



DfT Low Carbon Fuels Fund – GHG emissions briefing

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Overview of GHG emissions requirements for the LCFF

The Low Carbon Fuels Fund uses Appendix H, an Excel workbook detailing the lifecycle GHG emissions for your jet fuel

This briefing is designed to:

- Explain the GHG emissions methodology, thresholds and system boundary
- Explain how to complete Appendix H and report your findings in the LCFF application form
- Flag common errors
- Answer your questions

Applicants **must fill in one Appendix H workbook for each consignment from your proposed plant**. This is mandatory, and failure to do so will result in your application being deemed ineligible.

If you have any questions regarding eligibility, fuel categories, what is required, or if any LCFF guidance is unclear, questions can be submitted to LCFF@WSP.com. Questions and responses will be anonymised and published in the FAQ document.

In the interests of treating each bidder equally, we are not able to review your workbooks before submission, including during the voluntary eligibility pre-check process.

GHG methodology, thresholds & system boundary

GHG methodology & thresholds follow or improve on the SAF Mandate

- The GHG methodology follows the SAF Mandate (according to the consignment type), but the LCFF GHG thresholds only differ by plant type, not consignment type.

Consignment type	GHG emissions methodology	Threshold for FOAK commercial plant	Threshold for demonstration plant
Biofuel	RTFO & SAF Mandate technical guidance, Annex C	≤31.0 gCO₂e/MJ_{LHV} in first full calendar year of operations	≤53.4 gCO₂e/MJ_{LHV} in first full calendar year of operations
Renewable fuel of non-biological origin (as PTL)	RTFO & SAF Mandate technical guidance, Annex D		
Nuclear energy (as PTL)	RTFO & SAF Mandate technical guidance, Annex D		
Recycled Carbon Fuel (RCF)	RTFO & SAF Mandate technical guidance, Annex E		

- Proposed FOAK commercial plants must show how they will meet the FOAK threshold in the first full calendar year of operations.
- Proposed demonstration plants must show how they will meet the above SAF Mandate threshold in the first full calendar year of operations, **and** show how a future FOAK commercial plant will also meet the lower FOAK threshold above in that plant's first full calendar year of operations (using a separate version of Appendix H).

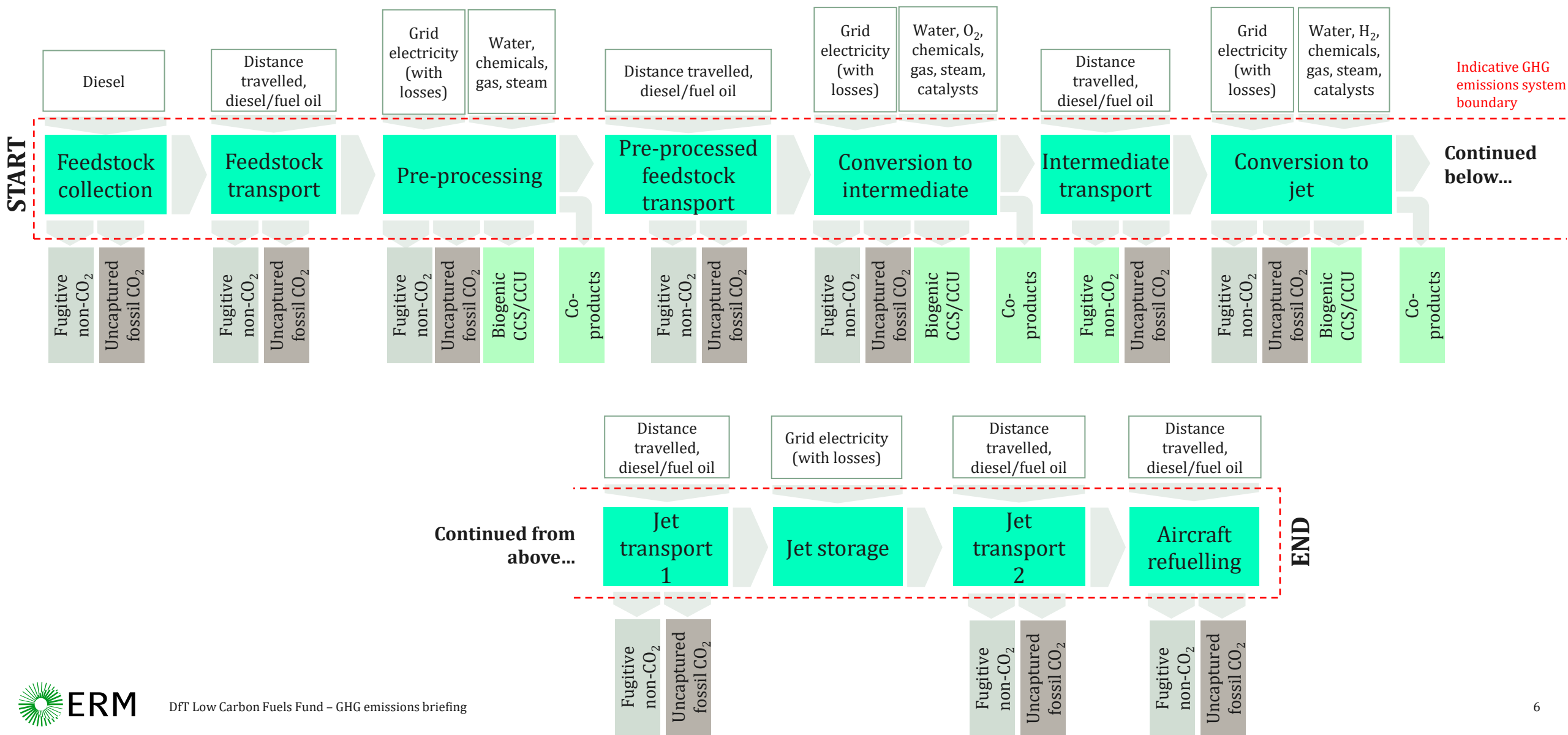
System boundary & supply chain scope depend on the consignment

- Within Appendix H, you must provide a diagram of the system boundary used for your GHG calculations, following the table below.

Consignment type	First step of supply chain	Last step of supply chain
Biofuel	Waste/residue collection	Aircraft refuelling
Renewable fuel of non-biological origin (as PTL)	Renewable power/heat generation	Aircraft refuelling
Nuclear energy (as PTL)	Uranium ore extraction	Aircraft refuelling
Recycled Carbon Fuel (RCF)	Feedstock counterfactual emissions, then waste collection	Aircraft refuelling

- Choices can be made about the breadth of the system boundary when e.g. there are supporting processes at/near the pre-processing/intermediate/jet conversion plant (e.g. CHP units, hydrogen production, CO2 capture). Be clear in your diagram about what **processes are within or outside of the system boundary**, and the **form of flows crossing the system boundary**.
- The data you provide in Appendix H should be the flow rates, dry LHV, moisture and GHG intensities of any **inputs** crossing your system boundary, and the flow rates, dry LHV, moisture (and GHG intensities for waste/residues, or temperature for any co-product heat/steam) of any **outputs** crossing your system boundary. Internal loops that do not cross the step/plant boundary are ignored.

Example system boundary and supply chain for a generic biofuel consignment



Completing Appendix H & your LCFF application form

The main choices when filling Appendix H

- If you have **sequential, adjacent processing** steps (e.g. power to methanol, then methanol to jet, with no transport between), you could choose to separate these steps into “Conversion to intermediate” and “Conversion to jet” tabs, or you could merge the input/output data and create a combined power to jet plant under the “Conversion to jet” tab.
- You **may** use the SAF Mandate default value for downstream jet distribution emissions ($+1.2 \text{ gCO}_2\text{e/MJ}_{\text{LHV}}$) instead of providing input/output data for downstream jet distribution steps. Many projects could achieve lower actual emissions.
- If your plant is a demonstration, or a FOAK commercial plant requesting **only** Pre-FEED funding, you **may** choose to input a delivered feedstock emission intensity into the main input row of the "Conversion to jet" tab, instead of providing input/output data for all the steps upstream of your proposed plant (the latter is mandatory for FOAK FEED). However, the value used must:
 - have followed the SAF Mandate GHG methodology, given that a value from a different scheme/methodology will likely not be appropriate (e.g. EU RED differences in manure credits, RCF approach, CO2 sources, temporal correlation etc)
 - be appropriate to the proposed plant (first operational year, country of origin, correct form – depending on the plant boundary, it could be an original feedstock or an intermediate)
 - be referenced (ideally based on specific proposed supplier data)
 - be backed up by evidence in Appendix B

This simplification does not remove the responsibility to ensure the original feedstock at the start of the supply chain meets the LCFF eligibility requirements, including any relevant sustainability criteria.

Completing Appendix H where there are multiple consignments

- If your feedstock contains a mix of components that give rise to different consignments (e.g. mixed waste being part biofuel, part RCF), **separate Appendix H files are required for each consignment** following the relevant methodologies.
- Separate Appendix H files are also needed for **different feedstocks**, as these give rise to different consignments (e.g. biojet from forestry residues vs biojet from straw).
- When splitting data into separate Appendix H files, the steps in that workbook should only refer to the individual consignment flows, and plant input/output data should be **pro-rated by consignment LHV energy content**. The sum across the different Appendix H workbook tonnages for a flow should equal your plant's total tonnage for that flow – e.g. the sum of the biogenic Appendix H jet tonnage plus the RCF Appendix H jet tonnage should equal the total jet tonnage output for a MSW to jet plant.
- If you have more than 5 different consignments for your plant, please email LCFF@WSP.com with details, and we can provide a version of Appendix H that produces a **weighted average** for compliant consignments within a consignment type to help simplify submission and assessment. Note that weighted average consignment results are **not** valid for the SAF Mandate.
- If your plant has a mix of consignment types due to different feedstocks (e.g. solid waste + imported wind electricity), you may need to split out the process steps within your plant to determine the share of consignments (e.g. based on where biosyngas + hydrogen are mixed), and input data for any recycled flows between these units (e.g. steam, hot gases). Please email LCFF@WSP.com with full details, and we can help set-up a new **iterative** Appendix H template that fits your plant configuration.

Reporting findings in the application form (Questions 3.4.1 & 2.2.2)

Demonstration plant, if applicable:

consignment #1: GHG emissions in year X = gCO_2e/MJ_{LHV}

consignment #2: GHG emissions in year X = gCO_2e/MJ_{LHV}

consignment #3: GHG emissions in year X = gCO_2e/MJ_{LHV}

Supply chain module	Module efficiency (MJ _{LHV} main output/MJ _{LHV} main input)	Cumulative backward chain efficiency (MJ module main output/MJ final fuel)	GHG emissions from module (gCO ₂ e/MJ _{LHV} module main output), WITHOUT allocation	GHG emissions from module (gCO ₂ e/MJ _{LHV} final fuel), WITHOUT allocation	Allocation of GHG emissions to main output of each module	Cumulative backward chain allocation of GHG emissions	GHG emissions from module (gCO ₂ e/MJ _{LHV} final fuel), WITH allocation
Not used	NA	NA	NA	NA	NA	NA	NA
Feedstock	NA	NA	NA	NA	NA	NA	NA
Pre-processing	NA	NA	NA	NA	NA	NA	NA
Intermediate	NA	NA	NA	NA	NA	NA	NA
Conversion	NA	NA	NA	NA	NA	NA	NA
Further transport	NA	NA	NA	NA	NA	NA	NA
Upgrading	NA	NA	NA	NA	NA	NA	NA
Fuel distribution	NA	NA	NA	NA	NA	NA	NA
Fuel storage	NA	NA	NA	NA	NA	NA	NA
Refuelling	NA	NA	NA	NA	NA	NA	NA
Total chain	NA	NA	NA	NA	NA	NA	NA
Advanced Fuels Fund threshold	NA	NA	NA	NA	NA	NA	NA

FOAK commercial plant:

consignment #1: GHG emissions in year Y = gCO_2e/MJ_{LHV}

consignment #2: GHG emissions in year Y = gCO_2e/MJ_{LHV}

consignment #3: GHG emissions in year Y = gCO_2e/MJ_{LHV}

Supply chain module	Module efficiency (MJ _{LHV} main output/MJ _{LHV} main input)	Cumulative backward chain efficiency (MJ module main output/MJ final fuel)	GHG emissions from module (gCO ₂ e/MJ _{LHV} module main output), WITHOUT allocation	GHG emissions from module (gCO ₂ e/MJ _{LHV} final fuel), WITHOUT allocation	Allocation of GHG emissions to main output of each module	Cumulative backward chain allocation of GHG emissions	GHG emissions from module (gCO ₂ e/MJ _{LHV} final fuel), WITH allocation
Not used	NA	NA	NA	NA	NA	NA	NA
Feedstock	NA	NA	NA	NA	NA	NA	NA
Pre-processing	NA	NA	NA	NA	NA	NA	NA
Intermediate	NA	NA	NA	NA	NA	NA	NA
Conversion	NA	NA	NA	NA	NA	NA	NA
Further transport	NA	NA	NA	NA	NA	NA	NA
Upgrading	NA	NA	NA	NA	NA	NA	NA
Fuel distribution	NA	NA	NA	NA	NA	NA	NA
Fuel storage	NA	NA	NA	NA	NA	NA	NA
Refuelling	NA	NA	NA	NA	NA	NA	NA
Total chain	NA	NA	NA	NA	NA	NA	NA
Advanced Fuels Fund threshold	NA	NA	NA	NA	NA	NA	NA

Common errors to avoid

Common errors from prior DfT competitions and recommendations

What commonly went wrong before, and how to avoid it?

- **Missing consignments.** GHG emissions were only reported for the biogenic fuel consignment, with emissions for non-biogenic consignments often missing. Report each consignment separately.
- **Non-approved methodologies.** Use the Excel template (Appendix H), and if in doubt about which methodology to employ, i.e. which consignment type(s) apply to your fuel, email LCFF@WSP.com
- **Inappropriate intensity values.** Values from sources that do not follow the SAF Mandate GHG method were used for some steps (e.g. different allocations or credits). Use SAF Mandate approved or (with caution) recommended datasets given in Appendix H.
- **Missing supply chain stages.** No GHG emissions often reported for jet distribution, storage or refuelling. Ensure your system boundary covers the full scope required – you can use a default value for downstream distribution emissions if you wish.
- **No commercial-scale calculation.** Calculations were provided only for a proposed demonstration plant. To enable a fair comparison of the benefits of your technology, FOAK commercial plant GHG estimates are required from all applicants.
- **Undecided assumptions.** Final decisions, e.g. plant location, had not been made, causing large emissions variations due to assumptions such as transport modes and distances. Be clear where you have had to make reasonable guesses and why they are appropriate, and if in doubt, choose a conservative assumption.
- **Missing supporting evidence.** Documentation and assumptions for the emission calculations were not provided for review, making data hard to validate. Provide clear links in Appendix H to your supporting evidence in Appendix B, with page numbers.
- **Inconsistencies.** Appendix H flow data differing from Appendix E for the same calendar year – please double-check values.

Questions & answers

Likely GHG related questions

Eligibility, timing and grid factors

- **Part of my feedstock is ineligible for the LCFF, am I still able to apply at a reduced rate for the eligible portion only?** Applications will still be eligible if <10% of feedstock electricity/heat is from ineligible sources. Otherwise, all feedstocks must be eligible. Budgets will not be pro-rated according to eligibility.
- **What do you mean by the first full calendar year of operations?** If your plant completes commissioning in e.g. August 2029, then your first full calendar year of operations would be 2030.
- **Why are we providing estimates for the first full calendar year of operations, and not a common year?** DfT need evidence that the plants they will be supporting through the LCFF will be able to meet the GHG threshold from their start of operations. Some plants may not be operating by a common year such as 2030.
- **What if I'm only planning a demo plant, and I don't know when my future commercial plant might be operating?** Please make a best estimate of the year aligned with your answer to the UK commercialisation roll-out question in the application form.
- **What is the GB grid electricity factor projection based on?** NESO's Future Energy Scenarios 2024 "Holistic Scenario", including BECCS. This is broadly aligned with the "Clean Power 2030" target. Issues were found with the FES 2025 dataset.
- **What should I use for grid electricity factors if part of the supply chain is abroad?** Use in-country projections for grid electricity factors aligning with national decarbonisation legislation, NDCs or long-term goals (assuming success), if this data is available, or else the best available evidence for the year required.

Likely GHG related questions (continued)

GWPs, data splits, CCS and CCU, and land use change

- **I don't have CO₂e data using the new GWPs.** SAF Mandate datasets and other UK datasets should be aligned, and JRC also have 2026 data. If the data you need is not available there, attempt a calculation bottom-up to adjust the GWPs from other data. If not possible or the impact is minimal, use data in the old GWPs and highlight that this factor has not been possible to update.
- **What if I only have emissions intensity data for the combined supply and use of an input, not split out?** The inputs table for each supply chain component asks you to account for only the upstream GHGs in supplying this input, with GHGs released on use recorded in the lower outputs table. If you do not have data for this split, put the combined GHG intensity (supply + use) in the inputs table row, ignore the outputs table row, and explain this in the Comments columns for those rows.
- **Do I include downstream emissions for CCS networks – e.g. distribution, compression, injection of CO₂?** Yes. We suggest you calculate these emissions in the “Additional evidence” tab, including downstream fugitive emissions/leakages, then reduce the 1,000gCO₂e/kg CO₂ credit to reflect these added emissions. Then provide the tonnes/yr of captured CO₂ that leaves the plant towards the CCS network to match (not tonnes/yr sequestered). Ensure the plant tab also includes emissions for CO₂ capture & any onsite processing.
- **How permanent do CCU applications have to be to be eligible?** CCU/CCR credits only apply to biofuels consignments. See C.47 of the RTFO & SAF Mandate Technical Guidance – permanence is not required, but other evidence requirements apply. As for CCS, any downstream emissions for transport, storage, compression, leakages etc need calculated, to reduce the 1,000gCO₂e/kg CO₂ credit. Then provide the tonnes/yr of captured CO₂ that leaves the plant towards the user (not tonnes/yr replaced). Ensure the plant tab also includes emissions for capture & any onsite processing.

Reminder of feedstock rules, and those for power, hydrogen & CO₂

Rules vary by the original feedstock used at the start of the pathway, irrespective of the form of any intermediates

- 100% of any original **biomass** feedstocks/feedstock components must be a sustainable biomass waste or residue meeting the requirements of the SAF Mandate. The feedstock must be listed as not subject to the SAF Mandate's HEFA cap. Waste biomass feedstocks must demonstrate compliance with the definition of a waste and with the waste hierarchy.
- 100% of any original **recycled carbon fuel** (RCF) feedstocks/feedstock components must either be the fossil fraction of MSW, or waste industrial fossil gases rich in carbon monoxide that are only suitable for incineration for energy recovery. These feedstocks must also demonstrate compliance with the definition of a waste, and with the sustainable waste management standard given in the RTFO & SAF Mandate Technical Guidance.
- At least 90% of any **feedstock electricity** (and/or **feedstock heat**), i.e. energy inputs that cross the plant boundary and are used in enhancing the heating value of the intermediate products or final SAF, must be derived from non-biogenic renewable or nuclear sources, and must meet the PTL requirements of the SAF Mandate, except for the additionality rules. For any consumption of average grid mix feedstock electricity, the forecast PTL-eligible share for the relevant year and location in Annex E should be used in calculating the total share of feedstock electricity from PTL-eligible sources.
- No other feedstocks are eligible, e.g. jet fuel & intermediate fuels cannot be purposely derived from non-waste fossil feedstocks. If **hydrogen** is a process input, non-waste fossil production/purchases cannot exceed 10% (by LHV energy content) of the jet fuel output of the project. If any **process input electricity/heat** is derived from a specific biogenic source (not as part of the average grid mix), the same original biomass feedstock eligibility rules as above apply. 100% of any **carbon dioxide** consumed as an input that contributes carbon atoms to the jet fuel must follow the RTFO & SAF Mandate Technical Guidance on CO₂ sourcing.

Thank you

If further information is
required, please contact:

LCFF@WSP.com