



Innovate UK  
KTN

# Future Plastic Circular Supply Chain Tour Teesside

[tees.ac.uk/netzero](https://tees.ac.uk/netzero)



TEES VALLEY MAYOR

# What to expect today...

9.30 - Delegate Arrival

10.00 - Presentations

11.00 - Break

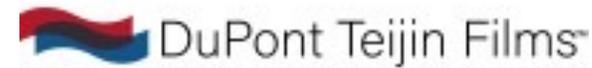
11:15 - Facility Presentations

12:00 - Lunch

1:00 - Facility Tours

3.00 - Close (Green & Blue)

5.00 - Close (Yellow)



TEES VALLEY MAYOR

# Chris Beck

Tees Valley Combined Authority

TEESWORKS

# TEES VALLEY COMBINED AUTHORITY

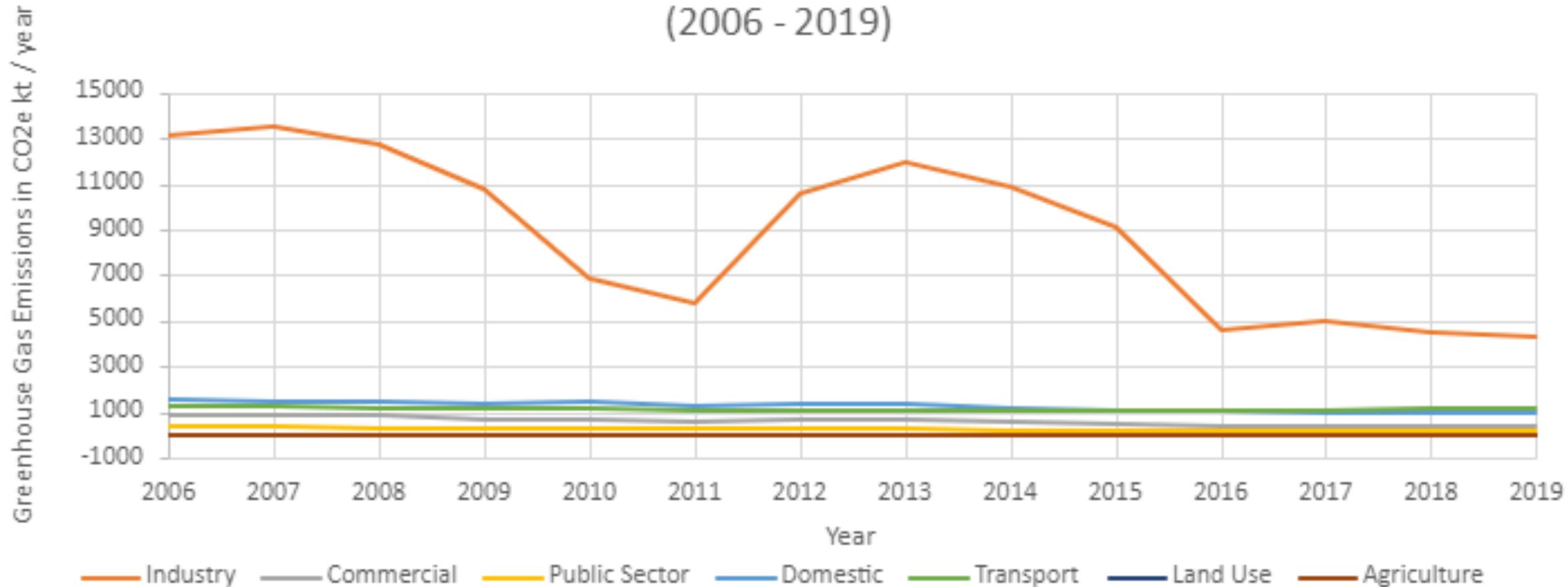
Chris Beck | Group Director of Clean Growth and Innovation

# LOCATION



# TEES VALLEY CO<sub>2</sub> EMISSIONS

Tees Valley Emissions by Type of Emitter (Including Industry) in kt per year  
(2006 - 2019)



# WHY THE TEES VALLEY

- Proximity and ease of access to **North Sea Storage**
- Deepwater port for **CO<sub>2</sub> / H<sub>2</sub> / NH<sub>3</sub> transport**
- **5.6%** of UK industrial emissions.
- History of decarbonisation planning > **Teesside Collective**
- Existing **pipe corridors** and infrastructure
- Operational **H<sub>2</sub> storage & distribution.**
- Import of **26%** of UK's natural gas through CATS.
- **Development Land**





# Teesside Freeport



# ROUTE TO NET ZERO

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- It is not just about emissions
- Also need to consider effect on current businesses
- Need to consider economic opportunities
- Need to create jobs



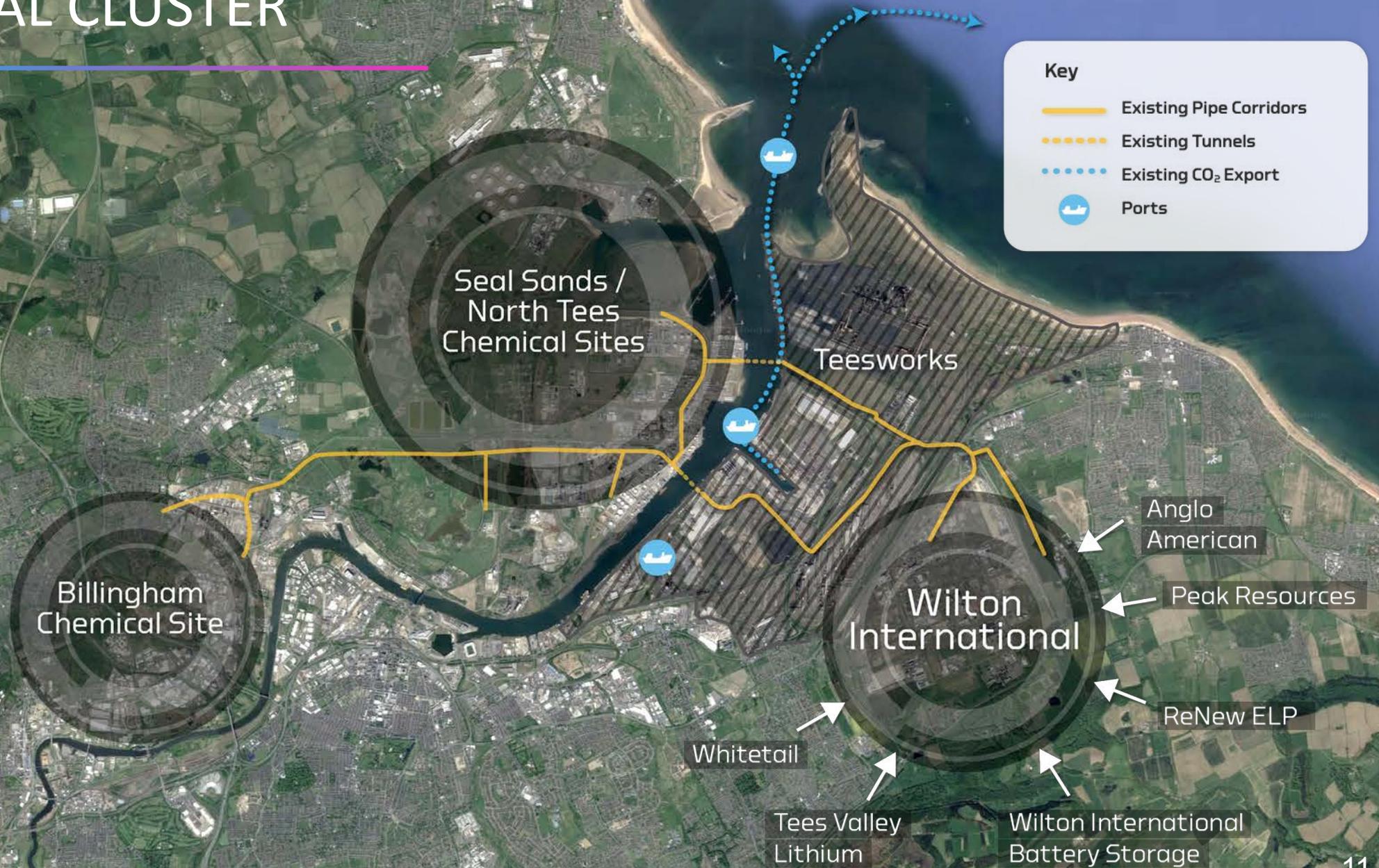
# ROUTE TO NET ZERO

- Net Zero Strategy – First draft Sept
- Five Pillars
  - Heavy Industry
  - Industry
  - Residential
  - Transport
  - Nature and Resources

*But we started 20 years ago!*



# CHEMICAL CLUSTER



# ROUTE TO CLUSTER NET ZERO



## HYDROGEN



H2Teesside,  
Hygreen



H2NorthEast



Department  
for Transport

Transport Hub

PROTIUM

Green Energy



## RENEWABLE POWER SECTOR



Net Zero  
Teesside



WHITETAIL  
CLEAN ENERGY

EFW PROJECTS



sembcorp



MGT  
Teesside

OFFSHORE  
WIND



## CARBON CAPTURE, USAGE & STORAGE



Net Zero  
Teesside

# GROUND ZERO FOR NET ZERO

## Creating the world's first Net Zero industrial cluster by 2040

- The go-to region to develop clean gas, hydrogen and low-carbon technologies
- The most developed and deliverable CCUS project – Net Zero Teesside
- UK's largest Green and Blue hydrogen projects
- Premier offshore wind location
- Multimillion-pound investments from SeAH Wind,, Net Zero Teesside, bp



# EAST CO<sub>2</sub>AST CLUSTER

NORTH SEA



145km

103km

MIDDLESBROUGH ●

DARLINGTON ●

**PROJECTS IN TEESIDE INCLUDING**

Net Zero Teesside

BOC bp CF

kellas MIDDLETOWN NZT Power suez

TV ERF 8 RIVERS

**UP TO 10 MTCO<sub>2</sub>E CAPTURED**

HULL ●

GRIMSBY ●

SCUNTHORPE ●

● YORK

● LEEDS

● SHEFFIELD

**PROJECTS IN THE HUMBER INCLUDING**

**ZEROCARBON HUMBER**

drax equinor MITSUBISHI POWER

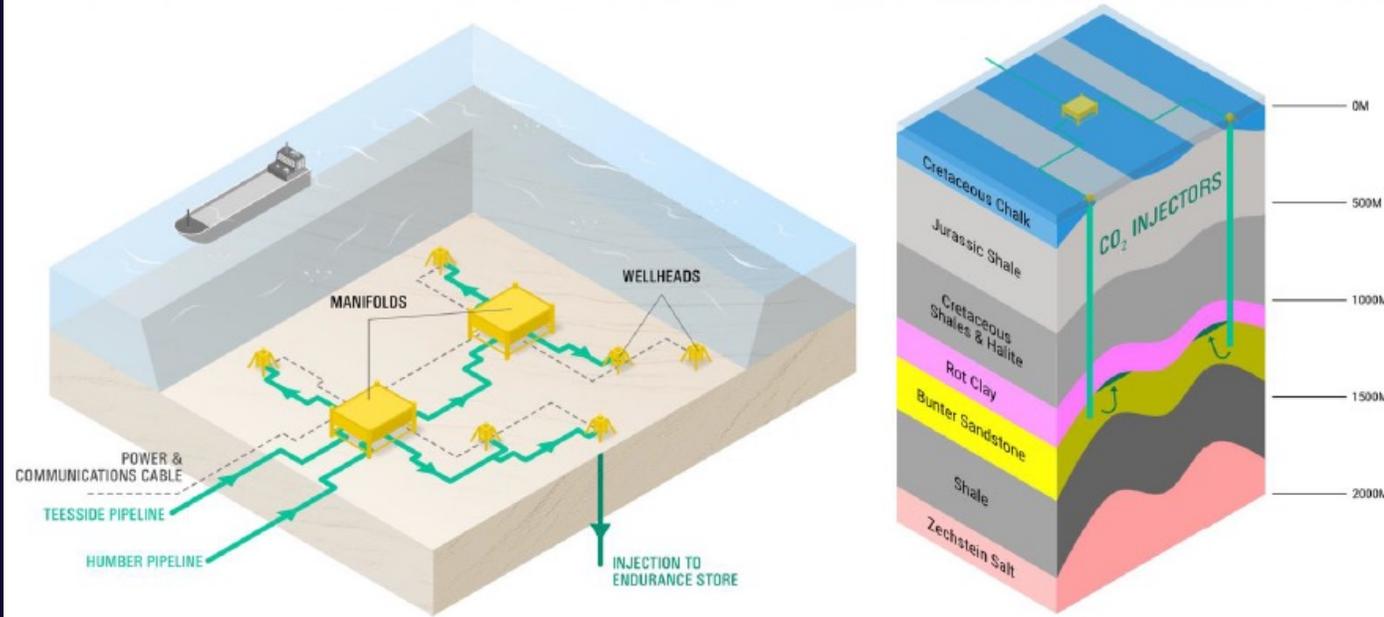
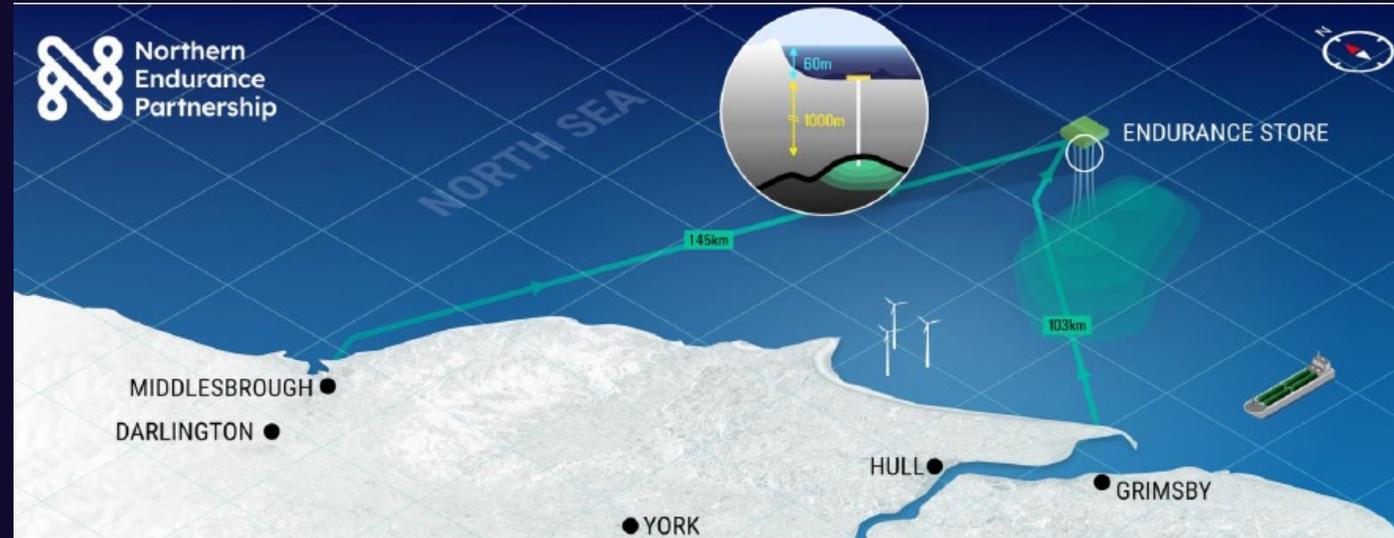
sse Thermal TRITON POWER uni per VELOCYS

**17+ MTCO<sub>2</sub>E CAPTURED**



# THE ENDURANCE CARBON STORE

- **First of a kind** offshore low carbon CCS infrastructure in the UK
- CO<sub>2</sub> injection into a **saline aquifer** is a worldwide proven concept
- Largest saline Aquifer in the southern North Sea – **capacity to store 450m tonnes of CO<sub>2</sub>** with potential to extend to ~1 billion tonnes with nearby stores
- Includes **CO<sub>2</sub> pipelines** from Teesside and the Humber
- Compression and pumping systems to a common subsea manifold and well injection site at the **Endurance store**



# SOUTH BANK



# PROGRESS SLIDE ON SOUTH BANK

- £107million investment from UKIB – its first ever
- Phase One 450metres to be complete by March 2023
- Planning permission granted for 76,500m<sup>2</sup> wind turbine blade manufacturing facility

January 2021



February 2022



# HYDROGEN



Region has existing hydrogen storage caverns



Currently produce more than 50% of the UK's hydrogen



Hydrogen pipework connecting major cluster sites



Tees Valley announced as the DfT Hydrogen Transport Test Hub



Significant hydrogen production planned on and around Teesworks

## PROJECTS

Blue hydrogen

- Kellas (1GW plant)
- bp (1GW plant)

Green hydrogen – linked to renewable energy production

- Protium (up to 60MW)
- EDF (hydrogen connected to near shore wind)
- bp (500MW)

# HYDROGEN TRANSPORT

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- DfT Hydrogen Transport Test Hub
- Major trials bidding for funding
- Looking at Airport Operations



# HYDROGEN FOR THE HOME

- Northern Gas Networks proposal for up to 2,000 homes and businesses in Redcar to be heated with hydrogen gas from 2025
- Plans for residents and businesses to be powered by locally produced hydrogen
- Teesside targeted as hub for green hydrogen production by 2025



# CIRCULAR ECONOMY

Waste / bio feed to :

- Bio ethanol
- Diesel
- Sustainable Aviation Fuel
- Bio Coal
- Bio LPG
- Power



# CIRCULAR ECONOMY

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## alfanar – Lighthouse Green Fuels Project

- Sustainable aviation fuel from waste
- £1billion investment
- Potential to produce 80% less greenhouse gas than its fossil fuel equivalent



## Circular Fuels - Bio Gas - LPG from Waste

- £150million investment at Teesworks site

Thank you

# Paul Davidson

## Smart Sustainable Packaging Challenge



# Smart Sustainable Plastic Packaging Challenge

**Paul Davidson**  
**Challenge Director**



# The SSPP Plan 2019 - 2025

To deploy £60m of public funding alongside £149m of private money using a combination of:

- **Early stage enabling research (~£8m)**
- **Collaborative R&D (~£12m)**
- **Large scale demonstrator projects (~£38m)**

Supporting **bold, ambitious innovation** to bring about wholesale change in the UK's ability to:

- **Reduce**
  - **Reuse**
  - **Recycle**
- } its plastics packaging and so dramatically reduce the amount of plastics entering the environment. "Recovery" is NOT part of the SSPP plan.

# Activity & Scope



7 Competitions



57 funded projects

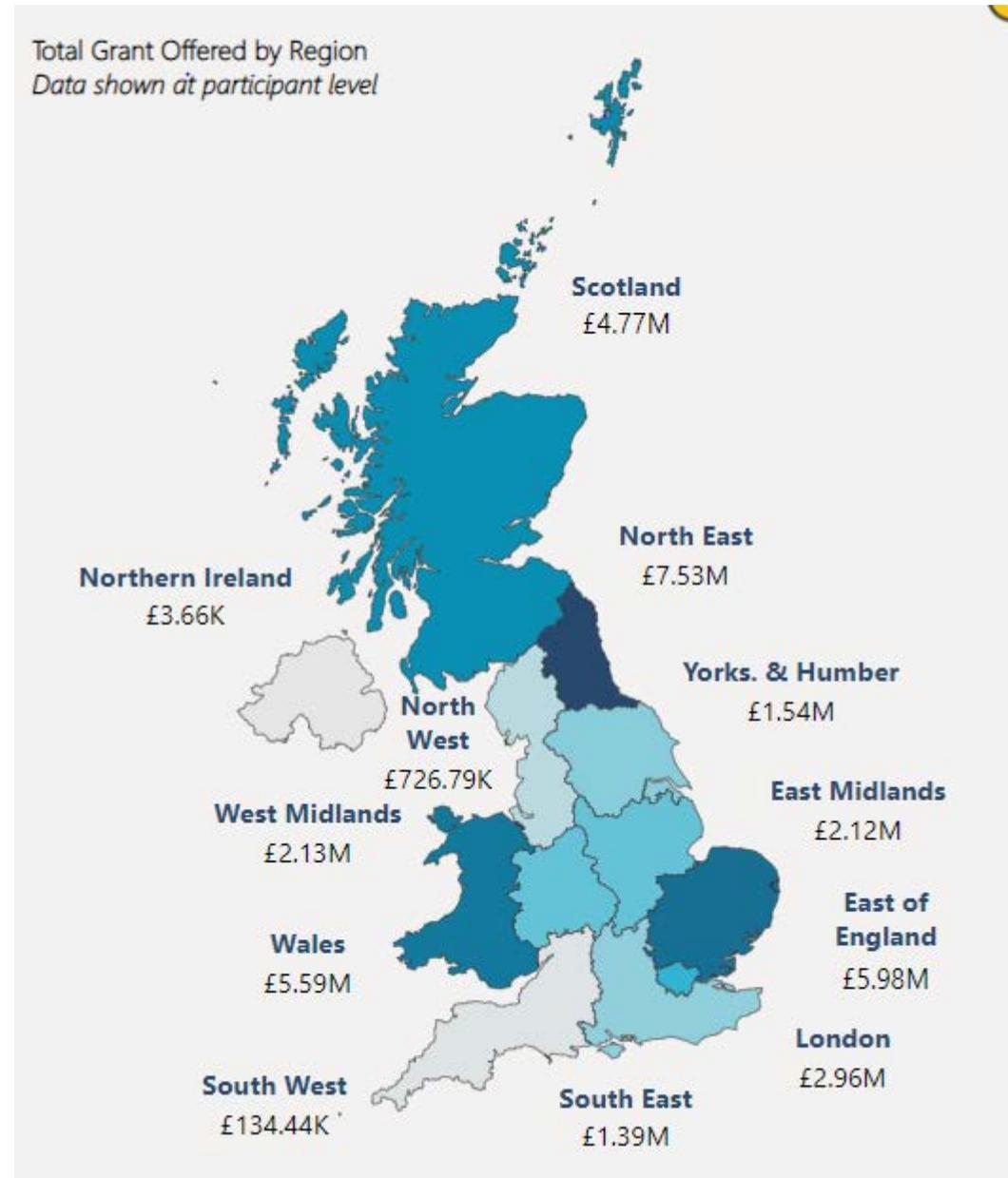


Balanced Portfolio



Collaborative

- Brand and retailers
- Polymer & packaging sectors
- Technology providers
- Recycling sector
- Academia & NGOs



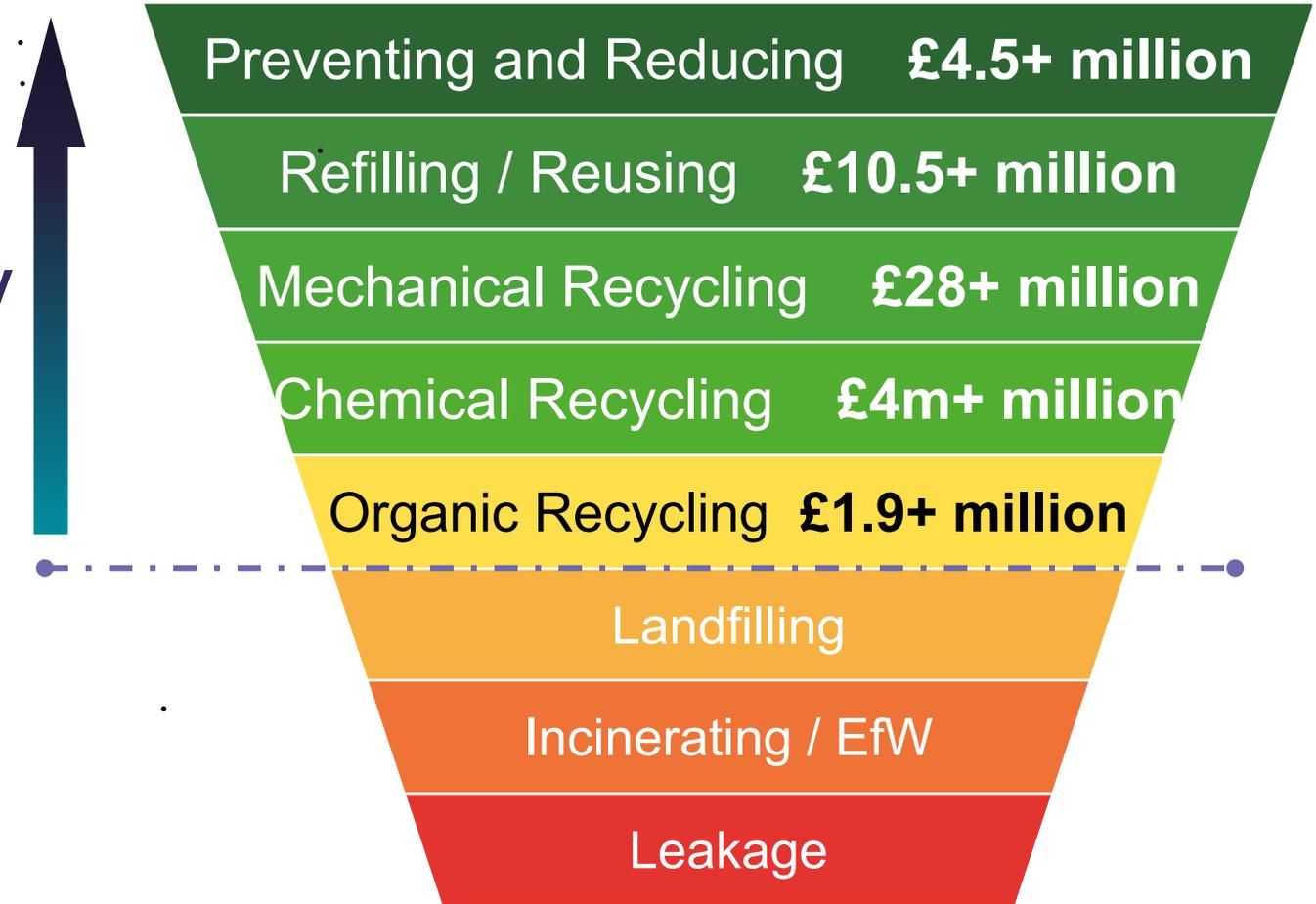


# Balanced Portfolio



# SSPP Portfolio

- 7 Funding Competitions
- 57 funded projects
- Collaborative/multi-disciplinary
  - Recycling industry
  - Packaging industry
  - Brand and retailers
  - Academia
- Balanced approach

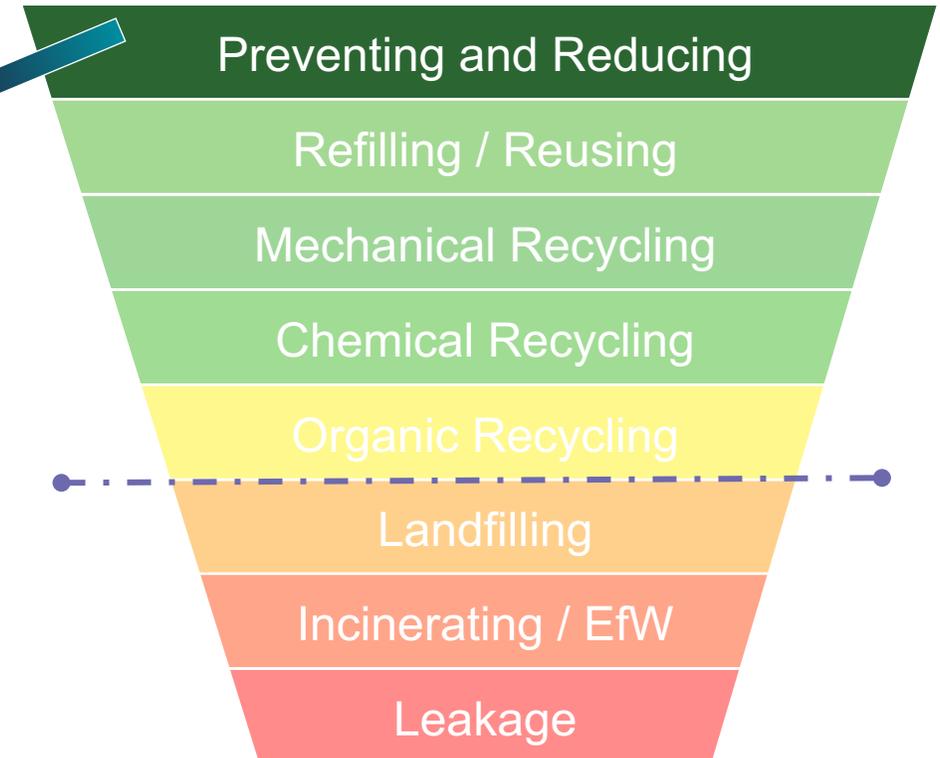


# SSPP Portfolio – Prevention/Reduction

£4.5+ million

11 research and feasibility projects including:

- novel **biodegradable / edible biopolymers** to displace plastic
- **process optimisation** solutions to reduce material wastage in plastic packaging manufacturing
- **packaging design innovation** to support reduction through behaviour change
- **circular systems** for food-to-go packaging



# SSPP Portfolio – Reuse & Refill

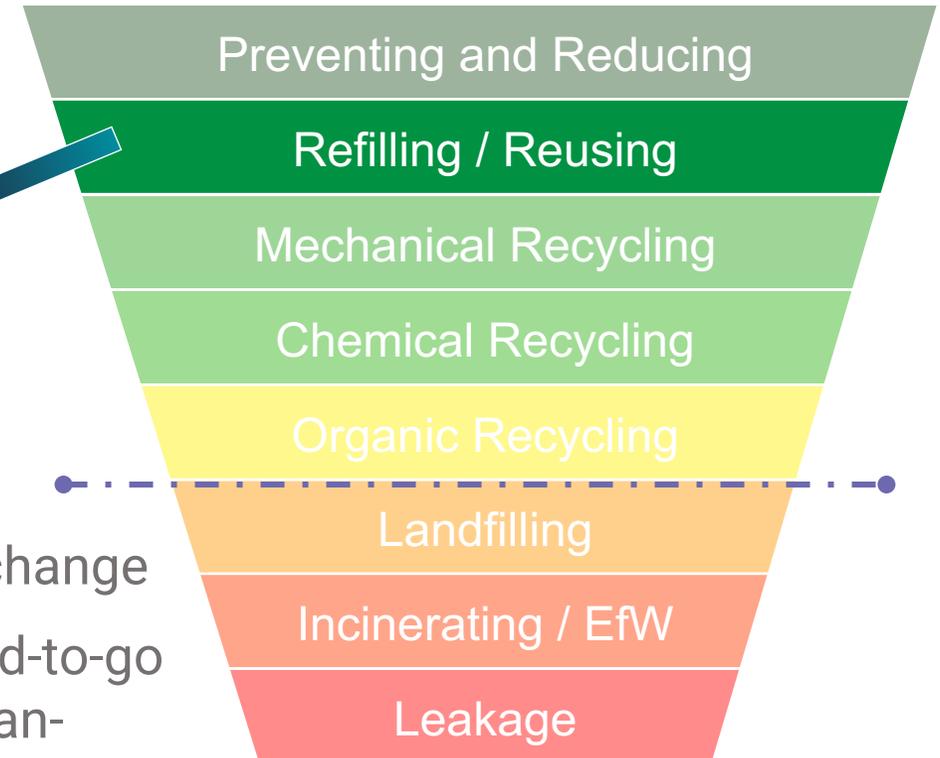
£10.5+ million

2 Large-Scale Demonstrators – whole system trials:

- Unpackaged Systems
- Return Refill Repeat

14 research and feasibility projects including:

- **identification, tracking & cleaning** solutions for reusable/refillable packaging
- **consumer perception**, incentives and behaviour change
- **circular systems and reuse models** including food-to-go packaging, milk, personal care products, and ocean-plastic derived water bottles



# SSPP Portfolio – Mechanical Recycling

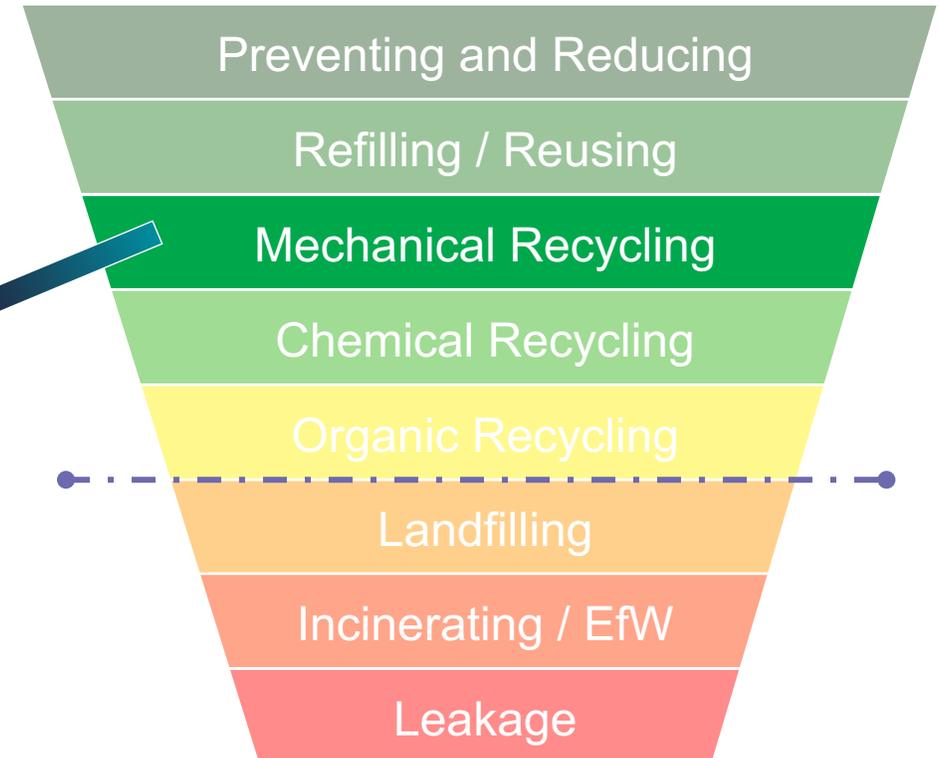
£28+ million

4 Large-Scale Demonstrators:

- Veolia (PET full loop)
- Cleanstream (separation of food & non-food PP)
- Uncaptured Unrecycled (mixed plastics)
- Post-consumer films (film separation)

and 15 research and feasibility projects including:

- Novel **food-grade quality recycling** processes, including a super-critical CO<sub>2</sub> cleaning process
- **Barrier film** innovations to increase recyclability
- Systemic and **behaviour change** research
- Polymer **identification and sorting** technologies



# SSPP Portfolio – Chemical Recycling

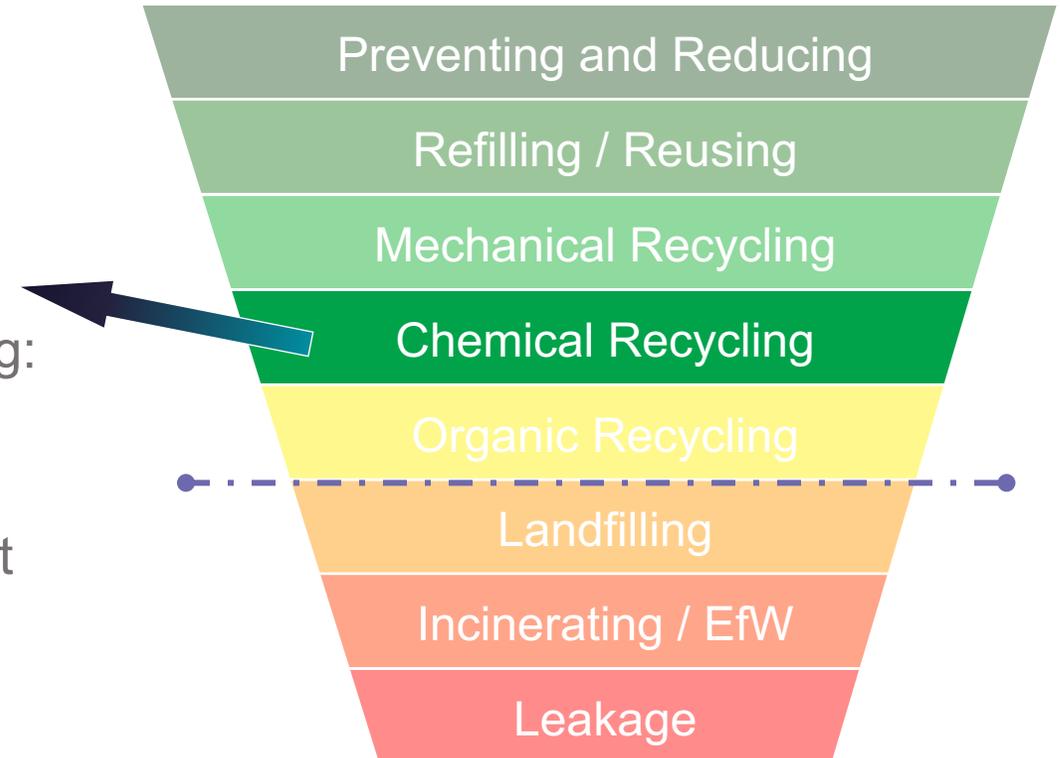
**£12+ million**

2 Large-Scale Demonstrators:

- ReNew ELP (hydrothermal)
- Recycling Technologies (thermal cracking)

and 4 research and feasibility projects including:

- Microwave assisted pyrolysis
- Use of super-critical water as a green solvent
- Plastics to plastics – pyrolytic and fractional distillation process

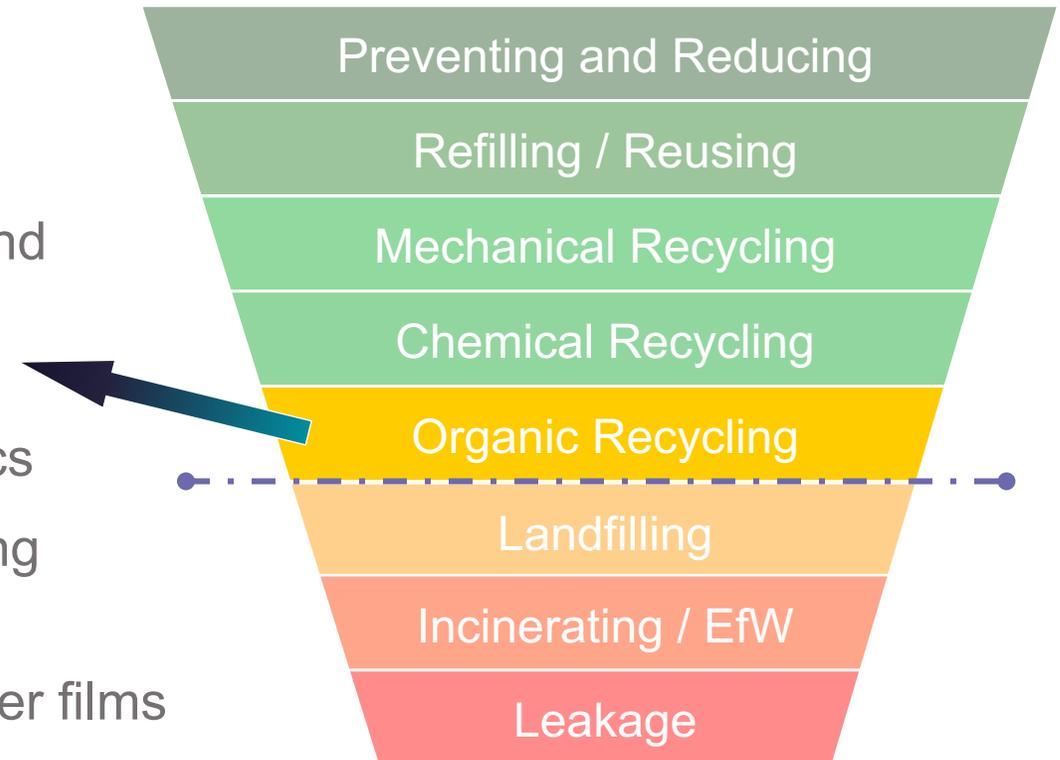


# SSPP Portfolio – Organic Recycling

**£1.9+ million**

4 research and feasibility projects including:

- Assessing the **integration of compostable packaging** in existing UK waste collection and treatment infrastructure
- Compostable packaging as a targeted alternative to the main hard-to-recycle plastics
- **Foamed biopolymer** formulation for replacing expanded polystyrene and PVC in PTTs
- **Bio-produced nylon** for recyclable multi-layer films



# Films and flexible packaging recycling



## THE CHALLENGE...

- 22% of all UK consumer plastic packaging in 2020
- 8% was recycled in 2021
- Challenging for current sorting & mechanical recycling processes

## Impact Recycling project

Demonstrator plant to separate post-consumer mixed flexible plastic packaging using a wet, density-based separation technology to separate multi-layer and mono-layer flexible

## Uncaptured Unrecycled Plastics project

Demonstrator plant for the recovery, sorting and recycling of post-consumer plastic packaging, including films and flexibles, from mixed waste streams (e.g. reject material from Materials Recycling Facilities and on-the-go/food retail outlet waste)

# Also on films and flexibles...



## Recently launched... FlexCollect

UK's biggest flexible plastic household collection and recycling pilot

- funding for local authorities to roll out and operate pilot collections
- Government and whole value chain working together to:
  - building an evidence base
  - share learning
  - provide key insights into operational issues.

Funding for **CEFLEX** to undertake a comprehensive testing programme to better understand the sortability and mechanical recyclability of flexible packaging and to generate robust, independent and credible data to update and improve their D4ACE design guidelines.



# Plastics Circular Economy Centre?

- The UK is already performing well globally (60% of AWEPP Competition finalists are UK based)
- Emerging centres of excellence and clusters:
  - Henry Royce (Manchester) – Collection and Recycling
  - Sheffield/Grantham – Reuse/refill/behaviour change/LCAs etc
  - Portsmouth – Enzymes
  - Plymouth – Marine environment and microplastics
  - UCL – Compostable plastics and alternative materials
- Gaps:
  - Sustainable Petchem at scale (some work around ethylene and bio feedstocks)
  - Retail systems
  - Digital and the resource agenda
  - Monitoring and measurement of plastic flows
  - Quantified understanding of the impact of plastic in the environment

Q. (How) Can Wilton become the first site with a fully circular supply chain?



**THANK YOU**

EMAIL: [paul.Davidson@iuk.ukri.org](mailto:paul.Davidson@iuk.ukri.org)

[www.ukcpn.co.uk/SSPP](http://www.ukcpn.co.uk/SSPP)

[www.ukri.org/smart-sustainable-plastic-packaging-challenge/](http://www.ukri.org/smart-sustainable-plastic-packaging-challenge/)

# Dr David Hughes

Net Zero Industry Innovation Centre

# Net Zero Industry Innovation Centre

**Total investment: £13.1m**

**Estimated completion date: April 2023**

The Net Zero Industry Innovation Centre (NZIIC) is an innovative new £13.1m facility and key component of Tees Valley Combined Authority's regional innovation strategy, which will position Teesside firmly at the heart of the UK's green industrial revolution.

# Specialised Laboratories

**Hydrogen and Decarbonisation** lab for carbon capture and utilisation, hydrogen transportation, geological storage of hydrogen and CO<sub>2</sub> and embrittlement mitigation.

**Circular Economy and Non-Mechanical recycling** lab for valorisation of waste by-products and building re-use into their product offerings. Thermal processing and chemical processing.

**Intelligent Energy and Industrial Systems** lab for simulation of micro-grids, energy vectors integration and development of intelligent systems

**Digital Modelling and Simulation** lab for Advanced modelling and simulation for operating industrial assets, real time analysis and visualisation, assisted operations , technological help, remote operations and assisted safety systems.

**Processing and Prototyping** lab for advanced additive manufacturing with focus on the physical production of components to be manufactured at scale, being repeatable and easily standardised.

**Thermal Technologies** lab for prevention of corrosion, ceramics production and enhancement of material performance for energy conversion technology.

# NZIIC Capabilities

- Carbon Capture Utilisation and Storage
- Characterisation of material performance
- Corrosion analysis of materials
- Green Hydrogen production, Hydrogen Fuel cells
- Smart Energy Lab
- Showcase modelling and VR suite
- Waste Material Recycling



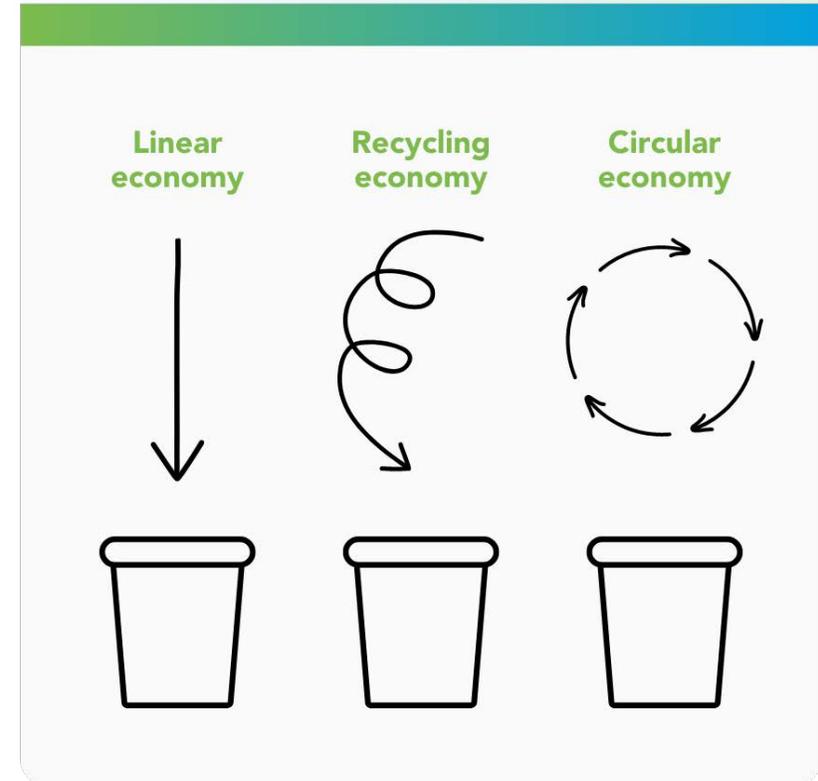
# Circular Economy & Recycling Innovation Centre (CERIC)



*Only 8.6% of the global economy is circular at present.*



TEES VALLEY MAYOR



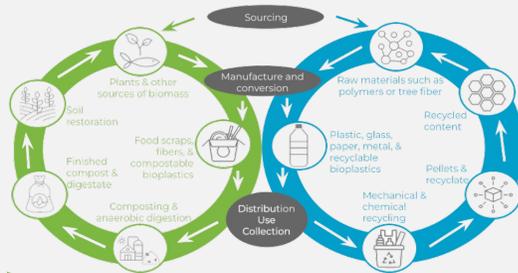
# Circular Economy & Non-mechanical Recycling Lab @ NZIIC

The NZIIC focuses on hard to recycle materials in high volumes.



# Current CERIC Themes

## Circular Bio-economy



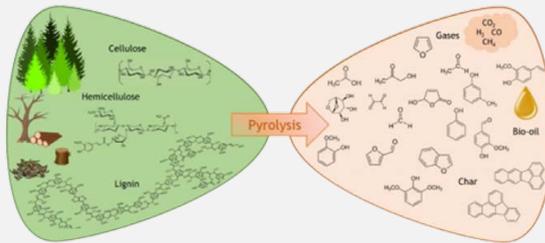
## Recovery & Activation of Industrial Solid Wastes



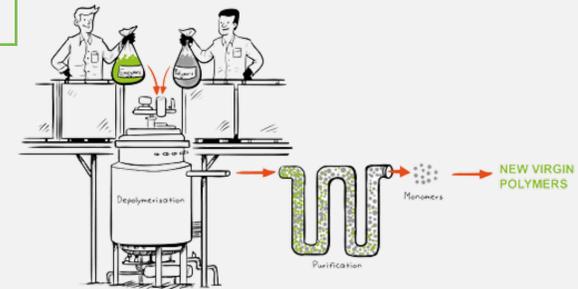
## Industrial Digitisation



## Pyrogenic Recovery & Treatment

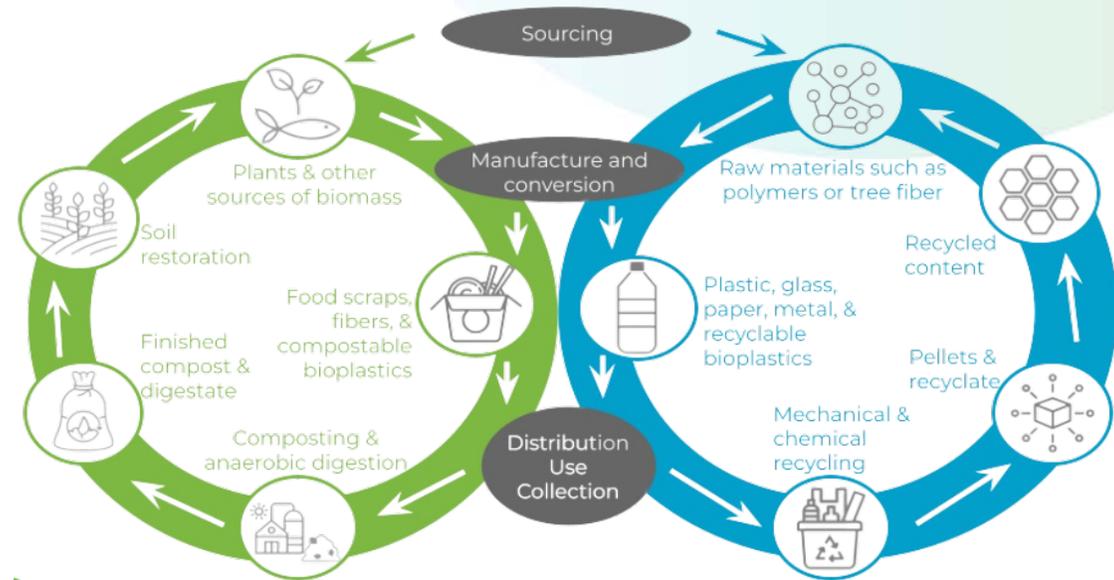


## Polymer Recycling



# Circular Bio-economy

- Bio-derived polymers
- Food security & bio-feedstocks
- AD digestion
- Biomass energy



# Recovery & Activation of Industrial Solid Wastes

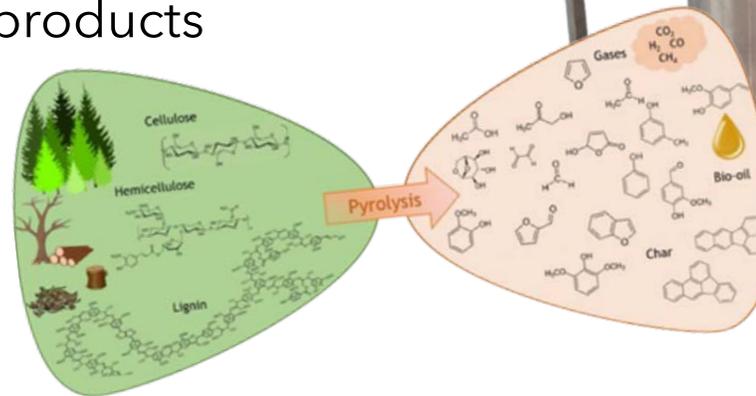
- Soil activation for cementitious materials
- Recovery & binding of metal wastes
- Geopolymers
- Valorisation of pyrolysis wastes



***2/3 of what goes to landfill  
in the UK is solid soil &  
mineral waste (DEFRA)***

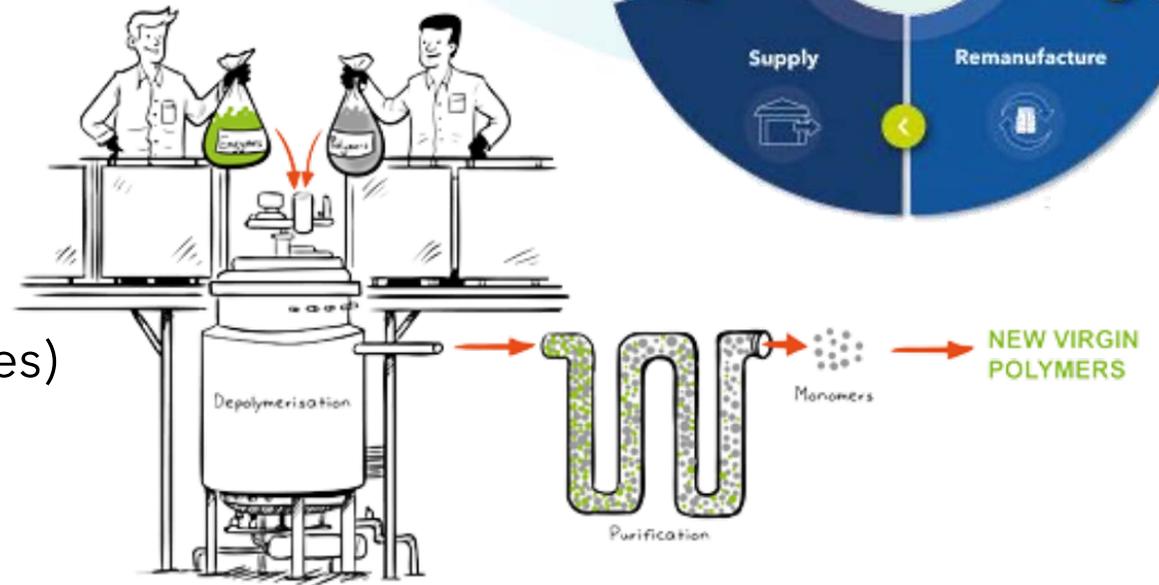
# Pyrogenic Recovery & Treatment

- Polymers
- Biomass
- Sewage and waste water treatment
- Valorisation of char bi-products



# Polymer Recycling

- Textile recovery
- Chemical recycling
- Recovery and reuse (packaging)
- Polymer re-design
- Composite recovery (fillers and fibres)
- AD digestion



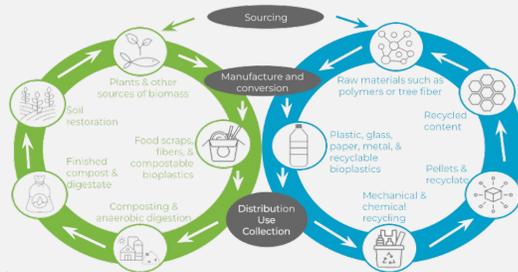
# Industrial Digitisation

- Digital Twins/Shadows
- SMART data capture + ML/AI
- Gamification & UI
- Circular Business Models (digital enabled)



# Current CERIC Themes

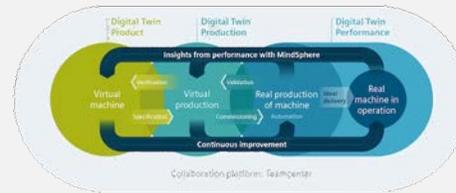
## Circular Bio-economy



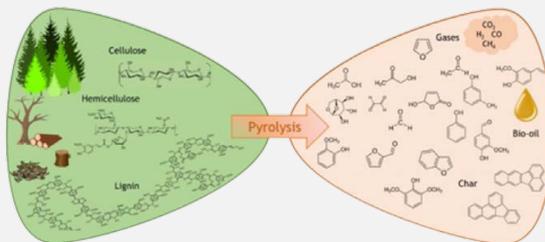
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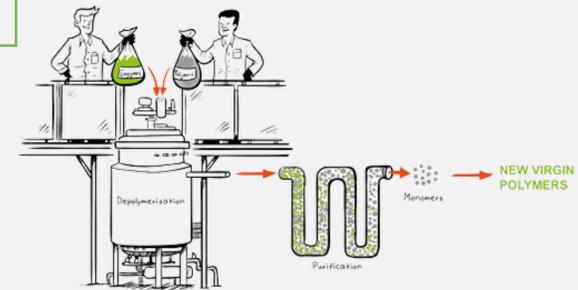
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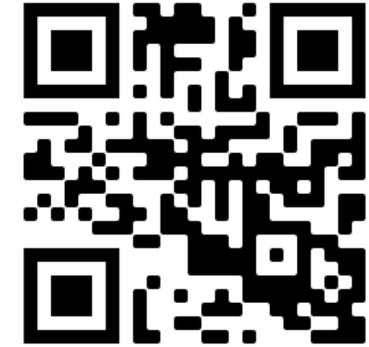


## Pyrogenic Recovery & Treatment



## Polymer Recycling





# Thanks for your time!

For more information about the Net Zero Industry Innovation Centre, please visit [www.nziic.org.uk](http://www.nziic.org.uk) or scan the QR code above:

Don't forget to stay up to date with our progress by following our socials.



@TU\_NZIIC



Net Zero Industry Innovation Centre



**NET ZERO**  
**INDUSTRY**  
**INNOVATION**  
**CENTRE**



Teesside  
University

[tees.ac.uk/netzero](https://tees.ac.uk/netzero)



TEES VALLEY MAYOR

# Chris Holt

NEPIC



nepic

*Cluster . Connect . Grow*

# Plastic recycling in the North East

Dr Chris Holt, Clean Growth Manager



## NEPIC'S PURPOSE

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We support the business development needs and interests of the North East process industries.

By working closely with our member companies, we forge meaningful business relationships that allow us to identify opportunities, facilitate connections, promote collaboration and enable growth.



## GROWING INDUSTRY & SUPPORTING MEMBERS

Our vision is for a **thriving** chemical processing industry in the **North East of England**



### We support your needs

We get to know your business so that we can provide you with the right support and connect you to the right people at the right time.



### We protect your interests

We continually address industry challenges and champion the sector to ensure the long term sustainability of chemical processing in the region.



### We build meaningful relationships

We have built trusted relationships with manufacturers, operators, supply chain businesses and support organisations.



### We identify opportunities

By working closely with members we identify and showcase upcoming business opportunities that supports investment, promotes diversification and inspires innovation.



### We promote collaboration

We have developed an established and trusted community that acts as a catalyst for collaboration.



### We enable growth

By supporting members at a local level in a collaborative environment, we can facilitate business growth and value for the region.



## NEPIC IN NUMBERS

REPRESENTING AN  
INDUSTRY THAT  
GENERATES  
£26 BILLION  
OF ANNUAL SALES  
& EMPLOYS  
190,000



**340** member companies

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**70+ events** in 2018  
& workshops hosting  
**2,500 guests**

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**120 industrialists** supporting the  
members through **mentoring**

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**6,000** social media followers &  
**9,000 strong industry database**

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**Led by industry:** experienced  
**Board of 10**, Leadership Council of  
60 industrialists & **strong team of 12**

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**Founded in 2004** to reconnect industry,  
promote investment & strengthen  
supply chain links

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# Tees Valley Process Industry Cluster



- Teesside is a diverse industrial cluster, with the chemical industry at its core
- Products include fertilisers, acrylic and plastics
- Other sectors, such as biopharma, are prominent in the region
- Energy is a fast growing sector due to the need to clean energy
- Industrial symbiosis is essential for the chemical industry

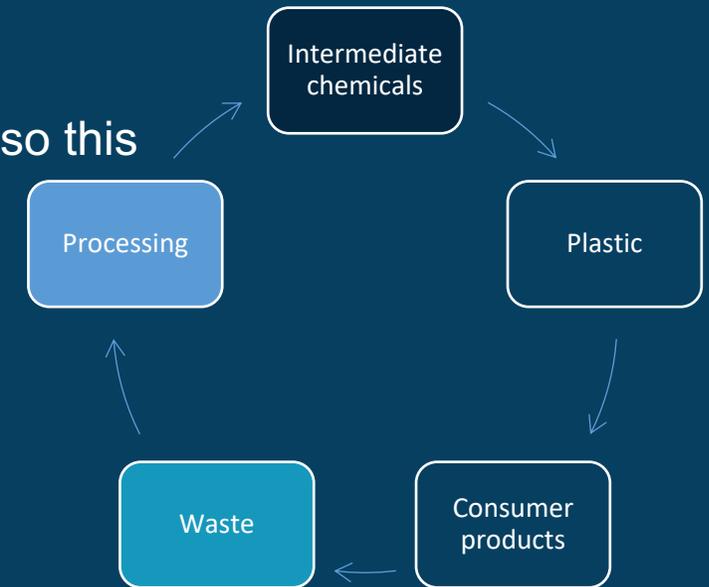


Credit: TVCA

# Why are we interested in circular economy and biofeedstocks?



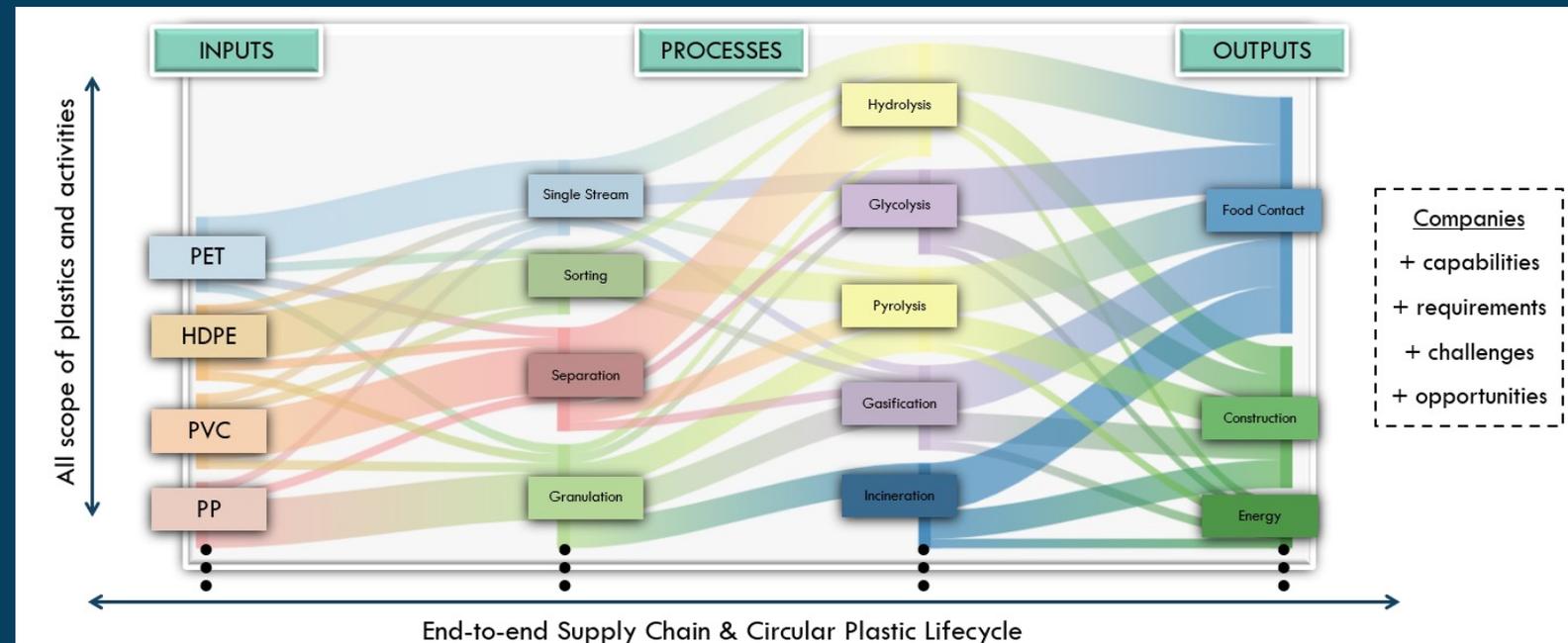
- The majority of the chemical industry is based on carbon
- The only way to replace petrochemicals as a feedstock is to use biomass, waste/byproducts or carbon dioxide
- Without this the chemical industry will always be based on petrochemicals
- Low-carbon feedstocks will be essential to achieve Net Zero so this is one of our major areas of attention



# NEPIC Projects - Plastics recycling project



- The 12- month project was carried out with Durham University
- The project involved engaging with the plastics sector to identify current recycling, material flow and opportunities
- Over 100 companies were considered in the supply chain map
- The plastics recycling supply chain is rapidly transforming



# Acknowledgements



Thank you to all our project collaborators

Thank you for your time, please let us know if you have any questions?

[Chris.holt@nepic.co.uk](mailto:Chris.holt@nepic.co.uk)



# Sally Beken

## Panel Q&A



[www.ktn-uk.org](http://www.ktn-uk.org)



InnovateUK  
KTN

# John Twitchen

Stuff4Life

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# A circular economy for polyester workwear

CPI, 8 November 2022

# Introduction

Workwear has a high impact in the UK. There is only limited infrastructure for recycling and manufacture, and the significant supply chain social and environmental costs are unaccounted for.



## *Manufacture and use*

- 16,000 tpa of UK workwear
- Composite materials; linear
- Limited washing/laundry



## *UK infrastructure*

- Limited recycling infrastructure
- Downcycling; EfW; landfill
- Scant manufacturing capacity



## *Externalities + impact*

- Fossil-derived, carbon impact
- Social impacts; exploitation
- EPR is on the horizon

# Where it started

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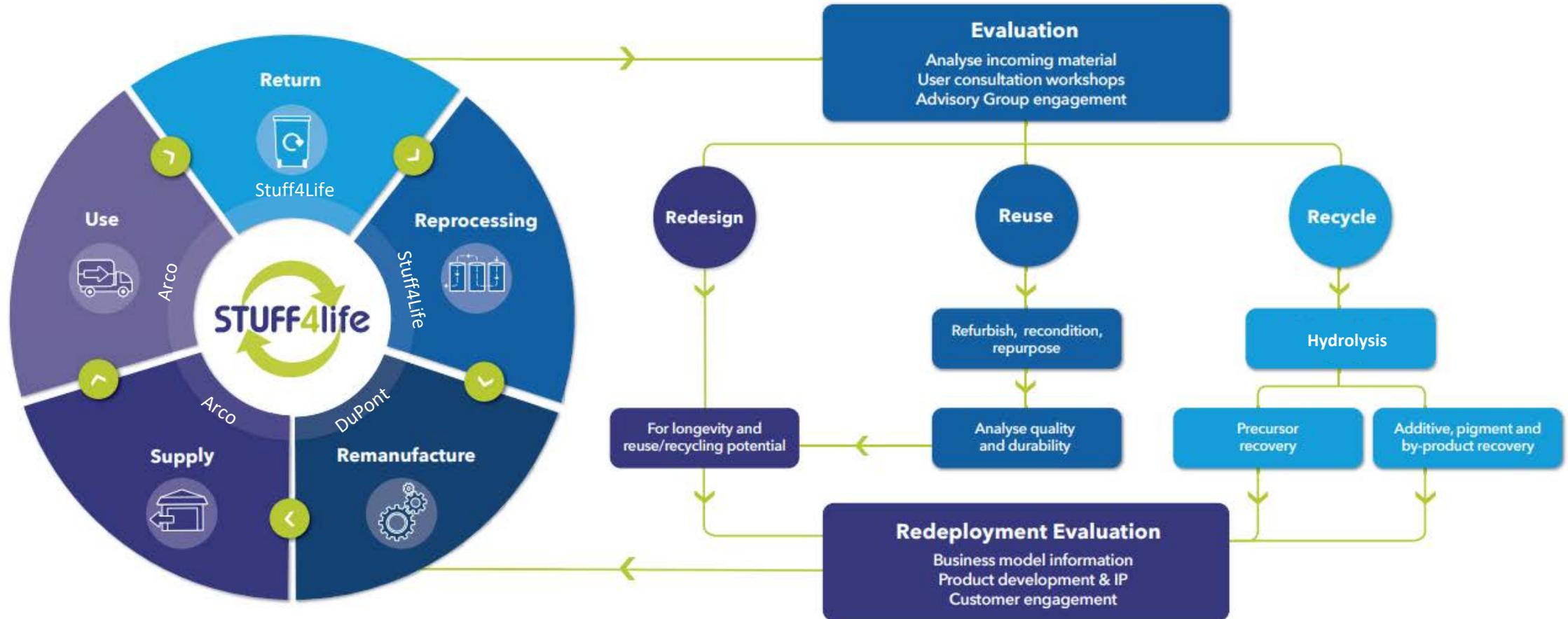


# Mission

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Establish supply chains and technologies to implement the closed-loop recycling of materials and facilitate new servitisation, manufacturing and ownership models, enabling a material circular economy.

# The Polymer Circular Economy Process



# Collection trial

## RECYCLE YOUR HI-VIS VESTS AND SHIRTS!

Please help us to create PPE for life by recycling your hi-vis vests and shirts here.

### HI VIS VESTS

Turning old PPE into new PPE

<p>✓</p> <p><b>Yes please</b></p> <ul style="list-style-type: none"><li>Hi-vis vests</li><li>- Short sleeve</li><li>- Long sleeve</li></ul> <p>Yellow ✓ Orange ✓</p>	<p>✗</p> <p><b>No thanks</b></p> <ul style="list-style-type: none"><li>Jackets</li><li>Trousers</li><li>Helmets</li><li>Goggles</li><li>Gloves</li><li>Masks</li></ul>
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These hi-vis garments are made from polyester which can be recycled in the UK and made back into completely new, 100% recycled hi-vis workwear.

Turning old PPE into new PPE

In partnership with **amey**





# Patent pending

Stuff4Life is working across the supply chain to establish the infrastructure, push and pull factors to deliver a the circular economy for polyester fabric – our starting points is through offset, the end point is recycled content.



*100% offset moving towards 100% recycled*

# CPI scale rig



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# Thank you

**Contact:**

John Twitchen: 07841 632761 / [it@stuff4.life](mailto:it@stuff4.life)

The Assembly Hall, Victoria Building, Victoria Road, Middlesbrough TS1 3AP

W: [stuff4.life](http://stuff4.life)

**arco**<sup>®</sup>  
Experts in Safety



# Dr Yvonne Armitage

CPI

# Introduction to CPI

**Dr Yvonne Armitage**

Director of Biotechnology



**We help companies to  
develop, prove, scale-up  
and commercialise new  
products and processes**

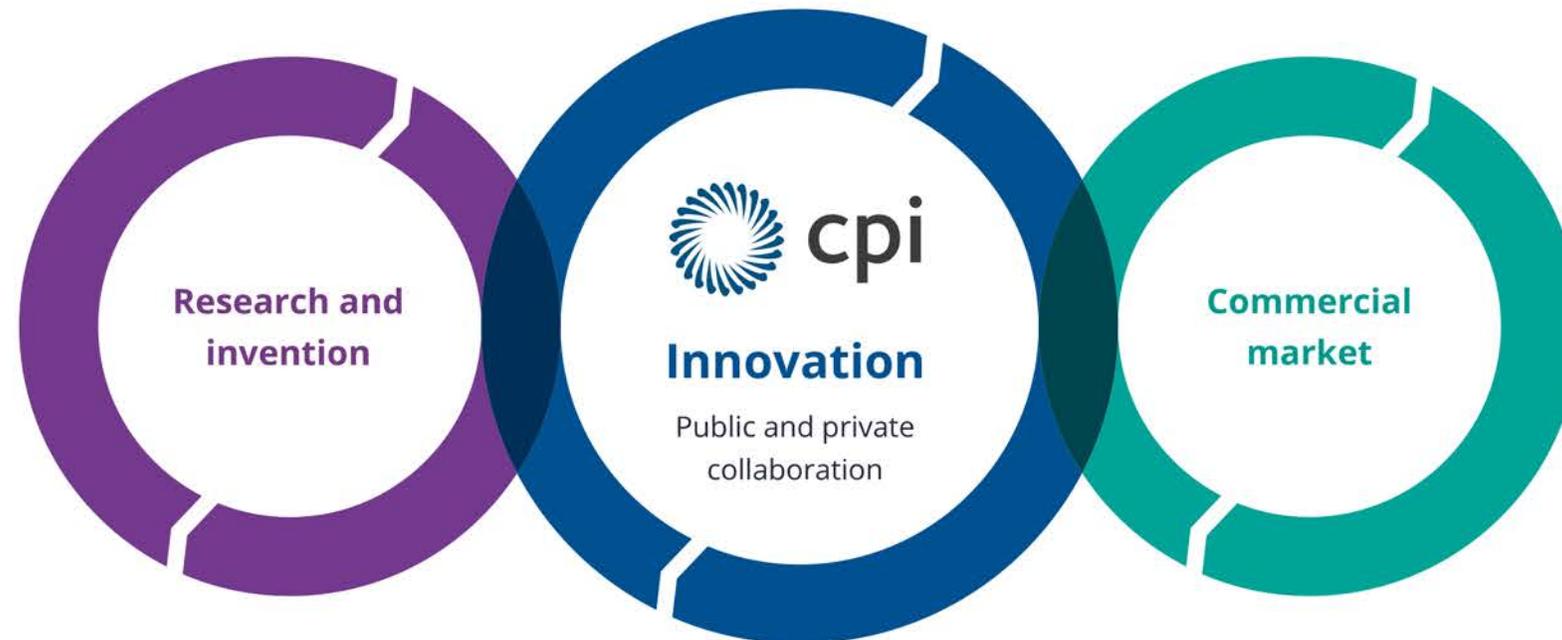


Creating a **healthier** society,  
**cleaner** environment and  
a **vibrant** economy...

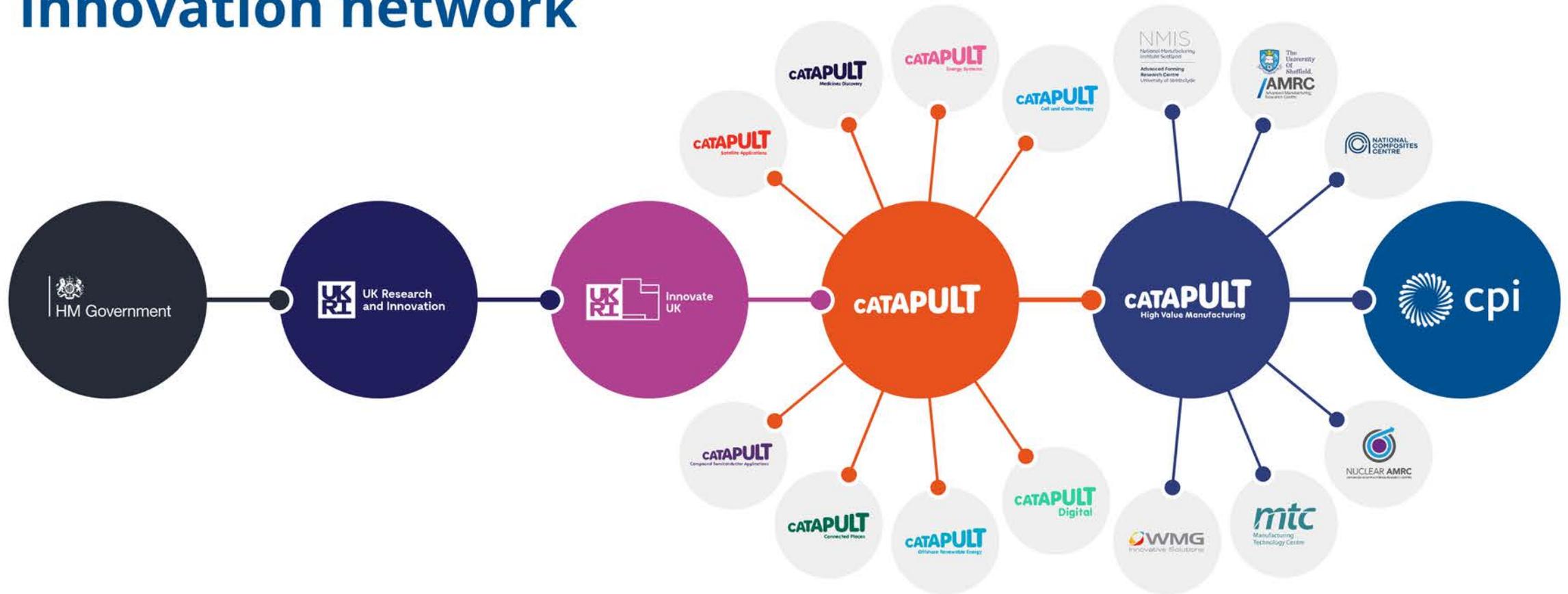


...by ensuring **every** great  
invention gets the **best**  
opportunity to become a  
successfully marketed product.

**We help to deliver, de-risk, and accelerate  
your concepts into successful products**



# Supported by an extensive innovation network



# A focus on high value markets



Pharmaceuticals



Medtech



Agritech



Food, drink and nutraceuticals



Fast-moving consumer goods



Logistics and packaging



Electronics



Energy



Speciality chemicals and materials



Automotive



Aerospace

# Our expertise in core capabilities



Biotechnology



Biotherapeutics



Formulation  
and materials



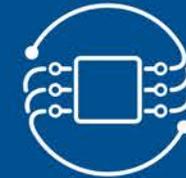
Pharmaceutical  
processing



Photonics



Printed  
electronics



Flexible hybrid  
electronics



Digital



## Healthcare innovation

- Medicines manufacturing innovation for multi-modalities such as small molecules, biologics, microbiome therapeutics, and nucleic acid therapeutics including oligonucleotides, mRNA, and saRNA
- Development and scale-up of nanotherapeutic delivery systems for intracellular delivery including lipidic or polymeric nanoparticles for mRNA delivery
- Development and scale-up of medical devices including in vitro and point-of-need diagnostics operated under ISO 13485 standards



## Innovations to support net-zero

- Development and scale-up of battery materials in support of low carbon mobility
- Development and scale-up of sustainable materials for a range of formulated goods and manufactured goods including packaging materials and sustainable aviation fuel
- Development and scale-up of bio-derived agrichemicals, alternative proteins, and functional ingredients for food, feed, and nutraceuticals
- Development, scale-up, and recycling of circular materials including polymers, textiles, and composites



## Digital and data enabled innovation

- Scale-up and market demonstration of data-enabled devices and IoT devices enabled by printed and flexible hybrid electronics
- Digitally-enabled manufacturing innovation of medicines, consumer goods, and other formulated products
- Development and scale-up of smart packaging for a range of consumer products and medicines

# State-of-the-art facilities and offices across the United Kingdom



# Home to our national centres of excellence in...

Biologics

Medicines Manufacturing

Formulation

Biotechnology

Electronics

Photonics





**19+**

years of helping  
business succeed



**1300**

completed  
projects

with a total worth of  
over **£500 million**



**2200**

business  
collaborations

including over  
**60% SMEs**



**601**

highly skilled  
staff

across **10** UK-wide  
offices and facilities



**£78.1  
million**

annual turnover  
for **2021/22**

# Thank you

For more information visit [www.uk-cpi.com](http://www.uk-cpi.com)



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Let's innovate together  
[www.uk-cpi.com](http://www.uk-cpi.com)



# Phil Goodier

Biffa

# We're changing the way people think about waste

An Introduction to Biffa plc

# Leading in UK waste management



**£1.3bn\***  
Net Revenue

**~ 10,000**  
Employees



**c.3,200**  
Collection  
Vehicles



**> 230**  
Locations



**7.5m**  
Tonnes of waste  
handled



**£99m\***  
Operating Profit



Collections

Revenue: £877m\*

**Our mission:** To provide the most efficient, low carbon waste and recycling *collections* and related services to Industrial & Commercial (I&C), Municipal and household customers.



Specialist Services

Revenue: £147m\*

**Our mission:** To help customers fulfil their sustainability ambitions by providing bespoke *solutions* including surplus redistribution, integrated resource management and hazardous waste services.



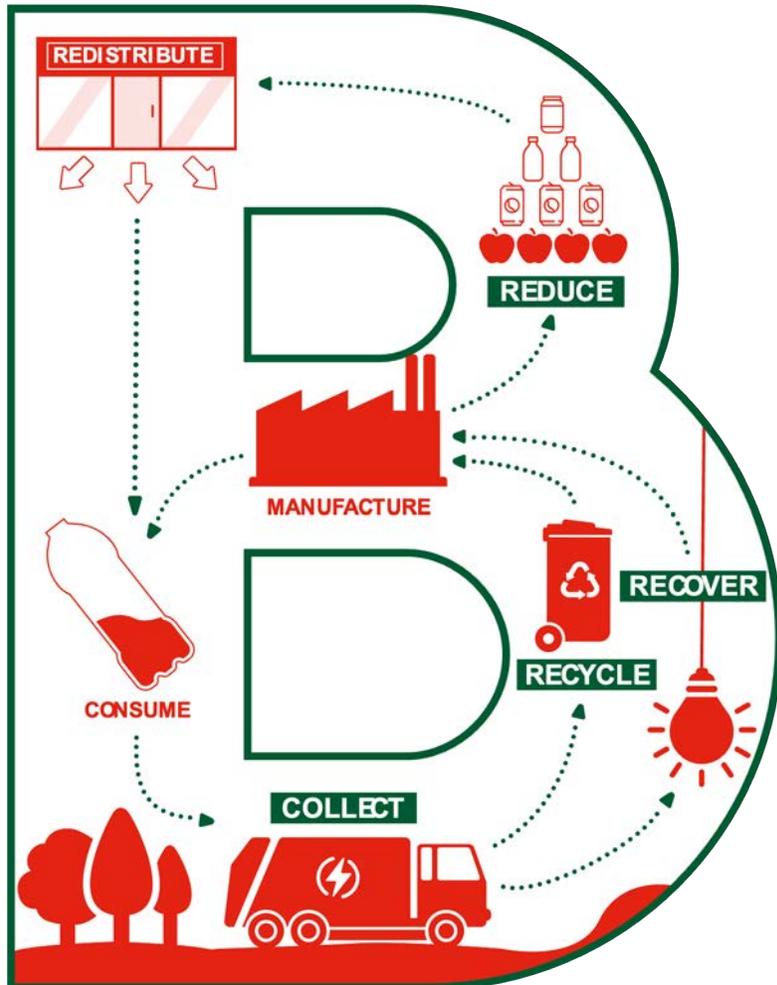
Resources & Energy

Revenue: £271m\*

**Our mission:** To maximise the recovery of resources and Energy from Waste (EfW) through our leading waste *treatment* and processing capabilities.

\* All financials are FY20 actuals, and include Viridor (y.e Mar-20) and Company Shop Group (y.e. Sep-20)

# Delivering on our promises: 3 years on: £500m committed to the UK green economy



	<h2>Collect</h2> <p>To build the UK's largest, most efficient, low carbon waste and recycling collections operation.</p>	<p>£261m</p>
	<h2>Reduce</h2> <p>To pioneer and operate the UK's leading waste reduction and redistribution services.</p>	<p>£92m</p>
	<h2>Recycle</h2> <p>To develop and operate the UK's leading recycling solutions.</p>	<p>£72m</p>
	<h2>Recover</h2> <p>To invest in energy recovery infrastructure as a lower carbon alternative to landfill for our customers' waste that cannot be recycled.</p>	<p>£75m</p>
<p><b>£500m</b></p>		<p><b>£500m</b></p>

# Biffa Polymers – The UK's Leading Plastics Recycling Business



- ▶ Food and non-food grade HDPE, PET & PP recycling.
- ▶ Market growth driven by the **Sustainability Agenda** – reinforced by regulation – Plastics tax, Deposit Return, Export Ban.
- ▶ 3 manufacturing sites : Redcar, Seaham (PET), Washington.
- ▶ 300 employees – and growing!
- ▶ Turnover > £130m
- ▶ 150,000te of processing capacity & 90,000te polymer sold – both growing rapidly.
- ▶ Strong customer relationships including Coca-Cola, Alpla, Müller, Nestle
- ▶ Critical success factors:
  - ▶ Quality & customer service
  - ▶ Manufacturing excellence
  - ▶ Control of feedstock – and maximising internal Biffa supply
  - ▶ Management of growth

# A true closed-loop recycling model



Mixed Recycling

Collection

Sorting

Bales

Hot Wash

Washed flake

Colour sort & decontamination

Pellets

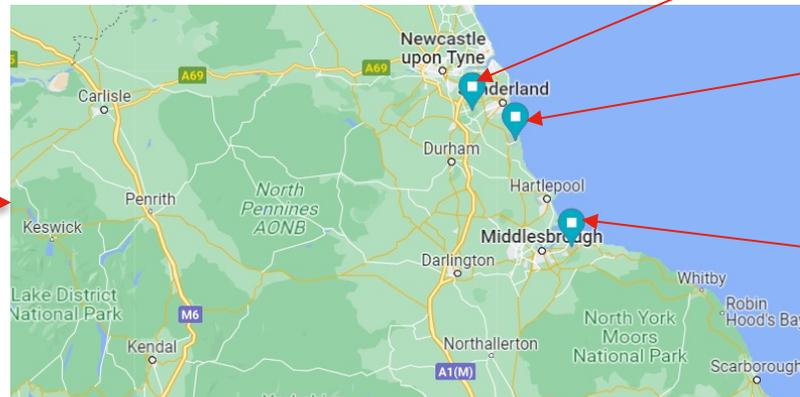
Blow Moulding

Dairy

Supermarket



# Biffa Polymers in the North East of England



Washington :  
• rHDPE / rPP flake.

Seaham :  
• Food Grade rPET pellet & flake.

Redcar  
• Food Grade rHDPE plus non-food grade rHDPE / rPP pellet and flake

# Biffa Polymers – The UK's Leading Plastics Recycling Business



## Redcar (Our first site)

- ▶ The leading recycler of milk bottles (HDPE).
- ▶ Food grade HDPE and a variety of non-food grade products made from HDPE & PP.
- ▶ £18M expansion underway.



## Seaham (PET)

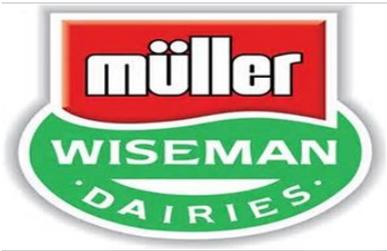
- ▶ Processes 57,000tpa of PET or 1.4Bn bottles!
- ▶ Largest UK facility of its type.
- ▶ A £27.5M investment in 2020/21.



## Washington (Polypropylene)

- ▶ Polypropylene wash line operational in June '21.
- ▶ PET rework line operational in July '22.
- ▶ Space available for future expansion.

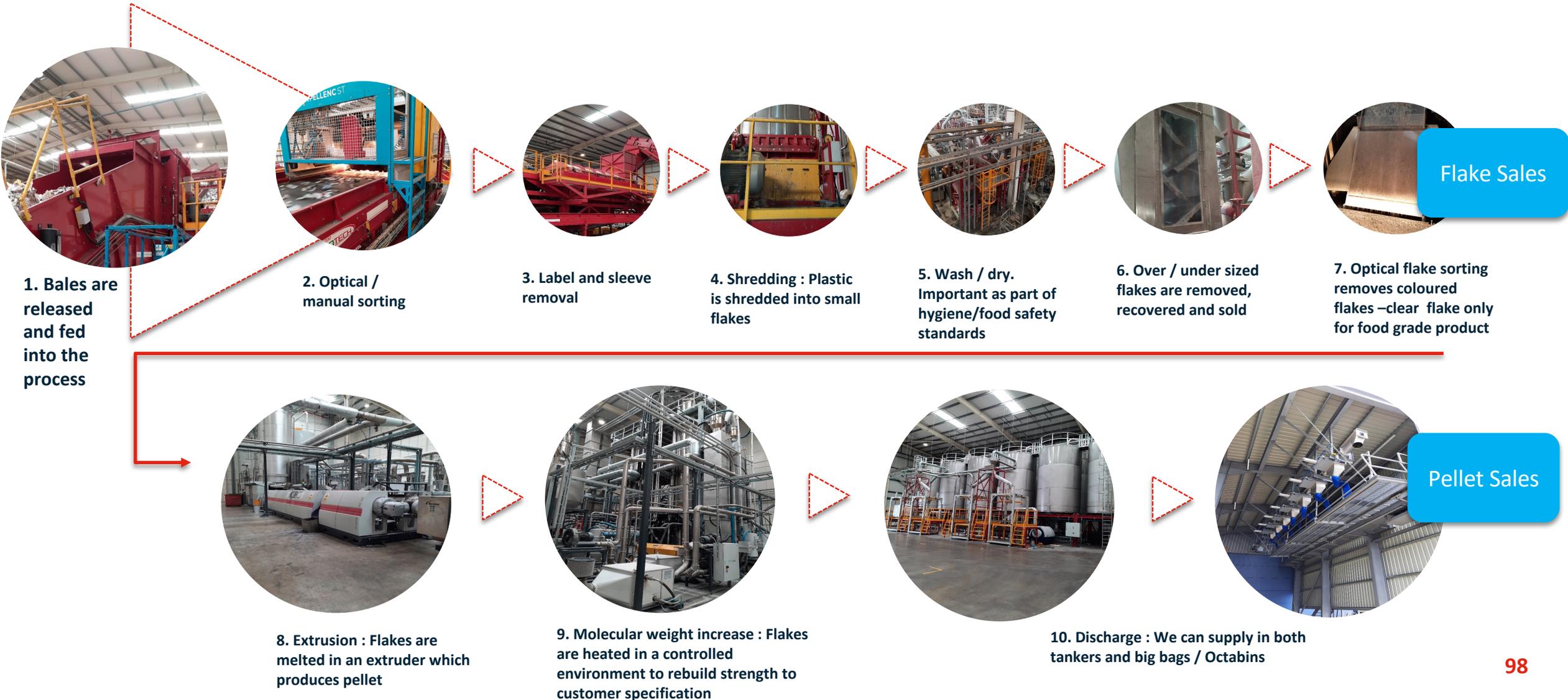
# Strong Customer Partners



# Biffa Polymers – Seaham rPET Food Grade Plant



Recycle



# We pioneered a Sustainable Industry-wide Model for rHDPE



- Collaboration along the entire supply chain from dairies to supermarkets – the Dairy Roadmap
- In 2008 set a target to achieve 30% recycled content by 2015
- Biffa developed the world's first food-grade standard recycling HDPE plant
- Won the Queen's Award for Enterprise Innovation in 2009
- Industry standardised labels , glues and pigments to boost recycling
- The result is Biffa's recycled plastic is used in 85% of plastic milk bottles



# The Way it Should Be. The Perfect Model for a Circular Economy



# Closed Loop Plastic Recycling Works Well!



## But it could be easier & better!

- **Design for recycle:**
  - Avoid mixed polymers where possible (HDPE / PET are OK)
  - Film, shrink-wrapped labels
  - Clear polymers
  - Mono-layer
- **Label for recycle**
  - Guide the consumer with clear, simple messages
  - Eliminate greenwashing
- **Modern infrastructure**
  - Deposit return schemes



**Biffa**

- 71,000 tonnes of CO<sub>2</sub>e is saved each year by recycling at Polymers
- 3 types of plastic recycled: PET, HDPE, PP
- 3 Plants in North East England
- Long term contracts with the major dairy and soft drinks brands
- The UK's largest recycler of plastics
- £135m sales
- 266 colleagues, rising to 288 this year
- 151,000t plastic reprocessed per year
- 1.4bn PET and 1.2bn milk bottles recycled annually
- 24/7 processing
- Won UK Recycling Business of the Year in 2022
- Regular beach cleaning events
- £53m investment in expansion since 2019
- £10kte expansion of HDPE recycling underway.
- Over 80% of our feedstock is supplied by Biffa's PRFs.
- Beehives on site at Seaham

**Polymers**  
*Proud to be R&E*

**Thank you**

# Dave Wall

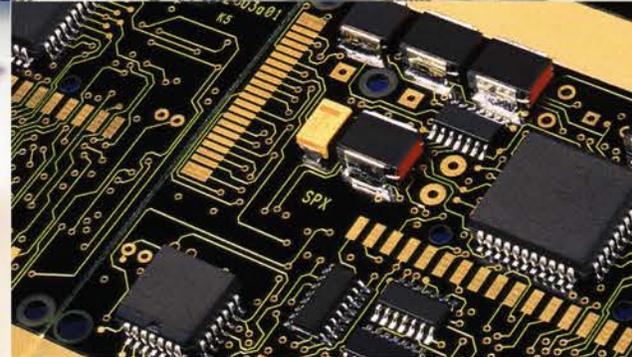
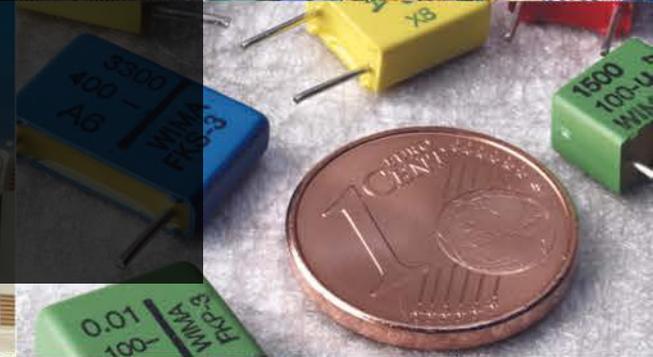
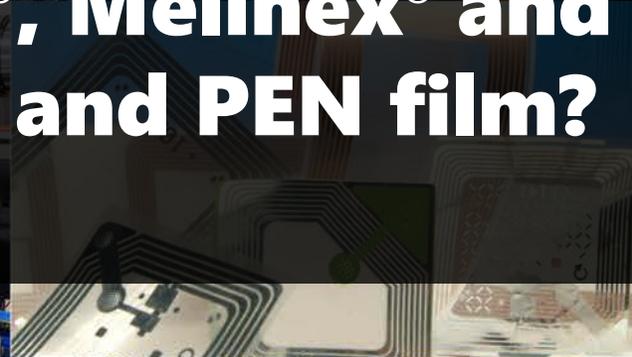
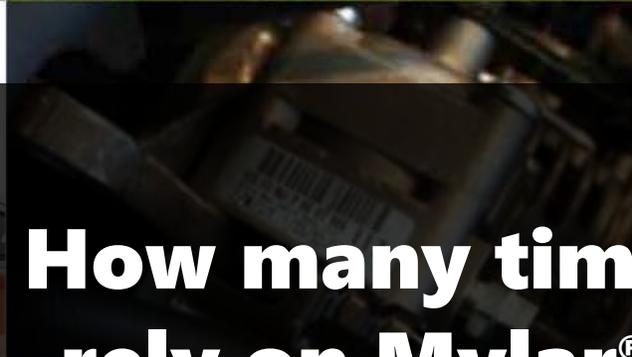
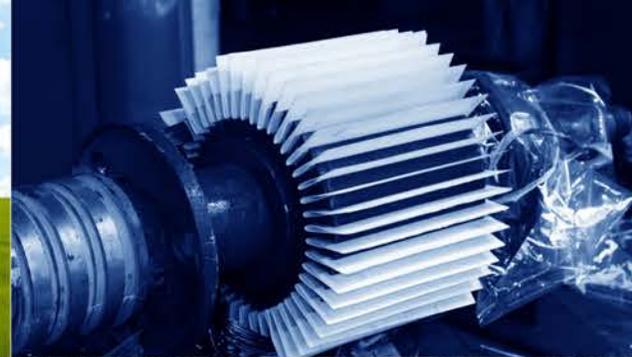
DuPont Teijin Films



Innovation | Partnerships | Sustainability

**The world's premier producer of  
differentiated PET and PEN films**

Future Plastic Supply Chain Event  
8<sup>th</sup> November, Wilton Centre



**How many times a day do you  
rely on Mylar<sup>®</sup>, Melinex<sup>®</sup> and  
Kaladex<sup>®</sup> PET and PEN film?**

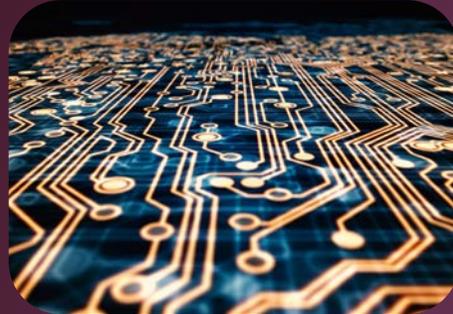
# Key Markets



Capacitors



Digital Print &  
Labels



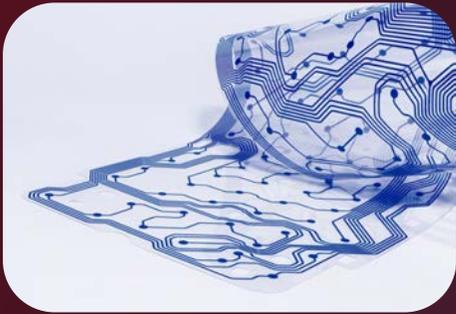
Dry Film Resist



Durable Cards



Electrical  
Insulation



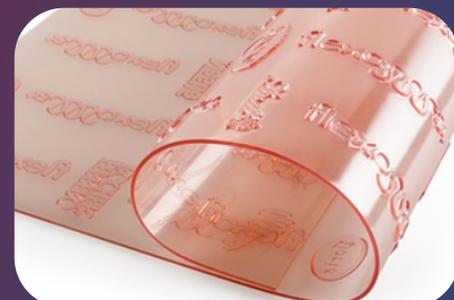
Flexible  
Electronics



Healthcare



Photovoltaics



Printing Plates



Specialty  
Packaging

# Investing for the future

Highly experienced  
technology teams based at  
manufacturing sites and at  
our global R&D centre

Over 15% of revenue  
generated by products  
developed in the last three  
years

Unique polymer and film  
pilot manufacturing plants

World class analytical  
capabilities tailored to meet  
customer requirements



# A sustainable building block

Low carbon footprint and water usage compared to alternative materials

Commercially available with high quality post consumer recycled content

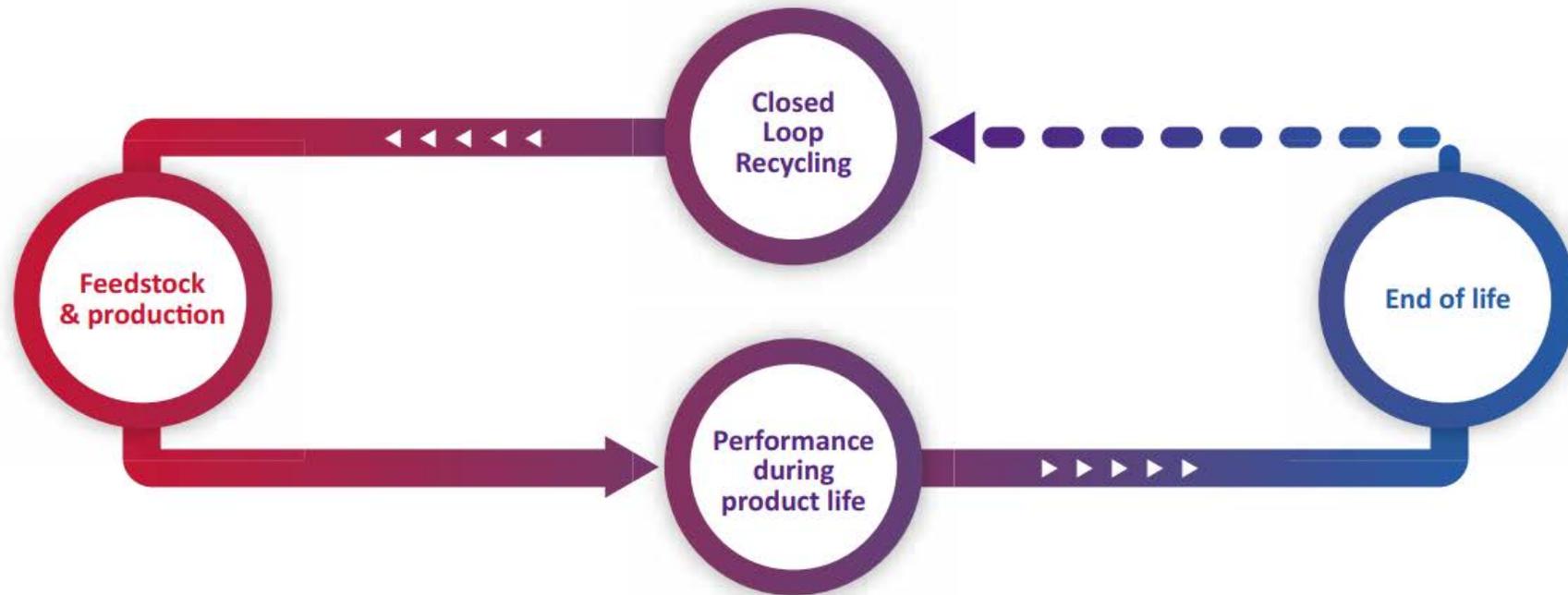
Most recycled plastic globally through best in class high yield recycling processes

Excellent performance/weight ratio minimising plastic use

Halogen free with zero hazardous waste products



# A holistic view on product sustainability



**We assess the impact of our products across their lifetime and across the full value chain that they are used in**

## The top seal lidding revolution

We led the move away from rigid punnet lids to top seal lidding films, reducing plastic by 35-50%. Additional material savings were achieved by replacing the label with printed lidding film.

The new pack format is more efficient to store and transport, and resulted in a reduction of in store spoilage.

Hermetically sealed packs offer the possibility to extend product shelf life through modified atmosphere and humidity packaging.



# Sustainability without compromise

We are committed to the solar industry with multiple product offers for C-Si and thin film PV applications.

Mylar® UVHPET™ products are halogen free making them easier to recycle than alternative products.

Over 200 million modules rely on the protection provided by Mylar® UVHPET™ products with zero reported field failures.



# Enabling the electrical revolution

Melinex<sup>®</sup>, Mylar<sup>®</sup>, and Kaladex<sup>®</sup> PEN films have a long and successful history in automotive electrical and electronic applications such as dashboard and door circuits, occupant sensors, heaters and flat cables.

The increasing electrification of vehicles is creating new applications including EV motor insulation, busbars, ultra-thin films for power capacitors and much greater use of flexible printed circuits for power distribution and connectivity.

Innovative development programmes are working towards PET-based solutions for battery current collectors and separator membranes, and PEN-based systems for fuel cell membrane electrode assembly sub-gaskets.

# LuxCR™ process and monomer recycling

Multi-award winning LuxCR™ monomer depolymerization process based in Contern, Luxembourg

Waste PET is depolymerized into BHET, removing contamination and rebuilding material properties

DuPont Teijin Films is pioneering research into future monomer recycling business models, closing the loop for difficult to recycle plastics



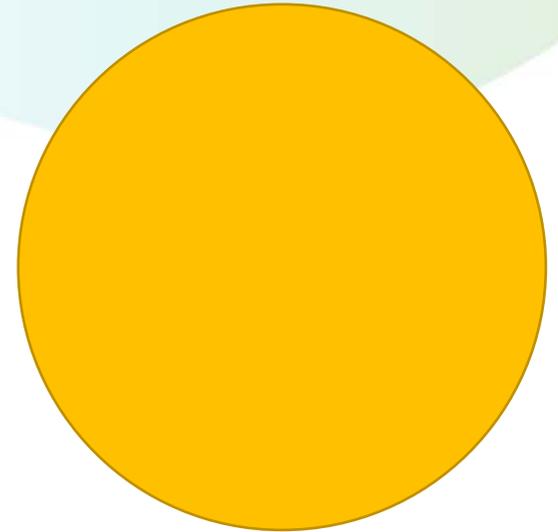
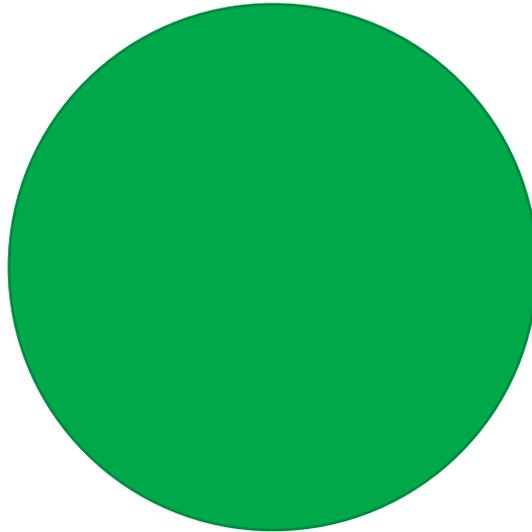
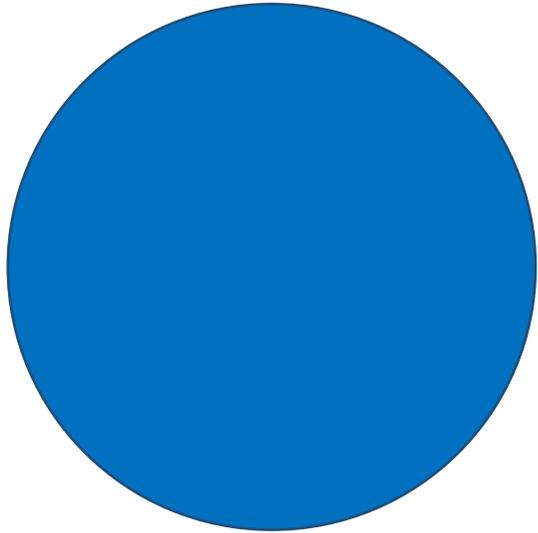
WORLDSTAR  
WINNER 2020



# Glen Kelly

Health & Safety

# Tour Groups...





Innovate UK  
KTN

# Thanks for your time!



@TU\_NZIIC  
@KTNUK



Net Zero Industry  
Innovation Centre  
Innovate UK KTN