Recycled Carbon Fuels
Proposed GHG Accounting Methodology
Very brief intro to the RTFO
What are recycled carbon fuels?
Research performed: GHG emission savings from RCFs
Selecting the counterfactual
Landfill?
Next steps
Quick Intro: UK RTFO

- **Renewable Transport Fuel Obligation (RTFO)**
  - Has been operating since 2008 – saves ~ 2.5 Mt CO₂/year
  - Typically has rewarded biofuels – though since 2018 there is support available for renewable transport fuels of non-biological origin
  - Two obligations
    - Main
    - Development fuel
Recycled carbon fuels are introduced and defined in REDII.

REDII states that recycled carbon fuels can contribute to the share of renewable energy in the transport sector.

REDII is yet to set a minimum GHG emission saving threshold for recycled carbon fuels.
- The Commission will produce a delegated act by 1 January 2021 which will establish a minimum GHG emission saving threshold for recycled carbon fuels.

REDII has also not set how the GHG emission savings from RCFs should be determined.
- By 31 December 2021 the Commission will produce a GHG assessment methodology for RCFs.

We are proposing to develop our own GHG methodology that will be implemented by 2021.
What are recycled carbon fuels?

**Solid wastes**

Recycled carbon fuels (RCFs) are transport fuels made from fossil derived wastes that are not suitable for reuse or recycling, or cannot be avoided.

**Gaseous wastes**

We recognise that RCFs are not renewable but have explored the potential GHG emission savings that can be achieved by RCFs.
Our Objective

- The objective is to decarbonise transport
  - RTFO: Supports renewable transport fuels that meet GHG emission saving criteria

- We aim to develop a GHG assessment methodology in order to be able to distinguish between RCFs that do and do not deliver GHG emission savings.

- Set an appropriate level of reward
Commissioned research
- Two reports now published (links at end)

Compared the GHG emissions from changing how fossil wastes are currently disposed
- ... With using them to produce RCFs instead.

X = avoided GHG emission
Recent research (August 2019)

- Focused on current uses of the fossil waste in the UK*
- Looked at fossil waste streams but excludes recyclable portion.
- Includes wastes such as:

  - Sorted residues from several waste processing streams e.g. SRF, composting residues, unrecyclable plastics
  - Waste rubber
  - Fossil fractions of residual mixed waste from households, or C&I
  - Blast furnace, steel mill and refinery waste gases
Calculating the GHG emission savings

- Calculates GHG emissions from ....

“What would have happened: Current situation”

Define wastes

Current disposal

- GHG emissions from disposal

+ GHG emissions from replacing electricity and heat

+ GHG emissions from producing RCFs

+ GHG emissions from burning RCFs

Avoided in RCF scenario

Emitted in counterfactual

“What will happen: RCF scenario”
Black bag waste and residual wastes ~ 23-30 MT

**Landfill is the most common end-of-life fate (~50%)**

Followed by EfW (~30%) (overall) and EfW CHP (~20%).
The GHG emissions from disposal

- Landfill – negligible for fossil part – not for bio

- Energy from waste (EfW) GHG emissions from **combusting** the waste to generate heat or power

- These emissions are avoided in the RCF scenario

<table>
<thead>
<tr>
<th>Landfill</th>
<th>EfW (power)</th>
<th>EfW (CHP)</th>
<th>Export CHP</th>
<th>Gases only: Coke ovens</th>
</tr>
</thead>
<tbody>
<tr>
<td>No replacement</td>
<td>Grid average electricity (2024 projected)</td>
<td>Grid average electricity and natural gas</td>
<td>Grid average electricity in country and natural gas</td>
<td>Natural gas</td>
</tr>
</tbody>
</table>
**Results**

**Emitted** when we make RCF
- Combustion emissions
- Processing emissions
- Energy ‘penalty’

**Avoided** when we make RCF
- Emissions from incineration

Fossil fuel comparator (94 g CO$_2$e/MJ)

Average result
The counterfactual affects the results: Plastics

<table>
<thead>
<tr>
<th>Process</th>
<th>Fuel use emissions</th>
<th>Process emissions</th>
<th>Feedstock counterfactual emissions</th>
<th>Total</th>
<th>GHG Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill</td>
<td></td>
<td></td>
<td></td>
<td>-117%</td>
<td></td>
</tr>
<tr>
<td>EfW power only (UK)</td>
<td></td>
<td></td>
<td></td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>EfW CHP (UK)</td>
<td></td>
<td></td>
<td></td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>EfW with CHP (export)</td>
<td></td>
<td></td>
<td></td>
<td>-170%</td>
<td></td>
</tr>
<tr>
<td>Cement kiln (UK)</td>
<td></td>
<td></td>
<td></td>
<td>-103%</td>
<td></td>
</tr>
<tr>
<td>Cement kiln (exported)</td>
<td></td>
<td></td>
<td></td>
<td>-118%</td>
<td></td>
</tr>
</tbody>
</table>

35% conversion efficiency
The counterfactual affects the result: Gases

GHG Saving

Electricity generation 66%  
Coke ovens and blast furnaces -22%  
Lost or burned as waste 84%  
Used in industrial processes -22%

Feedstock counterfactual emissions

Fuel use emissions

Process emissions

65% conversion efficiency
Conclusions from analyses

- Landfill acts as a store of carbon
  - But does it?

- If RCF feedstocks are diverted from **EfW** then there are GHG emission savings, because:
  - The conversion efficiency for RCF plants is better than for incineration
  - The average grid emissions are lower than incinerating waste.
  - And they will get lower over time

- If RCF feedstocks are diverted from **heat** then the GHG emissions increase because the heat is replaced by natural gas, or coal.
  - Will there be competition for RCF feedstocks for use in heat?
Let’s talk about landfill

- Is landfill an appropriate comparison system for RCF feedstocks?
  - UK: Targets to reduce waste to landfill
  - **Landfill not an option we should compare against**

- Does it act as a carbon store?
  - There is a considerable biological component of the waste would degrade and be emitted as **methane**.
  - Could remodel RCF study to include biogenic methane
  - But we know that it’s good to divert biomass from landfill

- **Change of question:** If material is diverted from landfill- where should it go?
Discussion: What counterfactual to select?

- Is it appropriate to select a specific counterfactual for RCFs?
- Our research suggests RCFs are “next best” option compared to landfill
  - If the RCF plant is more efficient than an incinerator
  - If the feedstock is mixed with biomass - all the better.
- Still have questions: Where do these savings occur?
- What happens when RCFs are exported?
Discussion: The counterfactual of RCFs?

- What about industrial gases?
- Would occur at a specific plant - could we have more information on what displacement has occurred?
- Could propose to do a “site specific” approach.

- What about double claiming?
- If a plant can demonstrate that CO2 emissions from industrial gases are counted already - can they be CO2 neutral to the importing country?
- We would still want to ensure they were being produced in an efficient plant.
- Could this be regulated by certification? Or verification? (like UERs?)
Next steps

- Refine policy for consultation in summer 2020.
- Public consultation
- Implementation now likely to be in 2021

Mixed wastes

Waste industrial gases

Aviation fuel
Hydrogen
Drop in fuels
Synthetic natural gas
Thank you!

- Thank you for listening

- Any questions or follow up conversations contact me on carly.whittaker@dft.gov.uk

- Links to reports