets with the support of a world-class technology and engineering company

Hydro-PRT^{SM}: the environmental impact





- **Incineration is not a path forward**
- **Hydro-PRT fuels*: saving >80% GHG (CO_2eq) emissions vs fossil fuels VS. fuel-exempt strategies to minimize GHG (CO_2eq) emissions**
- **Plastic-to-plastic process = true circularity! – min. 90% REDUCTION of natural resources consumption**
- Less global warming potential (GWP) vs fossil routes for plastics production – and even less with renewable energy in the process (rPRT)
- NOTE: fossil-derived scenarios: +20-50% to account for methane fugitive emissions from oil wells

* ReNewELP NNFCC LCA 2018

Hydro-PRT^{SM}: ReNew ELP (Wilton, UK) layout

Hydro-PRT^{SM}: commercialization progress

Project	Capacity (Feed rate)	Start-up
ReNew ELP (UK)	23,500 tpa	2022
Mitsubishi Chemical Corporation (Japan)	23,500 tpa	2024
LG Chem (S. Korea)	23,500 tpa	2024
Confidential (Asia)	118,000 tpa	2024
Cascade ELP (USA)	118,000 tpa	2025
at least 3 additional grassroot awards to KBR expected in 2022		

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Thank you!

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