Support to the development of methodologies for the certification of industrial carbon removals with permanent storage

Draft technical specifications for the certification of permanent carbon removals through DACCS/BioCCS

12 March 2025

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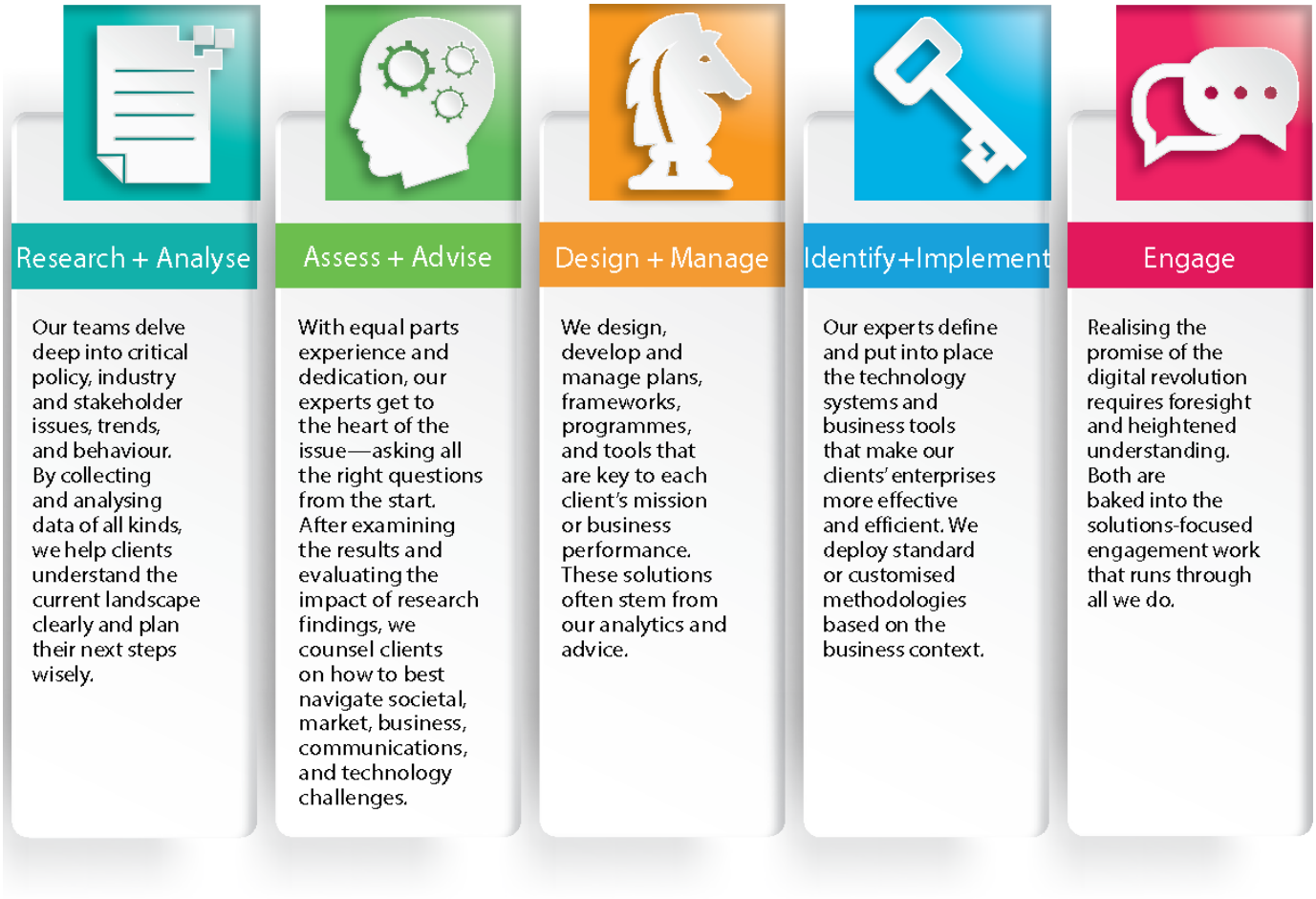

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A report submitted by ICF S.A., Cerulogy and Fraunhofer ISI

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SECTION 1: DEFINITIONS

'activity boundary' means the geographical boundary of the facility at which the carbon capture element of the activity occurs;

'activity period' is defined as in Article 2(7) of [the CRCF];

'activity renewal' means performing a certification audit on an activity that has previously completed an activity period;

'activity' is defined as in Article 2(3) of [the CRCF];

'associated GHG emissions' means the increase in direct and indirect greenhouse gas emissions over the entire lifecycle of the permanent carbon removal activity that are due to its implementation;

'atmospheric CO_2' means CO_2 well mixed in the free atmosphere at ambient air temperature, where the concentration of CO_2 is not impacted by local point sources but may vary because of regional anthropogenic and natural emission sources;

'BioCCS' means a carbon removal activity in which biogenic CO_2 produced by the oxidation of carbon in biomass is captured and transferred for permanent storage;

'biogenic CO_2' means CO_2 produced from a source of biomass by a chemical process acting on the carbon atoms in the biomass (including combustion, fermentation, other oxidation processes, and decarboxylation processes) of carbon in biomass;

'biomass' is defined as in Article 2(24) of Directive (EU) 2018/2001, and does not include any products produced through carbon capture and utilisation using biogenic CO_2;

'calculation factors' means any numerical information used in the quantification of the permanent net carbon removal benefits. This includes, but is not limited to, information regarding net calorific value, emission factor, preliminary emission factor, oxidation factor, conversion factor, carbon content, fossil fraction, biomass fraction, zero-rated biomass fraction, RFNBO or RCF fraction, zero-rated RFNBO or RCF fraction, synthetic low-carbon fraction, zero-rated synthetic low-carbon fraction, zero-rated fraction, or unit conversion factor;

'capital emissions' means the emissions associated with the construction of facilities and equipment associated with an activity;

'captured CO_2' means CO_2 captured and concentrated from a point source of CO_2 or from atmospheric CO_2;

'carbon removal activity' means a carbon removal practice or process undertaken by an operator that is subject to a single certification;

'carbon removal' means carbon removal as defined in Article 2(1) of [the CRCF];

'certification audit' means the audit undertaken prior to the commencement of a carbon removal activity, comparable to what is referred to as project validation in some other certification frameworks. An audit undertaken following the end of a certification period is a re-certification audit;

'certification body' is defined as in Article 2(14) of [the CRCF];

'certification period' means the period between a re-certification audit of an activity and the most recent preceding certification audit or re-certification audit of that activity;

'CO_2 fugitives' means any irregular or unintended CO_2 emissions from sources that are not localised, or are too diverse or too small to be monitored individually;

'CO_2 leakage' means any unintentional release of CO_2 from the CO_2 handling system or from the storage complex, other than CO_2 fugitives;

'CO_2 venting' means an intentional discharge of CO_2 occurring for operational or safety reasons;

'CO_2e' means carbon dioxide equivalent GHG emissions, where quantities of GHGs other than CO_2 are converted into CO_2 equivalent terms by the use of global warming potentials;

'direct air capture' means a process that captures and concentrates atmospheric CO_2 from the air and enables that CO_2 to be transferred for transport, storage or utilisation;

'exit point' mean a point at which CO_2 is transferred from one stage of the activity to the next stage, which excludes any smokestack, flue or other outlet from which CO_2 is discharged into the atmosphere;

'geological storage site' means a site at which CO_2 may be permanently geologically stored, permitted under Directive 2009/31/EC;

'greenhouse gas (GHG)' refers to any greenhouse gas listed in Part 2 of Annex V of the Regulation (EU) 2018/1999;

'monitoring period' is defined as in Article 2(8) of [the CRCF];

'permanent carbon removal' means permanent carbon removal as defined in Article 2(9) of [the CRCF];

'permanent geological storage' means storage of CO_2 in a storage site permitted under Directive 2009/31/EC;

'point source of CO_2' means a natural or anthropogenic source of gases that has a CO_2 concentration higher than that in the free atmosphere due to the generation of CO_2 by an oxidation process or other chemical process or the release of CO_2 from some form of storage or containment;

're-certification audit' is defined as in Article 2(17) of [the CRCF], and means the audit undertaken at the end of a certification period in order to determine how many units may be issued, comparable to what is referred to as verification in some other certification frameworks;

'significant irregularity' is defined in Article 3 (17) of Directive 2009/31/EC.

'useful heat' is heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes.

SECTION 2: SCOPE

These specifications apply to carbon removal activities that implement projects leading to net carbon removal benefits through capture and permanent storage of biogenic or atmospheric CO_2. The CO_2 capture plant must be located in the European Union and the CO_2 must be stored in regions covered by the CCS directive.

Two types of activity may be certified under these specifications:

a) Direct air capture with permanent carbon storage activity (also referred to DACCS hereafter) defined as a carbon removal activity resulting from the capture of atmospheric CO_2 from ambient air followed by permanent storage of that CO_2 by injection at a geological storage site permitted under Directive 2009/31/EC. The direct air capture facility may be newly constructed or may be operational for any period prior to certification;

b) Biogenic emission capture with permanent carbon storage activity (also referred to BioCCS hereafter) defined as a carbon removal activity resulting from the capture and permanent storage of biogenic CO_2 followed by permanent storage of that biogenic CO_2 by injection at a geological storage site permitted under Directive 2009/31/EC. The facility at which the biogenic CO_2 is captured may be newly constructed or may have been operational for any period prior to certification. The biogenic CO_2 that is captured must be generated as a by-product of producing a useful product or as a result of a natural process or of waste disposal. It is not permitted to generate CO_2 from biomass solely for the purpose of capture and storage.

Activities certified under this specification may transfer all or part of the captured CO_2 to storage sites for permanent storage to generate CRCF credits. If part of the captured CO_2 is transferred for utilisation or is transferred for storage but recognised under an alternative crediting program (for example to generate CORSIA-eligible emissions reduction units) then no carbon removal units will be generated in respect of that fraction of the CO_2.

The activities certified under this specification are subject to the use of a standardised baseline and therefore there is no requirement for any explicit financial additionality assessment for these activities before units may be issued. Activities may receive funding from any other public or private sources without affecting the generation of certified units. There is no restriction on the certification of activities that are already fully or partially operational prior to becoming certified.

Activities based on direct air capture are treated as consisting of three stages – CO_2 capture, CO_2 transport, and CO_2 storage. Activities based on biogenic CO_2 capture are treated as consisting of these same three stages, plus an additional upstream stage for biomass supply.

The CO_2 capture stage consists of the processes required to capture CO_2 from the atmosphere or from a biogenic-CO_2 containing stream and to condition it to a form (e.g. purity and pressure) that is ready to be transported. **The CO_2 transport stage** consists of transporting CO_2 from the location of CO_2 capture to the location of the storage site or storage sites – in the case that CO_2 capture and CO_2 storage occur at the same location there may not be any transport processes in the CO_2 transport stage. **The CO_2 storage stage** consists of any further CO_2 conditioning and storage necessary before CO_2 injection, and the CO_2 injection itself.

The points at which CO_2 moves from the capture stage to the transport or storage stage, or from the transport stage to the storage stage, are referred to in the specifications as ‘exit

points'. In the case that CO_2 is transported from a capture site by a single transport mode to a single storage site, there is only a single exit point between each pair of stages. In the case that CO_2 is transported by several transport modes to a number of storage sites, there may be several exist points between the stages. Unless otherwise stated, the flow of CO_2 across any of these exits point must be measured (see section 4(7.6)). In the case that some quantity of CO_2 from a biogenic point source is not captured, the flue/smokestack from which this CO_2 is emitted is not an exit point, as this emitted CO_2 does not move to the next stage of the removal activity.

The legal entity applying for certification must be an operator as defined in the [CRCF Regulation]. This operator is required to take on the responsibility for the compliance of entire carbon removal value chain with these specifications, either by providing required services (e.g. operation of a carbon capture plant, transportation, and storage) themself or by engaging with partners or subcontractors. Carbon removal units issues in relation to an activity shall be issued to this operator. It is not required that the legal entity that is the operator should be the owner of any particular part of the activity, only that decisive economic power over the technical functioning of the activity should have been delegated to that legal entity. The operator may therefore be the operator of a capture plant, a transportation company, the operator of a CO_2 storage facility, or an undertaking coordinating but not directly operating these three services.

SECTION 3: ACTIVITY PERIOD, MONITORING PERIOD AND CERTIFICATION PERIOD

Certification and re-certification of activities certified under these specifications must comply with any requirements specified by [the Implementing Act on certification process].

1. ACTIVITY PERIOD

The activity period for a direct air capture with permanent carbon removal activity shall be a maximum of 10 years, and can be renewed without limitation.

The activity period for a biogenic emissions capture with permanent carbon removal activity shall be a maximum of 10 years, and can be renewed without limitation.

The activity shall be certified and re-certified against the certification methodology in place at the time of certification for the entire activity period. Any revisions made to the certification methodologies shall not be applied to existing activities until and unless they seek renewal of the activity period.

2. MONITORING PERIOD

The monitoring period for DACCS and BioCCS activities shall be the period up until the point at which responsibility for all geological storage sites utilised by the activity has been transferred to the relevant competent national authorities in accordance with Article 18 of Directive 2009/31/EC (the CCS Directive).

3. CERTIFICATION PERIOD

The certification period for DACCS and BioCCS activities shall be a period of no more than 1 year. Certification schemes may set additional requirements on the certification period, for example by setting a minimum certification period or requiring that a certified activity must use a consistent certification period throughout the activity period.

For some projects, the transfer of CO_2 from the capture facility to the storage facility will be assessed following mass balance chain of custody rules (see Section 4(6.2)), and it would therefore not be possible to precisely identify the period in time during which CO_2 captured during a given certification period physically enters permanent storage. Where necessary, operators are therefore permitted to estimate emissions associated with transport and storage based on data recorded during the certification period without including in the calculation a temporal delay between the time at which the CO_2 was captured and the time at which it is injected, by assessing the average storage emissions per tonne of CO_2 handled during the certification period.

SECTION 4: REQUIREMENTS FOR QUANTIFICATION

At the initial certification audit, removals and emissions shall be estimated for the whole activity period by summing across the relevant number of certification periods. At re-certification audits, all removals and emissions of CO_2 and emissions of other GHGs shall be assessed over the whole of the relevant certification period (i.e. twelve months) and expressed in tonnes of CO_2 equivalent (CO_2e). Emissions of GHGs other than CO_2 shall be converted to tonnes of CO_2e by use of the 100-year Global Warming Potentials detailed in Annex I of Commission Delegated Regulation (EU) 2020/1044.

Following the sign convention established in Article 4(6) of [the CRCF], in the certificate of compliance and in the Union registry and certification registries referred to in Article 12 of [the CRCF] all quantities required for the quantification of net carbon removal benefit shall be designated as positive numbers if they are net GHG emissions and as negative numbers if they are net GHG removals/reductions.

Certification schemes must ensure that data reported as part of the certificate of compliance and/or for inclusion in the Union registry uses the terminology and sign conventions of this specification, and that if that certification scheme operates a certification registry within the meaning of Article 12 of the CRCF, the information in that registry can be displayed using the terminology and sign conventions of this specification.

Where the specifications refer to a provision in EU legislation (for example in [the MRR]), if that EU legislation is amended during the course of the activity period than the operator is permitted to choose whether to apply the requirements as they stood at the time of certification or in their amended form.

1. QUANTIFICATION OF PERMANENT NET CARBON REMOVAL BENEFIT

The permanent net carbon removal benefit of an activity (NCR_P) shall be calculated as defined in Article 4(1) of [the CRCF]:

$$NCR_P = CR_{baseline} - CR_{total} - GHG_{associated}$$	[1]

where:

$CR_{baseline}$ = minus the total carbon removals under the baseline, in tonnes of CO_2 and shall be quantified following the rules in section 4(2);

CR_{total} = minus the total carbon removals of the activity and represents the amount of atmospheric or biogenic CO_2 captured and permanently stored, in tonnes of CO_2. This excludes any captured CO_2 lost to fugitive emissions, leakage or venting during the capture, transport and storage of the CO_2, and shall be calculated following the rules in section 4(1.1);

$GHG_{associated}$ = the increase in direct and indirect greenhouse gas emissions over the entire lifecycle of the carbon removal activity which are due to its

implementation, in tonnes of CO_2e. It encompasses the greenhouse gas emissions associated to the capture of CO_2 as well as the transport and storage of captured CO_2 and shall be calculated following section 4(1.2).

1.1. CR_{total}

Two approaches are permitted for the calculation of CR_{total}. The choice of approach depends on whether the CO_2 captured by the activity will share transport infrastructure or storage site with CO_2 from other sources.

1.1.1. Segregated CO_2 stream

If the CO_2 captured by the activity (including any CO_2 captured at the capture facility that is not of biogenic or atmospheric origin) is at all times segregated from CO_2 from other sources during transit in the transport infrastructure and during storage and injection at the storage site or sites, then CR_{total} may be measured as the quantity of CO_2 entering storage, adjusted where necessary to exclude any CO_2 captured by the activity that is not atmospheric or biogenic (for example CO_2 captured from thermal energy generation using fossil fuels at the capture site) in accordance with Equation [2]. Certification schemes must set auditing rules for certification bodies that ensure that when this calculation option is used the segregation of the CO_2 from the activity is robustly demonstrated.

$$\mathrm{CR_{total}} = \mathrm{F_C} * \left(\sum_{\mathrm{S}} \left(\mathrm{CO_{2_{injected,S}}} \right) + \mathrm{CO_{2_{captured,other}}} * (1 - \mathrm{F_{lost}}) \right) \quad [2]$$

where:

$\mathrm{CO_{2_{injected,S}}}$ = minus the amount of CO_2 (of all origins) from the activity that is injected at each storage site S, which must be measured during injection;

$\mathrm{CO_{2_{captured,other}}}$ = amount of CO_2 other than atmospheric or biogenic CO_2 that is captured as part of the activity and transferred for permanent storage. Where this is CO_2 captured from a mixed biogenic and non-biogenic CO_2 stream, it is calculated as $(1 - F_B) * \mathrm{CO_{2_{captured,total}}}$, where F_B is the biogenic fraction (see section 4(4.1)). Where this is process CO_2 captured from a separate stream (e.g. CO_2 from oxyfuel combustion of natural gas to provide heat for a direct air capture facility) it must be measured at the capture site prior to being mixed with the captured CO_2 of atmospheric or biogenic origin;

S = an index of utilised storage sites, at which CO_2 from the activity is fully segregated from any CO_2 from other sources;

F_C = the conservatism factor calculated based on the uncertainty in the measurement of the activity calculated in accordance with section 7.6;

F_{lost} = the fraction of $CO_{2_{captured,other}}$ that is lost between the point at which the mixed CO_2 stream leaved the capture site at one or more exit points, and the point at which it is injected for storage. This may be taken as 1 to reduce the administrative burden, or else may be calculated in accordance with Equation [3].

$$F_{lost} = 1 - \frac{\sum_S \left(CO_{2_{injected,S}}\right)}{F_{CCS} * CO_{2_{captured,total}}} \quad [3]$$

where:

$CO_{2_{captured,total}}$ = the sum quantity of CO_2 from all sources captured at the activity site and transferred for permanent storage;

F_{CCS} = The fraction of the captured CO_2 that is designated as being transferred for storage to generate CRCF units. This is 1 if no captured CO_2 is to be transferred for another purpose.

1.1.2. Non-segregated CO_2 stream

Alternatively, the operator may calculate CR_{total} in accordance with Equation [4]. This approach is mandatory for cases where the CO_2 captured by the activity is not fully segregated from other CO_2 in the transport infrastructure or at the storage site.

$$CR_{total} = F_C * \left(F_{CCS} * CO_{2_{captured}} + CO_{2_{transport\ losses}} + CO_{2_{storage\ losses}}\right) \quad [4]$$

where:

$CO_{2_{captured}}$ = minus the amount of atmospheric or biogenic CO_2 captured and exported from the capture facility for permanent storage, calculated following the rules in section 4(3). In the case of CO_2 capture from a mixed biogenic and non-biogenic CO_2 stream,

$CO_{2_{captured}} = CO_{2_{captured,total}} - CO_{2_{captured,other}}$;

$CO_{2_{transport\ losses}}$ = amount of CO_2 lost during transport from the capture facility to the storage facilities, calculated following the rules in section 4(5);

$CO_{2_{storage\ losses}}$ = amount of CO_2 lost at the storage facilities prior to entering permanent geological storage, calculated following the rules in section 4(6);

F_{CCS} = The fraction of the captured CO_2 that is designated as being transferred for storage to generate carbon removal units. This is 1 if no captured CO_2 is to be transferred for another purpose;

F_C = the conservatism factor calculated based on the uncertainty in the

measurement of the activity calculated in accordance with section 4(7.6).

***Note on allocation of losses**: the specifications have been developed to allow an activity to use a shared transport infrastructure and to dispatch CO_2 to several storage sites that may be storing CO_2 from multiple sources. This means that allocation of losses in transport and storage is required between the activity CO_2 and other CO_2.*

1.2. $GHG_{associated}$

$$GHG_{associated} = F_{CCS} * GHG_{capture} + GHG_{transport} + GHG_{storage}$$	[5]

where:

$GHG_{capture}$ = GHG emissions associated with the capture facility, calculated following the rules in section 4(3) in the case of atmospheric CO_2 capture and following the rules in section 4(4) in the case of biogenic CO_2 capture;

$GHG_{transport}$ = GHG emissions associated with CO_2 transport from the capture facility to the storage facilities, calculated following the rules in section 4(5);

$GHG_{storage}$ = GHG emissions associated with the storage facilities, calculated following the rules in section 4(6);

F_{CCS} = The fraction of the captured CO_2 that is designated as being transferred for storage to generate carbon removal units. This is 1 if no captured CO_2 is to be transferred for another purpose.

These specifications shall be applied at a certification audit or at a re-certification audit. The certification audit is the first audit of an activity period and requires the operator to make estimates of operational performance. All other audits, including the final audit of an activity period, are re-certification audits and shall consider data gathered during the certification period immediately preceding the audit.

- When undertaking a certification audit, the calculation factors relating to measurable quantities under the control of the operator shall be based on expected values estimated by the operator. If a certification body is not satisfied that the estimated values represent a reasonable characterisation of the project then it shall withhold certification. When undertaking a re-certification audit, the calculation factors relating to measurable quantities under the control of the operator shall be based on measured values.
- When undertaking a certification audit, the formulas in this section shall be applied to expected values for the carbon removal activity over the whole activity period. When undertaking a re-certification audit, the formulas shall be applied to measured values from the certification period immediately preceding the audit.

1.3. CARBON REMOVAL SINKS AND GHG EMISSION SOURCES

The quantification of associated GHG emissions shall be complete and cover all process and combustion emissions from all material emission sources and source streams belonging to the permanent carbon removal activities and all other relevant emissions. The GHG sources and sinks that shall be considered for the purpose of the quantification of the net carbon removal benefit are shown in 1.

It is possible that an activity operator or a certification body may identify that emissions from a source, or from a group of sources, associated with an activity are material (i.e. generating emissions equal to or greater than the materiality threshold defined below in section 4(1.3.1) but are not identified in these specifications. The principle of completeness requires that in such cases the certification body shall ensure that these emissions are included in the calculation of the associated GHG emissions. In such cases the certification body should notify the certification schemes that an additional material emission source has been potentially identified, and the certification scheme should notify this to the Commission.

Table 1 Sources and sinks that shall be included within the boundaries of the calculations

Phase of the operation	Emission sources and sinks	Gases included
CO_2 capture	Capture facility: Operation of equipment used to capture CO_2 from the ambient air or from biogenic emissions, including equipment used to generate airflow, and equipment associated with regeneration processes to recover the fluids or other media used in the carbon capture process.	Greenhouse gases
	Capture facility: Any CO_2 conditioning equipment used to further process the CO_2 stream before transfer to transport or storage infrastructure.	Greenhouse gases
	Capture facility: Any associated energy generation equipment that is under the control of the operator.	Greenhouse gases
	Capture facility: Any treatment equipment for processing wastes or byproducts of the carbon capture process.	Greenhouse gases
	Capture facility: Fuel combustion, electricity consumption, heat consumption.	Greenhouse gases
	Biomass supply: Emissions associated with additional biomass consumed for the operation of the capture facility.	Greenhouse gases
	Losses: CO_2 fugitives and venting pre-prior to transfer to the transport or storage infrastructure.	CO_2 only
	Input emissions: Production and supply of inputs used by the capture facility.	Greenhouse gases
	Waste treatment: Processing and treatment of any wastes (including wastewater and exhaust gases) generated by the capture facility.	Greenhouse gases

Phase of the operation	Emission sources and sinks	Gases included
	Capital emissions: Emissions associated with the construction and installation of the capture facility.	Greenhouse gases
Transport of CO_2	Transportation: Fuel consumption and electricity consumption at road transportation (e.g. tank trucks, rails), maritime transportation (e.g. sea tanker) and other vehicles.	Greenhouse gases
	Infrastructure: Fuel consumption, electricity consumption and heat consumption in infrastructure and buildings functionally connected to the transport network (e.g. booster stations, heaters).	Greenhouse gases
	Losses: CO_2 fugitive, vented, and leakage emissions from the transport network.	CO_2 only
Injection at the geological storage site	Storage site: Removal by CO_2 injection.	CO_2 only
	Storage site: Fuel consumption, electricity consumption, heat consumption.	Greenhouse gases
	Losses: CO_2 fugitive, vented, and leakage emissions from injection and from the storage complex.	CO_2 only
	Input emissions: Production and supply of any inputs used by the storage facility.	Greenhouse gases
	Waste treatment: Processing and treatment of any wastes (including wastewater and exhaust gases) generated by the storage facility.	Greenhouse gases

1.3.1. Materiality

In general, all emission sources identified in these specifications must be assessed and must be included in the calculation of $GHG_{associated}$, even if they do not reach the level of materiality described here. There are two potential exceptions to this principle, contexts in which a materiality assessment may be undertaken and emissions identified as below the materiality threshold do not need to be directly assessed.

These contexts are capital emissions (section 4(7.5)), and input emissions (sections 4(3.2.2), 4(4.3.2) and 4(6.4.2)). Where a materiality assessment is required on a specified emission source, the operator must present to the certification body an estimate of the potential range of emissions associated with that source. If the emissions at the high end of this range are material, then the emissions from that source are considered potentially material and must be directly assessed.

Any emission from a source shall be considered material where it is associated with emissions equal to or greater than 2% of the gross carbon removals delivered, or expected to be delivered, over the course of an activity period (in the case of a materiality test during a

certification audit) or a certification period (in the case of a materiality test during a re-certification audit). At the certification audit this shall be assessed based on expected emissions and removals over the whole activity period. At the re-certification audit the certification body must assess whether there has been any significant deviation from the operational conditions expected at the certification audit (e.g. a change in the inputs used or quantity of inputs required, or an unforeseen capital installation), and if such a deviation is identified the materiality test should be rerun.

Note on materiality: *the materiality requirement is introduced with two purposes: firstly to limit excessive regulatory burden for the operator in the calculation of specified emissions that make only a minor contribution to the lifecycle; and secondly to provide a framework within which the certification bodies may require the inclusion of significant emissions sources not anticipated when the specifications were set. Materiality assessments are required at specific places in the specifications such as in the assessment of capital emissions.*

The level of the materiality threshold is proposed to be set at 2% of the gross carbon removals delivered by the activity. This proposed level may be compared to the materiality levels defined in Article 23 of the ETS Accreditation and Verification Regulation, which are 5% for verifying the reports of Category A and B installations and smaller aircraft operators, and 2% for Category C installations and larger aircraft operators, and 5% for verifying baseline data reports.

The specifications currently call for a materiality assessment in three places – in considering capital emissions and in considering emissions from inputs for processes related to CO_2 capture and CO_2 storage. If the emissions treated as immaterial from each of these sources were at the materiality threshold (i.e. 2% of gross removals) this could lead $GHG_{associated}$ to be understated by 4% of gross removals (the underestimation of input emissions is limited to 1% of gross removals for each of the two terms). In practice it is very unlikely that each of these terms would be precisely at the materiality threshold, and therefore the likely discrepancy introduced for most projects by disregarding emissions in these categories as immaterial would be below this.

2. BASELINE

A standardised baseline set to 0 tCO_2/year shall apply for DACCS and BioCCS activities. All DACCS and BioCCS activities shall therefore be considered additional.

The standardised baseline will be reviewed, and if necessary, updated at least every five years in light of evolving regulatory circumstances and of the latest available scientific evidence (e.g. if Union or national statutory requirements are introduced that would require the performance of the activity or would count the benefit of the activity towards other Union targets). Note that projects shall use the baseline that was current at the time of their initial certification for the whole of the activity period, so for example if the rules for baseline setting for a type of activity are amended five years into the ten year activity period of a certified project this will not affect that project until the activity period is ended and it seeks to renew its certification.

Note on baselines: *There is currently no commercially viable market for achieving negative emissions through DACCS or BioCCS unless it is enabled through the voluntary trading of carbon removal credits. The emission of biogenic CO_2 from the combustion or processing of sustainable biomass is not subject to the EU's Emissions Trading System ('ETS'). Operators capturing and storing biogenic or atmospheric CO_2 are unable to receive allowances under the ETS or reductions in ETS obligations. Taking account of the cost of developing BioCCS and DACCS projects, the deployment of these activities is unlikely to become financially viable without the incentive effect of the certification, in which case no carbon would be removed from the atmosphere.*

3. INSTALLATIONS CAPTURING ATMOSPHERIC CO_2 FROM AMBIENT AIR

This part applies to activities that capture atmospheric CO_2 from ambient air by DAC and generate a concentrated stream of CO_2 to be transported for storage, either as a gaseous stream or dissolved in water.

3.1. QUANTIFICATION OF TOTAL CO_2 CAPTURED

The amount of CO_2 leaving the capture facility at each exit point i must be measured, so that the total amount of CO_2 captured at the capture facility $CO_{2_{captured}}$ may be calculated in accordance with the following equation:

$$CO_{2_{captured}} = \sum_{i} CO_{2_{OUT,activity,i}}$$	[6]

where:

$CO_{2_{OUT,activity,i}}$ = amount of CO_2 from the capture activity leaving the capture facility at each exit point i;

$CO_{2_{captured}}$ = amount of CO_2 captured at the capture facility and transferred for transport or storage.

Any leakage of CO_2 occurring between the point of capture and the point of leaving the capture facility is thus implicitly excluded from the term $CO_{2_{captured}}$.

3.2. QUANTIFICATION OF ASSOCIATED GREENHOUSE GAS EMISSIONS

The emissions associated with the operation of the direct air capture facility must be calculated and are part of the $GHG_{associated}$ emissions term in the calculation of net carbon removal benefit. The emissions are the sum of emissions associated with the capture facility itself and relevant processes to produce inputs to the capture facility:

$$GHG_{capture} = GHG_{facility} + GHG_{inputs}$$	[7]

where:

$GHG_{capture}$ = total GHG emissions associated with the capture of CO_2 from ambient air, in tonnes of CO_2e;

$GHG_{facility}$ = total GHG emissions from all relevant activities within the boundaries of the capture facility, in tonnes of CO_2e, including emissions associated with conditioning CO_2 prior to transfer to transport infrastructure or a storage site;

GHG_{inputs} = total emissions associated with inputs to the capture facility, in tonnes of

CO_2e.

3.2.1. Emissions from the capture facility ($GHG_{facility}$)

The emissions $GHG_{facility}$ associated with the capture facility shall be calculated in accordance with the following equation:

$GHG_{facility} = GHG_{combustion} + GHG_{electricity} + GHG_{heat} + GHG_{capital} + GHG_{disposal}$	[8]

The terms in equation [8] are as follows.

$GHG_{combustion}$ refers to emissions due to fuel consumption at the capture facility, calculated in accordance with the following equation:

$GHG_{combustion} = \sum_{fuels} (Q_{fuel} * EF_{fuel}) + CO_{2\,fossil,stored}$	[9]

where:

Q_{fuel} = quantity of the fuel consumed in the certification period, expressed in an appropriate unit;

EF_{fuel} = lifecycle emissions value, expressed in tonnes of CO_2e per unit, selected in accordance with the rules in section 4(7.4);

$CO_{2\,fossil,stored}$ = minus the quantity of fossil CO_2 from fuel combustion at the capture facility captured and permanently stored, in tonnes CO_2, expressed as a negative number. To be calculated as the minus the measured quantity of CO_2 captured from fossil sources at the capture facility plus any CO_2 losses prior to storage.

$GHG_{electricity}$ refers to emissions due to net electricity consumption at the capture facility, calculated in accordance with the following equation:

$GHG_{electricity} = \sum_{electricity\ source} Q_{electricity} * EF_{electricity}$	[10]

where:

$Q_{electricity}$ = net quantity of electricity consumed in the certification period, expressed in an appropriate unit;

$EF_{electricity}$ = lifecycle emission factor for the consumed electricity, expressed in tonnes of CO_2e per unit, selected in accordance with section 4(7.4).

GHG_{heat} refers to emissions due to net consumption of useful heat at the capture facility, calculated in accordance with the following equation:

$$GHG_{heat} = \sum_{heat\ source} Q_{heat} * EF_{heat} \quad [11]$$

where:

Q_{heat} = net quantity of useful heat consumed in the certification period, expressed in an appropriate unit;

EF_{heat} = lifecycle emission factor for the consumed heat, expressed in tonnes of CO_2e per unit, selected in accordance with section 4(7.4).

$GHG_{capital}$ refers to capital emissions from construction and installation of the carbon capture facility and is to be calculated in accordance with the principles detailed in section 4(7.5).

$GHG_{disposal}$ refers to emissions from the treatment or disposal of any wastes generated by the direct air capture facility. This shall include emissions associated with the supply of any energy and inputs consumed in the course of waste disposal and any other GHG emissions associated with the disposal process.

3.2.2. Emissions from inputs (GHG_{inputs})

Where there are non-capital inputs including chemicals consumed by the capture facility (for example sorbents) the emissions associated with the consumption of these inputs during the certification period must be characterised in accordance with the following equation:

$$GHG_{inputs} = \sum_{inputs} Q_{input} * EF_{input} \quad [12]$$

where:

Q_{input} = quantity of the input consumed in the certification period, expressed in an appropriate unit;

EF_{input} = lifecycle emission factor for the input consumed, expressed in tonnes of CO_2e per unit, selected in accordance with the rules in section 4(7.4.3).

The operator may group any number of inputs whose collective emissions are considered non-material on the basis of a materiality assessment and substitute for them an emission term equal to $1\% * CR_{total}$, i.e. a group of inputs for which when taking a high-end estimate of expected associated emissions:

$$\sum_{inputs} Q_{input} * EF_{input} < 2\% * CR_{total} \quad [13]$$

3.3. MONITORING AND REPORTING

A monitoring plan consisting of a detailed, complete and transparent documentation of the parameters used in calculations shall be submitted by the operator. This shall include parameters set at a single value for the whole of the activity period and parameters that may

change during the activity period and will therefore be monitored for each certification period until the end of the activity period.

Such plan shall include, at minimum, the parameters listed in Table 2.

Table 2 Parameters for inclusion in the monitoring plan

Emission source	Data / Parameter	Data unit	Description	Notes
n/a	$CO_{2_{OUT,activity,i}}$	tonnes CO_2	Amount of CO_2 from the capture activity leaving the capture facility at each exit point i	
$GHG_{combustion}$	Q_{fuel}	[appropriate unit]	Quantity of the fuel consumed in the certification period	
	$CO_{2_{fossil,stored}}$	tonnes CO_2	Quantity of fossil CO_2 from fuel combustion at the capture facility captured and permanently stored	
$GHG_{electricity}$	$Q_{electricity}$	[appropriate unit]	Net quantity of electricity consumed in the certification period	
GHG_{heat}	Q_{heat}	[appropriate unit]	Net quantity of useful heat consumed in the certification period	
GHG_{inputs}	Q_{input}	[appropriate unit]	Quantity of the input consumed in the certification period	
$GHG_{capital}$	-	tonnes CO_2	Capital emissions	
$GHG_{disposal}$	-	tonnes CO_2	Emissions from waste disposal	

4. INSTALLATIONS CAPTURING CO_2 FROM POINT SOURCES OF BIOGENIC EMISSIONS

This part applies to activities that capture biogenic CO2 from point sources generate a concentrated stream of CO2 to be transported for stored, either as a gaseous stream or dissolved in water.

4.1. QUANTIFICATION OF TOTAL CO_2 CAPTURED

The amount of CO_2 leaving the capture facility at each exit point **i** must be measured, so that the total amount of biogenic CO_2 captured at the capture facility $CO_{2_{captured}}$ and transferred for transport or storage may be calculated in accordance with the following equation:

$$CO_{2_{captured}} = F_B * \sum_i CO_{2_{OUT,activity,i}} \quad [14]$$

where:

$CO_{2_{captured}}$ = amount of CO_2 of biogenic origin captured at the capture facility and transferred for transport or storage;

$CO_{2_{OUT,activity,i}}$ = amount of CO_2 leaving the capture facility at each exit point **i**;

F_B = fraction of captured CO_2 that is of biogenic origin. This should be set as 1 if the material from which CO_2 is generated is demonstrably wholly biogenic, or else shall be calculated in accordance with Article 39 of [the MRR]. See section 4(4.2).

4.2. CAPTURE OF CO_2 FROM PARTIALLY BIOGENIC STREAMS

Activities that capture biogenic CO_2 as part of a mixed stream that also contains CO_2 of fossil or other origin may be certified for the biogenic part. This would include capture of CO_2 from co-fired bioenergy facilities or from waste-to-energy facilities processing partially biogenic waste. Only the biogenic part of the captured CO_2 is then counted towards CR_{total}. Emissions associated with the carbon capture process shall be allocated proportionately between the biogenic fraction (and therefore included in $GHG_{associated}$) and the non-biogenic fraction (and not further considered within this methodology). After transfer of the CO_2 from the point of capture into transportation infrastructure or a storage site, mass balance accounting may be used to identify a quantity of CO_2 consistent with the amount of biogenic CO_2 capture (minus any losses) as wholly biogenic.

4.3. QUANTIFICATION OF ASSOCIATED GREENHOUSE GAS EMISSIONS

Only the emissions specifically associated with implementing the capture activity shall be considered. Emissions associated with the normal operation of the facility generating the biogenic CO_2 source that do not result from the implementation of the capture activity shall be considered out of scope.

The calculation of the $GHG_{capture}$ term shall consider only the emissions directly associated with the operation of the carbon capture unit and the transfer of the CO_2 for storage or transport. It shall be calculated:

$$GHG_{capture} = F_B * (GHG_{facility} + GHG_{inputs}) \quad [15]$$

where:

$GHG_{capture}$ = total GHG emissions associated with the capture of CO_2, in tonnes of CO_2e;

$GHG_{facility}$ = total GHG emissions from all relevant activities required for CO_2 capture at the capture facility, in tonnes of CO_2e;

GHG_{inputs} = total emissions associated with inputs to the capture facility, in tonnes of CO_2e.

F_B = fraction of captured CO_2 that is of biogenic origin. This should be set as 1 if the material from which CO_2 is generated is demonstrably wholly biogenic, or else shall be calculated in accordance with Article 39 of [the MRR]. See section 4(4.2).

4.3.1. Emissions from the capture facility ($GHG_{facility}$)

The emissions $\mathbf{GHG_{facility}}$ associated with the capture facility shall be calculated in accordance with the following equation:

$$GHG_{facility} = GHG_{bio} + GHG_{bio\text{-}storage} + GHG_{combustion} + GHG_{electricity} + GHG_{heat} + GHG_{capital} + GHG_{disposal} \quad [16]$$

The terms in equation [16] are as follows.

$\mathbf{GHG_{bio}}$ refers to emissions due to additional biomass use for energy consumed by the capture process, calculated in accordance with the following equation:

$$GHG_{bio} = \sum_{\text{biomass types}} Q_{biomass} * EF_{biomass} \quad [17]$$

where:

$Q_{biomass}$ = quantity of the biomass that is consumed in the certification period to supply any on-site heat and/or electricity used for the capture process specifically, calculated in accordance with the rules in section 4(7.3), expressed in an appropriate unit;

$EF_{biomass}$ = lifecycle emissions value, expressed in tonnes of CO_2e per unit, selected in accordance with the rules in section 4(7.4).

$GHG_{bio\text{-}storage}$ refers to CH_4 emissions due to biomass storage prior to processing at the facility where CO_2 is captured. When moist biomass is stored for a period prior to processing, in some cases anaerobic decomposition may occur in the biomass pile leading to degradation of the biomass and generation of CH_4. Significant CH_4 emission may be avoided by following best practices for biomass storage. $GHG_{bio\text{-}storage}$ shall be set to zero if one or more of the following practices are followed for all biomass utilised:

- Biomass stored consists of coarse woody material that the certification body is satisfied will naturally remain well aerated;
- Biomass stored in a form that will not necessarily remain naturally aerated (including wood chips, agricultural residues, sawdust etc.) shall either:
  - be stored for no more than four weeks prior to processing; or
  - be stored with a maximum of 30% residual moisture.
- Biomass is pelleted for storage;
- It is demonstrated to the satisfaction of the certification body that biomass is stored in a way that ensures adequate aeration to prevent anaerobic decomposition.

Otherwise, **$GHG_{bio\text{-}storage}$** shall be calculated in accordance with the following equation:

$$GHG_{bio\text{-}storage} = \sum_{feedstocks} \left(\frac{16}{12} * 0.0013 * Q_{feedstock} * C_{feedstock} * (T_{storage} - 1) \right) * GWP_{CH_4} \quad [18]$$

where:

$Q_{feedstock}$ = quantity of the feedstock in each batch, expressed in an appropriate unit;

$C_{feedstock}$ = carbon content of the feedstock, expressed as a mass %;

$T_{storage}$ = time in months for which the feedstock batch is stored (rounded up);

feedstocks = an index of the batches of feedstocks consumed;

0.0013 = assumed monthly fractional loss of biomass carbon from storage.

$GHG_{combustion}$ refers to emissions due to fuel consumption at the capture facility for the capture process specifically, including CH_4 and N_2O emissions from additional biomass combustion but treating the CO_2 emissions from biomass combustion as zero, calculated in accordance with the following equation:

$$GHG_{combustion} = \sum_{fuels} (Q_{fuel} * EF_{fuel}) + CO_{2_{fossil,stored}} \quad [19]$$

where:

Q_{fuel} = quantity of the fuel consumed in the certification period, expressed in an appropriate unit;

EF_{fuel} = lifecycle emissions value, expressed in tonnes of CO_2e per unit, selected in accordance with the rules in section 4(7.4);

$CO_{2\,fossil,stored}$ = minus the quantity of fossil CO_2 from fuel combustion at the capture facility captured and permanently stored. If this captured CO_2 is intermixed with the atmospheric or biogenic CO_2 captured by the activity prior to transfer to the transport infrastructure or storage site, it must be included in the term $CO_{2\,captured,other}$ in equation [2]

$GHG_{electricity}$ refers to emissions due to net consumption of electricity at the capture facility, excluding own electricity consumption, calculated in accordance with the following equation:

$$GHG_{el} = \sum_{source} Q_{el,source} * EF_{el,source} \quad [20]$$

where:

Q_{el} = net quantity of electricity from each source consumed in the certification period for the capture process specifically, expressed in an appropriate unit;

EF_{el} = lifecycle emission factor for the consumed electricity, expressed in tonnes of CO_2e per unit, selected in accordance with section 4(7.4).

GHG_{heat} refers to emissions due to net consumption of useful heat at the capture facility, excluding own heat consumption, calculated in accordance with the following equation:

$$GHG_{heat} = \sum_{heat\ source} Q_{heat} * EF_{heat} \quad [21]$$

where:

Q_{heat} = net quantity of useful heat consumed in the certification period for the capture process specifically, expressed in an appropriate unit;

EF_{heat} = lifecycle emission factor for the consumed heat, expressed in tonnes of CO_2e per unit, selected in accordance with section 4(7.4).

$GHG_{capital}$ refers to capital emissions from construction and installation of the carbon capture facility and is to be calculated in accordance with the principles detailed in section 4(7.5).

$GHG_{disposal}$ refers to emissions from the treatment or disposal of any wastes generated specifically due to the capture activity, including waste from any biomass used for energy consumed by the capture process. This shall include emissions associated with the supply of any energy and inputs consumed in the course of waste disposal and any other GHG

emissions associated with the disposal process including emissions of N_2O and/or CH_4 due to aerobic or anaerobic degradation of biomass wastes.

4.3.2. Emissions from inputs (GHG_{inputs})

Where there are non-capital inputs including chemicals consumed by the capture facility the emissions associated with the consumption of these inputs during the certification period must be characterised in accordance with the following equation:

$$GHG_{inputs} = \sum_{inputs} Q_{input} * EF_{input} \quad [22]$$

where:

Q_{input} = quantity of the input consumed in the certification period for the capture process specifically, expressed in an appropriate unit;

EF_{input} = lifecycle emission factor for the input consumed, expressed in tonnes of CO_2e per unit, selected in accordance with section 4(7.4).

The operator may group any number of inputs whose collective emissions are considered non-material on the basis of a materiality assessment and substitute for them an emission term equal to $1\% * CR_{total}$, i.e. a group of inputs for which when taking a high-end estimate of expected associated emissions:

$$\sum_{inputs} Q_{input} * EF_{input} < 2\% * CR_{total} \quad [23]$$

4.4. MONITORING AND REPORTING

A monitoring plan consisting of a detailed, complete and transparent documentation of the parameters used in calculations shall be submitted by the operator. This shall include parameters set at a single value for the whole of the activity period and parameters that may change during the activity period and will therefore be monitored for each certification period until the end of the activity period.

Such plan shall include, at minimum, the parameters listed in Table 3.

Table 3 Parameters for inclusion in the monitoring plan

Emission source	Data / Parameter	Data unit	Description	Notes
$CO_{2_{captured}}$	$CO_{2_{OUT,activity,i}}$	tonnes CO_2	Amount of CO_2 leaving the capture facility at each exit point i	
	F_B	%	Fraction of captured CO_2 that is of biogenic origin	

GHG_{bio}	$Q_{biomass}$	[appropriate unit]	Quantity of the biomass that is consumed in the certification period to supply any on-site heat and/or electricity used for the capture process specifically	Relevant data may be available in verified RED reporting.
	$EF_{biomass}$	Tonnes CO_2e per unit	Lifecycle emissions value selected in accordance with the rules in section 4(7.4)	Relevant data may be available in verified RED reporting.
$GHG_{bio\text{-}storage}$	$Q_{feedstock}$	[appropriate unit]	Quantity of the feedstock in each batch	These only need to be monitored if the practices detailed in section 4(4.3.1) are not followed.
	$C_{feedstock}$	%	Carbon content of the feedstock	
	$T_{storage}$	months	Time in months for which the feedstock batch is stored	
$GHG_{combustion}$	Q_{fuel}	[appropriate unit]	Quantity of the fuel consumed in the certification period	
	$CO_{2\,fossil,stored}$	tonnes CO_2	Quantity of fossil CO_2 from fuel combustion at the capture facility captured and permanently stored	
$GHG_{electricity}$	Q_{el}	[appropriate unit]	Net quantity of electricity consumed in the certification period	
GHG_{heat}	Q_{heat}	[appropriate unit]	Net quantity of useful heat consumed in the certification period	
GHG_{inputs}	Q_{input}	[appropriate unit]	Quantity of the input consumed in the certification period	
$GHG_{capital}$	-	tonnes CO_2	Capital emissions	

$GHG_{disposal}$	-	tonnes CO_2	Emissions from waste disposal	

5. TRANSPORT OF CO_2

This section provides rules and requirements for the quantification of GHG emissions associated to CO_2 transportation activities via pipelines, road, rail or water transportation, and their infrastructure, as well as losses of CO_2 occurring during this process.

This section applies to activities that transport captured CO_2 as a concentrated CO_2 stream from a capture site to one or more storage sites using one or more modes of CO_2 transportation. The transport pathway from the capture site to the storage site(s) consists of one or more segments of transport infrastructure (where transport infrastructure is defined as in Article 3(29) of Regulation (EU) 2024/1735) which may be parts of one or more transport networks (as defined in Article 3(22) of Directive 2009/31/EC). Where relevant data is available from reporting under [the MRR] then that data shall be treated as reliable for the purpose of calculating transport emissions for the activity.

Transport infrastructure segments must be designated in order to allow the allocation of transport-related emissions in the case that CO_2 from more than one source passes through parts of the same transport network. If CO_2 captured by a single removal activity is the only CO_2 passing through the relevant transport infrastructure, then the whole transport pathway may be designated as a single transport infrastructure segment. Otherwise, the transport pathway must be divided into a series of transport infrastructure segments. A new transport infrastructure segment must be designated at least every time two or more CO_2 streams are merged, or two or more CO_2 streams are separated. Additional transport infrastructure segments may be defined at the discretion of the operator or certification body for organisational reasons.

***Example of transport segments**: consider an activity that captures CO_2 and transports it to storage following a transport pathway as follows:*

1. *A 20 km pipeline (from the capture facility to a port) that is used only for CO_2 captured by the activity;*
2. *Shipping for 150 km to a second port in a CO_2 transport ship that is shared with CO_2 from other sources;*
3. *A 10 km pipeline (from the second port to a pipeline node) that is shared with the same CO_2 from other sources as shared the ship;*
4. *A 2 km pipeline from the pipeline node to the storage site, which is used only for CO_2 captured by the activity.*

This transport pathway must be split into at least three transport infrastructure segments. The first segment consists of the first 20 km pipeline. All emissions from this segment are allocated to the activity. The second segment consists of the transport ship and the 10 km pipeline from the second port to the pipeline node. Emissions from this segment are allocated between the activity CO_2 and the other CO_2 passing through this segment. The third segment consists of the final 2km pipeline. All emissions from this segment are allocated to the activity.

An allocation fraction F_S shall be defined for each transport infrastructure segment S as the fraction of the CO_2 passing through the segment in a certification period that comes from the activity and is being sent for storage (i.e. not including any CO_2 coming from the activity that is being transferred for utilisation):

$F_S = CO_{2\ activity,S} / CO_{2\ total,S}$	[24]

where:

$CO_{2\ total,S}$ = total amount of CO_2 from all sources passing through the CO_2 infrastructure segment S in the certification period, in tonnes CO_2;

$CO_{2\ activity,S}$ = amount of CO_2 from the activity that is being transferred for permanent storage to generate carbon removal units (including an associated fraction of any CO_2 captured as part of the activity and transferred for permanent storage that is not of atmospheric or biogenic origin) passing through the CO_2 infrastructure segment S in the certification period, in tonnes CO_2. For the first infrastructure segment in the transport pathway, this is equal to the quantity of CO_2 measured as transferred from the capture facility to the infrastructure segment. For subsequent infrastructure segments, this is the quantity of CO_2 entering the previous infrastructure segment minus any CO_2 losses in that infrastructure segment, and where the CO_2 stream is split at a node to be sent to multiple storage sites allocated across the infrastructure segments leaving that node.

S = index of the transport infrastructure segment.

5.1. QUANTIFICATION OF FUGITIVE, VENTED AND LEAKED EMISSIONS OF CAPTURED CO_2

The transportation of CO_2 using one or a combination of various modes of transportation could result in intentional or accidental losses of transported CO_2 throughout the transport network, whether in the journeys or at eventual transfer points. If the quantity CR_{total} is calculated based on Equation [4] then these losses must be explicitly quantified.

The specifications for the quantification of intentional or non-intentional emissions of the captured CO_2 during its transportation to the storage site are based predominantly on the Commission implementing regulation (EU) 2018/2066, but are adapted to the requirements of the CRCF.

EU 2018/2066 outlines two methods for the quantification of GHG emissions due to the operation of pipeline transport network: Method A, which is based on the overall mass

balance of all input and output streams[1]; and Method B, which relies on the monitoring of emission sources individually.

Operators shall favour the method that leads to more reliable results (i.e. lower uncertainty of the overall emissions) without incurring disproportionate costs. Both methods are set out in the following sections. For further guidance, please refer to EU 2018/2066, Annex IV, Section 22.

5.1.1. CO_2 losses ($CO_{2_{transport,losses}}$): Method A

Under this method, operators shall quantify the intentional and accidental escapes of CO_2 throughout the transport network based on equation [25].

$$CO_{2_{transport,losses}} = \sum_{S} \left(F_S * \left(CO_{2_{in,S}} - CO_{2_{out,S}} \right) \right) \quad [25]$$

where:

F_S = fraction of the CO_2 passing through segment S that is biogenic or atmospheric CO_2 captured by the activity, in %;

$CO_{2\ in,S}$ = amount of CO_2 entering transport infrastructure segment S, determined in accordance with Regulation (EU) 2018/2066 Articles 40 to 46 and Article 49, in tonnes CO_2;

$CO_{2\ out,S}$ = amount of CO_2 leaving transport infrastructure segment S, determined in accordance with (EU) 2018/2066 Articles 40 to 46 and Article 49, in tonnes CO_2;

S = index of the transport infrastructure segments.

5.1.2. CO_2 losses ($CO_{2_{transport,losses}}$): Method B

Under this method, operators shall quantify $CO_{2transport,losses}$ based on the measured losses throughout the transport network, as described in equation [26].

$$CO_{2_{transport,losses}} = \sum_{S} \left(F_S * \left(CO_{2\ fugitive,S} + CO_{2\ vented,S} + CO_{2\ leakage,S} \right) \right) \quad [26]$$

where:

F_S = fraction of the CO_2 passing through segment S that is biogenic or atmospheric CO_2 captured by the activity, in %;

$CO_{2\ fugitive,S}$ = sum of fugitive emissions from CO_2 transported in the transportation infrastructure, such as from seals, valves, intermediate compressor

[1] Each transport network shall have a minimum of one start point and one end point, each connected to other installations carrying out one or more of the activities: capture, transport or geological storage of CO_2. This includes bifurcations of the network and cross-national borders. (EU) 2018/ 2066

stations in pipeline structures and intermediate storage facilities, in tonnes CO_2;

$CO_{2\ vented,S}$ = sum of vented emissions from CO_2 transported in the transportation infrastructure, in tonnes CO_2;

$CO_{2\ leakage,S}$ = sum of CO_2 transported in the transportation infrastructure, which is emitted as the result of the failure of one or more components of the network, in tonnes CO_2;

S = index of the transport infrastructure segments.

5.1.2.1. Fugitive emissions ($CO_{2\ fugitive}$)

Regulation (EU) 2018/2066 anticipates that fugitive emissions during CO_2 transportation could occur in any of the following components: (a) seals; (b) measurement devices; (c) valves; (d) intermediate compressor stations; (e) intermediate storage facilities.

Such emissions shall be calculated based on equation [27].

$$CO_{2\ fugitive} = \sum_{S}\left(\sum_{c}\left(EF_{occur,c,S} * N_{occur,c,S}\right)\right) \quad [27]$$

where:

F_S = fraction of the CO_2 passing through segment S that originates from the activity, in %;

$EF_{occur,c,S}$ = average emission factors per piece of component per time period, expressed in tonnes CO_2/unit time. $EF_{occur,c}$ shall be determined by the operator for each type of component, and included in the monitoring plan. Such factors shall be reviewed at least every 5 years based on newly available techniques and knowledge;

$N_{occur,c,S}$ = number of components type c in the transportation system, multiplied by the number of time periods;

c = type of equipment*:* seals*;* measurement devices*;* valves*;* intermediate compressor stations*;* and intermediate storage facilities;

S = index of the transport infrastructure segments.

Certification schemes may choose to facilitate emissions calculations by providing lists of default fugitive emissions factors for relevant equipment.

5.1.2.2. Vented emissions ($CO_{2\ vented}$)

Regulation (EU) 2018/2066 requires that each transport network operator provide in the monitoring plan an analysis regarding planned CO_2 venting, including for maintenance or emergency purposes, and a suitable documented methodology for calculating the amount of CO_2 vented, based on industry best practice guidelines.

The activity operator shall calculate $CO_{2\ vented}$ for each transport infrastructure segment S as the expected venting identified for that transport infrastructure segment by the transport network operator's monitoring plan. If the transport network operator's monitoring plan does not identify venting emissions at the disaggregated level of the transport infrastructure segment, venting emissions shall be allocated by segment on a reasonable basis to be agreed by the activity operator and certification body. Certification schemes may choose to facilitate emissions calculations by further specifying the basis to estimate vented emissions.

5.1.2.3. Leakage events ($CO_{2\ leakage}$)

Regulation (EU) 2018/2066 requires that each transport network operator shall monitor the transport network and calculate the amount of CO_2 leaked from the transport with a suitable methodology documented in the monitoring plan, based on industry best practice guidelines.

The activity operator shall calculate $CO_{2\ leakage}$ for each transport infrastructure segment S as the amount of leakage identified for that transport infrastructure segment by the transport network operator during the certification period. If the transport network operator does not report leakage emissions at the disaggregated level of the transport infrastructure segment, leakage emissions shall be allocated for each segment on a reasonable basis to be agreed by the activity operator and certification body.

5.2. QUANTIFICATION OF ASSOCIATED GREENHOUSE GAS EMISSIONS FOR TRANSPORT

GHG emissions from the combustion of fuels during the transportation of CO_2 (for vehicles and/or in the supporting infrastructure) must be calculated.

Equation [28] outlines the calculation:

$$GHG_{transport} = \sum_{S}\left(F_S * \left(\sum_{T} GHG_{T,S} + GHG_{infra,S}\right)\right) \quad [28]$$

where:

F_S = fraction of the CO_2 passing through segment S that originates from the activity, in %;

$GHG_{T,S}$ = GHG emissions due to energy use for CO_2 transportation in mode of transportation type T in infrastructure segment S, in tonnes of CO_2e;

GHG_{infra} = GHG emissions due to energy use at the supporting infrastructure connected to the CO_2 transport network (including pipeline operation infrastructure), in tonnes CO_2e;

T = transport type for the infrastructure segment, road, rail or maritime;

S = index of the transport infrastructure segments.

5.2.1. Emissions from transportation of CO_2 ($GHG_{T,S}$)

GHG emissions due to fuel consumption during the transportation of CO_2, shall be calculated according to Equation [29].

$$GHG_{T,S} = \sum_{L=1}^{O} \left(K_{T,L,S} * CO_{2_{T,L,S}} * EF_{T,S} * 10^{-3} \right) \quad [29]$$

where:

$GHG_{T,S}$ = GHG emissions due to energy use for CO_2 transportation in mode of transportation type T in infrastructure segment S, in tonnes of CO_2e;

F_S = fraction of the CO_2 passing through segment S that originates from the activity, in %;

$K_{T,L,S}$ = distance of one-way trip travelled by mode of transportation type T in infrastructure segment S, in kilometres;

$CO_{2_{T,L,S}}$ = amount of CO_2 transported in each one-way trip in mode of transportation type T in infrastructure segment S, in tonnes;

$EF_{T,S}$ = emission factor for mode of transportation type T in infrastructure segment S, in kg CO_2e / tonne.km, see section 7(7.4.5);

L = outbound trip by the mode of transportation;

O = total number of outbound trips by the modal per year;

T = transport type for the infrastructure segment, road, rail or maritime;

S = index of the transport infrastructure segments.

Note that the more detailed and broken-down is the information available on distance between sites, and volume transported, the more accurate will be the calculation of GHG_T. Therefore, if data is available per trip, operators shall calculate the emissions for each trip, using the average distance in each leg, and the amount of CO_2 transported in that exact leg (which can be derived from the estimated capacity of the truck), and add them up, as described in the above equation. Otherwise, an approximated estimate of the total distance travelled in the year and the total CO_2 transported in the year is allowed as a proxy.

5.2.2. Emissions from transportation infrastructure (GHG_{infra})

GHG emissions due to fuel and electricity consumption across all processes at installations required to operate the transport network, shall be calculated according to Equation [30].

$$GHG_{infra} = \sum_{S}\left(F_S * \sum_{f}\left(GHG_{stat,f} + GHG_{mob,f}\right) + GHG_{elec,f}\right)$$
$$= \sum_{S}\left(F_S * \sum_{f}\left(Q_{stat,f} * EF_f + Q_{mob,f} * EF_f\right) + Q_{elec} * EF_{elec}\right) \quad [30]$$

where:

GHG_{infra} = GHG emissions due to energy use at the supporting infrastructure connected to the transport network, in tonnes CO_2e;

$GHG_{stat,f}$ = GHG emissions from the combustion of fuels type f in stationary machinery at the installed infrastructure, in tonnes CO_2e. This shall include fuel consumed for generation of electric power and heat, and from auxiliary loads, where such emissions occur;

$GHG_{mob,f}$ = GHG emissions from the combustion of fuel type f in on-site vehicles and other transportation at the installed infrastructure, in tonnes CO_2e. This includes vehicles used for regular maintenance;

GHG_{elec} = GHG emissions due to the electricity imported from the grid and consumed at the installed infrastructure, in tonnes CO_2e;

$Q_{stat,f}$ = quantity of fuel type f combusted in stationary sources at the site, in GJ. Should any unit conversions be necessary, the density and NCV parameters adopted shall be included in the Table 4;

$Q_{mob,f}$ = quantity of fuel type f combusted in mobile sources at the installed infrastructure, in GJ;

EF_f = emission factor due to the combustion of the fuel type f, in tonnes CO_2e/GJ, chosen following section 4(7.4);

Q_{elec} = amount of electricity imported from the grid and consumed at the installed infrastructure, in MWh;

EF_{elec} = emissions factor for the generation of electricity, in tonnes CO_2e/MWh, chosen following section 4(7.4.1);

f = fuel type, including those from fossil and biogenic origin.

5.3. MONITORING AND REPORTING

A monitoring plan consisting of a detailed, complete and transparent documentation of the parameters used in calculations shall be submitted by the operator. This shall include parameters set at a single value for the whole of the activity period and parameters that may change during the activity period and will therefore be monitored for each certification period until the end of the activity period.

Such plan shall include, at minimum, the parameters listed in Table 4.

Table 4 Parameters for inclusion in the monitoring plan

Emission source	Data / Parameter	Data unit	Description	Notes
F_s	$CO_{2\ activity,S}$	tonnes CO_2	Amount of CO_2 from the activity passing through the CO_2 infrastructure segment S in the certification period	
	$CO_{2\ total,S}$	tonnes CO_2	Total amount of CO_2 from all sources passing through the CO_2 infrastructure segment S in the certification period	
$CO_{2transport,losses}$: Method A	$CO_{2\ in,S}$	tonnes CO_2	Amount of CO_2 transferred to the transport infrastructure segment S, determined in accordance with Regulation (EU) 2018/2066 Articles 40 to 46 and Article 49	Relevant data may be available in verified MRR reporting
	$CO_{2\ out,S}$	tonnes CO_2	Amount of CO_2 transferred out of the transport infrastructure segment, determined in accordance with Regulation (EU) 2018/2066 Articles 40 to 46 and Article 49	Relevant data may be available in verified MRR reporting
$CO_{2transport,losses}$: Method B, fugitive emissions ($CO_{2\ fugitive}$)	$EF_{occur,c}$	tonnes CO_2/unit time	Average emission factors per piece of component per occurrence, determined by the operator	Relevant data may be available in verified MRR reporting
	$N_{occur,c}$	Number of time units per year	Number of components in the transportation system type of equipment	Relevant data may be available in verified MRR reporting
$CO_{2transport,losses}$: Method B, vented emissions ($CO_{2\ vented}$)	-	-	To be informed by the transport infrastructure operator	Relevant data may be available in verified MRR reporting
$CO_{2transport,losses}$:	-	-	To be informed by the transport	Relevant data

Method B, leakage events ($CO_{2\ leakage}$)			infrastructure operator	may be available in verified MRR reporting
Emissions from transportation of CO_2 ($GHG_{T,S}$)	$K_{T,L}$	km	Distance of each one-way trip ("L") travelled by mode of transportation type T	
	$CO_{2\ T,L}$	tonnes CO_2	Amount of CO_2 transported in each one-way trip by mode of transportation type T	
Emissions from transportation infrastructure (GHG_{infra})	$Q_{stat,f}$	GJ	Quantity of fuel type f combusted in stationary sources at the installed infrastructure	
	$Q_{mob,f}$	GJ	Quantity of fuel type f combusted in mobile sources at the installed infrastructure	
	Q_{elec}	MWh	Amount of electricity imported from the grid and consumed at the installed infrastructure	

6. STORAGE OF CO_2

This subsection provides rules and requirements for the quantification of GHG emissions associated to the geological storage of CO_2 in a storage site permitted under Directive 2009/31/EC. A CO_2 capture activity may transfer CO_2 (via a transport pathway) to one or more sites for geological storage.

If CO_2 from sources other than the activity are stored at the same site, then an allocation fraction shall be defined for each storage site S as the fraction of the CO_2 stored at that site in a certification period that comes from the activity:

$F_S = CO_{2_{activity,S}} / CO_{2_{total,S}}$	[31]

where:

F_S = fraction of the CO_2 stored at site S that originates from the activity and is to be used to generate carbon removal units, in %;

$CO_{2\ activity,S}$ = amount of CO_2 from the activity stored at site S to generate carbon removal units in the certification period. This amount must be specified on a mass balance basis;

$CO_{2\ total,S}$ = total amount of CO_2 from all sources stored at site S in the certification period;

S = index of the storage sites.

Carbon removals shall only be recorded for hours during which the storage site was operating without leakage events or significant irregularities. For the purpose of the calculation of CR_{total}, any CO_2 injected in an hour during which leakage events or significant irregularities are identified will be treated as if it had been leaked, and added to the $CO_{2_{storage,losses}}$ term as shown in equation [32]. When available, reporting shall differentiate explicitly between injection during periods with and periods without leakage events or significant irregularities based on measured data. If that data is not available, average values for the amount of CO_2 removal that must be excluded from the calculation of net carbon removal benefit on this basis shall be calculated by multiplying injected CO_2 by the ratio of operating hours during the certification period experiencing leakage or significant irregularities over total operating hours of the storage site.

6.1. QUANTIFICATION OF CO_2 ENTERING THE STORAGE SITE

The amount of CO_2 entering the storage site shall be determined at the entry point or points using a measurement-based approach in accordance with Articles 40 to 45 and 49 of the [MRR].

6.2. APPLICATION OF MASS BALANCE RULES

A mass balance system must be used to trace CO_2 through the transport infrastructure from the capture site to the storage site. The mass balance approach allows the properties of CO_2 transferred into a shared system of transport infrastructure and/or injected at shared storage sites to be allocated to a specified quantity of CO_2 injected at specified storage site without requiring total physical segregation of the activity CO_2 from the other CO_2 or requiring the destination of the physical CO_2 molecules captured by the activity to be predicted using statistical physics.

The basic principles of the mass balance system are:

1. Each quantity of CO_2 entering the transport and storage system may be treated as having been stored or otherwise discharged from the system (by losses or by supply for a non-storage application) once and only once.
2. The sum of the quantities of CO_2 entering or released from storage at any transport infrastructure segment or storage site in a given period must be equal to the sum of the quantities of CO_2 identified as leaving or being stored at that infrastructure segment or storage site in the same period (allowing for any discrepancy associated with the quantity of CO_2 actively in transit or undergoing storage related processes at the end of the period).
3. Contractual arrangements may be used to identify a quantity of CO_2 being injected at a storage site with an equivalent quantity of CO_2 from a carbon removal activity (accounting for losses en-route using the rules in this methodology) that was transferred into a system of shared infrastructure, even though the actual physical location of the CO_2 molecules captured by the activity may be unknown. No other quantity of CO_2 stored by or leaving that system of shared infrastructure may then be identified with the quantity of CO_2 captured by the carbon removal activity.
4. The operator of the carbon removal activity must be able to provide adequate evidence (or arrange for the operators of the transport and/or storage infrastructure to provide adequate evidence) to satisfy the certification body that the mass balance requirements stated here, and any additional requirements imposed by a certification scheme, have been fully satisfied. If it is not possible to confirm that mass balance requirements have been satisfied, then the certification body may not approve the issuance of certificates.

6.3. QUANTIFICATION OF FUGITIVE, VENTED AND LEAKED EMISSIONS OF CAPTURED CO_2

The temporary storage of CO_2 and the injection of CO_2 at the storage site could result in intentional or accidental losses of CO_2 prior to entering permanent storage. If the quantity CR_{total} is calculated based on Equation [4] then these losses must be explicitly quantified.

Fugitive and vented emissions from the storage site shall be calculated in accordance with Annex IV Article 23 Part B1 of the [MRR]. Leaked emissions from the storage complex shall be calculated in accordance with Annex IV Article 23 Part B3 of the [MRR]. In the case of geological storage sites, data regarding fugitive, vented and leaked emissions shall be based on data recorded by the relevant site operator under [MRR]. The total loss of activity CO_2 during storage shall be calculated as:

$$CO_{2_{storage,losses}} = \sum_{S} \left(F_S * \left(\begin{matrix} CO_{2_{fugitive,S}} + CO_{2_{vented,S}} \\ + CO_{2_{leakage,S}} + CO_{2_{irregularity,S}} \end{matrix} \right) \right) \quad [32]$$

where:

F_S = fraction of the CO_2 stored at site S that originates from the activity, in %;

$CO_{2_{fugitive,S}}$ = fugitive CO_2 emissions from the site S, in tonnes CO_2;

$CO_{2_{vented,S}}$ = vented CO_2 emissions from the site S, in tonnes CO_2;

$CO_{2_{leakage,S}}$ = leakage CO_2 emissions from the storage complex at site S, in tonnes CO_2;

$CO_{2_{irregularity,S}}$ = quantity of CO_2 injected at site S during hours in which there was a leakage event or significant irregularity.

At each site S, the sum of the fugitive, vented and pre-injection leakage emissions must be equal to the difference between the measured amount of CO_2 entering the site and the measured amount of CO_2 entering the storage reservoir:

$$CO_{2_{fugitive,S}} + CO_{2_{vented,S}} + CO_{2_{leakage,S}} = CO_{2_{IN,S}} - CO_{2_{total,S}} \quad [33]$$

where:

$CO_{2_{IN,S}}$ = measured total amount of CO_2 entering the site S, in tonnes CO_2;

$CO_{2_{total,S}}$ = measured total amount of CO_2 entering permanent storage at the site S, in tonnes CO_2.

6.4. QUANTIFICATION OF ASSOCIATED GREENHOUSE GAS EMISSIONS

The GHG emissions associated with the injection into a geological storage site shall be calculated:

$$GHG_{storage} = \sum_{S} \left(F_S * \left(GHG_{on-site} + GHG_{inputs} \right) \right) \quad [34]$$

where:

F_S = fraction of the CO_2 stored at site S that originates from the activity, in %;

$GHG_{storage}$ = GHG emissions associated with the injection into a geological storage site, in tonnes CO_2e;

$GHG_{on-site}$ = GHG emissions associated to energy use and operation in the storage site, in tonnes CO_2e;

GHG_{inputs} = GHG emissions associated with the production and use of other inputs used at the storage site, in tonnes CO_2e.

6.4.1. Emissions from the storage site ($GHG_{on-site}$)

The on-site GHG emissions at each site shall be calculated as

$$GHG_{on-site} = GHG_{combustion} + GHG_{electricity} + GHG_{heat} + GHG_{capital}$$	[35]

where:

$GHG_{on-site}$ = GHG emissions associated to energy use and operation in the storage site, in tonnes CO_2e;

$GHG_{combustion}$ = GHG emissions due to fuel consumption at the storage facility, in tonnes CO_2e. Calculated in accordance with the equation [36];

$GHG_{electricity}$ = GHG emissions due to net electricity consumption at the storage facility in tonnes CO_2e. Calculated in accordance with the equation [37];

GHG_{heat} = GHG emissions due to net useful heat consumption at the storage facility, in tonnes CO_2e. Calculated in accordance with the equation [38];

$GHG_{capital}$ = capital emissions from construction and installation of the storage facility, in tonnes CO_2e. Calculated in accordance with the principles detailed in section 4(7.5).

Equations [36], [37] and [38] are described as follows:

$$GHG_{combustion} = \sum_{fuels} Q_{fuel} * EF_{fuel}$$	[36]
$$GHG_{electricity} = \sum_{electricity\ source} Q_{electricity} * EF_{elec}$$	[37]
$$GHG_{heat} = \sum_{heat\ source} Q_{heat} * EF_{heat}$$	[38]

where:

Q_{fuel} = quantity of the fuel consumed in the certification period, expressed in an appropriate unit;

EF_{fuel} = lifecycle emission factor for the fuel consumed, expressed in tonnes of CO_2e per unit, selected in accordance with Section 4(7.4);

$Q_{electricity}$ = net quantity of electricity consumed in the certification period, expressed in an appropriate functional unit;

$EF_{electricity}$ = lifecycle emission factor for the consumed electricity, expressed in tonnes of CO_2 per functional unit, selected in accordance with Section 4(7.4);

Q_{heat} = net quantity of useful heat consumed in the certification period, expressed in an appropriate unit;

EF_{heat} = lifecycle emission factor for the consumed heat, expressed in tonnes of CO_2e per unit, selected in accordance with Section 4(7.4).

6.4.2. Emissions from inputs (GHG_{inputs})

Where there are non-capital inputs consumed by the storage facility (for example chemicals mixed into the CO_2 stream before injection) the emissions associated with the consumption of these inputs during the certification period must be characterised in accordance with the following equation:

$$GHG_{inputs} = \sum_{inputs} Q_{input} * EF_{input} \quad [39]$$

where:

GHG_{inputs} = GHG emissions associated with the production and use of other inputs used at the storage site, in tonnes CO_2e;

Q_{input} = quantity of the input consumed in the certification period, expressed in an appropriate unit;

EF_{input} = lifecycle emission factor for the input consumed, expressed in tonnes of CO_2e per unit, selected in accordance with the rules in Section 4(7.4).

The operator may group any number of inputs whose collective emissions are considered non-material on the basis of a materiality assessment and substitute for them an emission term equal to $1\% * CR_{total}$, i.e. a group of inputs for which, when taking a high-end estimate of possible associated emissions:

$$\sum_{inputs} Q_{input} * EF_{input} < 2\% * CR_{total} \quad [40]$$

6.5. MONITORING AND REPORTING

At certification all activities must propose a monitoring plan detailing the parameters to be monitored and parameters not to be monitored (e.g. default values) and the associated measurement or estimation approaches.

The monitoring plan shall be consistent (to the extent relevant) with the Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council.

Operators shall obtain, record, compile, analyse and document monitoring data, including assumptions, references, activity data and calculation factors in a transparent manner that enables the checking of performance achieved during at the various activity stages. Data shall be monitored continuously where that is practical and proportionate, otherwise operators must establish a frequency of monitoring in the monitoring plan. If the certification body is not satisfied that the frequency of monitoring in a certification period or part of a certification period is adequate to provide an accurate characterisation of delivered net carbon removals then carbon removal units shall not be issued in relation to the affected removals.

Such plan shall include, at minimum, the parameters listed in Table 5.

Table 5 Parameters for inclusion in the monitoring plan

Emission source	Data / Parameter	Data unit	Description	Notes
$GHG_{storage}$	$CO_{2_{IN}}$	tonnes CO_2	Amount of CO_2 entering each relevant storage site for injection	Relevant data may be available in verified MRR reporting
	$CO_{2_{activity,S}}$	tonnes CO_2	Amount of CO_2 from the activity stored at site S to generate carbon removal units in the certification period.	To be calculated following mass balance rules
	$CO_{2_{total}}$	tonnes CO_2	Amount of CO_2 injected for permanent storage at each relevant storage site	Relevant data may be available in verified MRR reporting
$CO_{2_{storage,losses}}$	$CO_{2_{vented,S}}$	tonnes CO_2	Amount of CO_2 vented at each relevant storage site	Relevant data may be available in verified MRR reporting

	$CO_{2_{fugitive,S}}$	tonnes CO_2	Amount of CO_2 fugitives at each relevant storage site	Relevant data may be available in verified MRR reporting
	$CO_{2_{leaked,S}}$	tonnes CO_2	Amount of CO_2 leaked at each relevant storage site	Relevant data may be available in verified MRR reporting
	$CO_{2_{irregularity,S}}$	tonnes CO_2	Amount of CO_2 injected during periods of leakage events or irregularities at each relevant storage site	Relevant data may be available in verified MRR reporting
$GHG_{combustion}$	Q_{fuel}	[appropriate unit]	Amount of fuels used for combustion at storage site for all relevant storage sites	Relevant data may be available in verified MRR reporting
$GHG_{electricity}$	$Q_{electricity}$	MWh	Net amount of electricity consumed at each storage site, for all relevant storage sites	
GHG_{heat}	Q_{heat}	MWh	Net amount of useful heat consumed at storage site, for all relevant storage sites	
GHG_{inputs}	Q_{input}	[appropriate unit]	Amount of input consumed	
$GHG_{capital}$	-	-	To be informed by the operator	

7. COMMON PRINCIPLES FOR QUANTIFICATION

7.1. ACCURACY, CONSERVATIVENESS AND TRANSPARENCY

Carbon removal activity operators shall ensure that emission determination is neither systematically nor knowingly inaccurate. They shall identify and reduce any source of inaccuracies as far as possible. They shall exercise due diligence to ensure that the calculation and measurement of emissions exhibit the highest achievable accuracy. Certification schemes may choose to facilitate accurate emissions calculations by further specifying monitoring requirements, required measurement techniques, and calculation factors.

Operators shall quantify the carbon removals achieved by carbon removals activities conservatively, meaning that if there is uncertainty in the calculation of total carbon removals then operators should adopt calculation approaches that are more likely to lead to an underestimate than an overestimate, and that if there is uncertainty in the calculation of associated GHG emissions then operators should adopt approaches that are more likely to lead to an overestimate than an underestimate.

Operators shall obtain, record, compile, analyse and document monitoring data, including assumptions, references, activity data and calculation factors, in a transparent manner that enables the reproduction of the determination of emissions by the certification bodies, certification schemes and competent bodies.

7.2. NET CONSUMPTION OF USEFUL HEAT AND/OR ELECTRICITY

Some process configurations for carbon removal activities will provide opportunities for energy to be recovered from new processes. This energy recovery may lead to a reduction in the additional net consumption of a specified type of energy (e.g. if electricity is used to compress flue gas prior to CO_2 capture and then electricity is generated by running the output pressurised N_2 gas through a turbine) or a shift in net demand from one energy type to another (for example in some capture configurations the capture unit could consume electricity but become a source of recovered heat so that net electricity consumption is positive but net useful heat for the capture process is negative).

Where the specifications call for net electricity or net useful heat consumption to be calculated, the overall change in demand after these recovery processes have been implemented shall be assessed. The calculation of net consumption always excludes any electricity or heat both produced and consumed on-site at the capture facility or the storage facility or for the transport infrastructure. It is therefore the difference between the quantity of electricity or heat imported from outside the facility for use directly by the activity and the quantity of electricity or heat recovered from processes directly required for the activity that is recovered and exported. Emissions associated with electricity or heat generated on-site at a facility are accounted separately by consideration of the fuel consumed.

In the case that there is a net increase in availability of a type of energy as a result of energy recovery after implementing the capture activity, the quantity (Q_{heat} or $Q_{electricity}$) may be reported as a negative value, so that there is a negative term in $GHG_{associated}$ for that type of energy. It is not allowable to include in the calculation of net electricity or net useful heat consumption any heat or electricity that is produced specifically for export from the facility rather than recovered from a necessary process. Certification bodies must carefully review the process assumptions that give rise to any negative GHG emission terms of this sort. If a certification body is not satisfied that net energy use is correctly characterised then it should withhold certification.

7.3. ADDITIONAL BIOMASS CONSUMPTION

Additional biomass consumption refers to the biomass that is consumed specifically to provide energy for the carbon capture process.

7.3.1. Bioenergy facilities generating only electricity

In the case that carbon is captured at a bioenergy facility generating only electricity and some of this own electricity is consumed to power the carbon capture process, the additional biomass consumption $Q_{biomass}$ shall be calculated from the net amount of own electricity consumed following equation [41].

$$Q_{biomass} = \frac{Q_{el}}{\eta_{el}}$$	[41]

where:

Q_{el} = the net consumption of own electricity;

η_{el} = the electrical efficiency of the facility, defined as the annual electricity produced, including the electricity consumed for carbon capture, divided by the annual fuel input based on its energy content.

7.3.2. Bioenergy facilities generating only heat

In the case that carbon is captured at a bioenergy facility generating only heat and some of this own heat is consumed to power the carbon capture process, the additional biomass consumption $Q_{biomass}$ shall be calculated from the net amount of own heat consumed following equation [42].

$$Q_{biomass} = \frac{Q_{heat}}{\eta_{heat}}$$	[42]

where:

Q_{heat} = the net consumption of own heat;

η_{heat} = the heat efficiency of the facility, defined as the annual heat produced, including the heat consumed for carbon capture, divided by the annual fuel input based on its energy content.

7.3.3. Bioenergy facilities generating a mix of heat and electricity

In the case that carbon is captured at a bioenergy facility generating both electricity and heat, consumption of own energy to power the capture process may lead to a change in the output mix of electricity and heat (for example if electricity is consumed and some of that energy is then recovered as heat), making it more difficult to identify the additional biomass consumption required. In this case, the additional biomass consumption $Q_{biomass}$ shall be calculated from the net amount of own electricity and own heat consumed following equation [43] (noting that if output of one form of energy is increased at the expense of reducing the other, one of these net consumption values may be negative, though the resulting value $Q_{biomass}$ may never be negative).

$$Q_{biomass} = \frac{(C_{el} * Q_{el} + C_{heat} + Q_{heat})}{(C_{el} * \eta_{el} + C_{heat} * \eta_{heat})}$$	[43]

where:

Q_{el} = the net consumption of own electricity;

η_{el} = the electrical efficiency of the facility, defined as the annual electricity produced, including the electricity consumed for carbon capture, divided by the annual fuel input based on its energy content.

Q_{heat} = the net consumption of own heat;

η_{heat} = the heat efficiency of the facility, defined as the annual heat produced, including the heat consumed for carbon capture, divided by the annual fuel input based on its energy content;

C_{el} = The fraction of exergy in the electricity, set to 1;

C_{heat} = Carnot efficiency (fraction of exergy in the useful heat), defined as $C_{heat} = \frac{(T_{heat} - T_0)}{T_{heat}}$ where T_{heat} is the average temperature of the consumed heat in °K (degrees Kelvin), and T_0 is 273.15 °K.

7.4. EMISSION FACTORS

7.4.1. Electricity

The emission factor applied in the calculation of emissions associated with any electricity consumption under equations [10], [20] and [37] for activities certified to these specifications ($EF_{electricity}$) shall be calculated following the rules in paragraph 5 and 6 of Part A of the Annex to Commission Delegated Regulation (EU) 2023/1185 (the rules to set emissions factors for electricity used in the production of renewable fuels of non-biological origin, RFNBOs, and of recycled carbon fuels, RCFs), with two exceptions:

1. The calculation period for the electricity emission factor may be less than a calendar year if the certification period includes only part of a given calendar year.
   - If the certification period falls entirely within a single calendar year, then the electricity emission factor shall be calculated based on that period.
   - If the certification period includes one or more full calendar years, and parts of up to two calendar years, then emissions factors shall be calculated for each of the calendar years and each of the part calendar years, and utilised in respect of the calculation of emissions from electricity consumption in those periods.
   - If data is not available to allow an emission factor to be calculated for a given part of a calendar year then the electricity emission factor for that period may be set equal to the emission factor calculated for the full relevant calendar year.

2. For the period until 31 December 2029, temporal correlation of renewable electricity generation with consumption may be assessed on an annual basis instead of on a monthly basis.

The use of these rules ensures that the indirect emissions effect associated with competing demands for electricity is accounted for in the calculation of $GHG_{associated}$. These rules provide a basis for operators to treat consumed electricity as having zero emissions if it meets the criteria in Delegated Regulation (EU) 2023/1184 to be identified as fully renewable, to treat consumed electricity that is not identified as fully renewable as having zero emissions if the consuming facility operates in a mode that limits load hours below a defined level, or to treat consumed electricity as having the marginal emission intensity on the grid at the time it is consumed or the average emission intensity for electricity produced in the country or bidding zone in which the activity is located. Operators may choose the reporting basis for each source of consumed electricity independently, i.e. they do not have to use the same basis for setting the emission factor for electricity consumed in different locations.

Certification schemes may choose to facilitate emissions calculations by providing lists of up to date electricity emissions intensity values at the bidding zone level.

Note on temporal correlation: *For electricity supplied over a grid, Article 6 of Commission Delegated Regulation (EU) 2023/1184 requires the demonstration of temporal correlation between production of renewable electricity and consumption of electricity by a consumer in order for the consumer to claim that the electricity consumed over the grid is fully renewable, which is one way for the consumer to assign that electricity an emission factor of zero. The demonstration of temporal correlation is required on a monthly basis until 31 December 2029 and on an hourly basis from 1 January 2030. For the CRCF, it is proposed to allow operators to use annual matching until 31 December 2029, after which (as for RFNBO production) a switch to hourly matching would be required. .*

The Commission will assess by December 2028 the feasibility and impact on activity costs and net carbon removal benefit of requiring a temporal correlation on an hourly basis in the specific context of permanent carbon removal activities. This assessment will inform future development of specifications for DACCS and BioCCS activities.

7.4.2. Heat

The emission factor applied in the calculation of emissions associated with any heat consumption under equations [11], [21] and [38] shall be:

a) In the case that heat is recovered from a process that is part of the activity, there are no additional emissions (but there may be emissions that must be accounted and that are associated with the process that generated the heat that is then recovered);

b) In the case that heat is generated by combustion of fossil fuels, the lifecycle emission factors for fossil fuel supply and combustion in the latest version of the document *Definition of input data to assess GHG default emissions from biofuels in EU legislation* published by the Joint Research Centre divided by the thermal efficiency of the heat generation process;

c) In the case that heat is generated from biomass resources, emission factors for the supply and combustion (excluding CO_2 from combustion) of the biomass used,

calculated using the rules in Annex VI of Directive (EU) 2018/2001 ('the RED III'), divided by the thermal efficiency of the heat generation process;

d) In the case that heat is generated from non-biomass renewable sources (such as solar or geothermal heat), zero;

e) In the case that heat is provided from nuclear energy, zero;

f) In the case that heat is recovered from a process from which heat was not previously recovered (i.e. not recovered until a maximum of three months prior to the commencement of the carbon removal activity), zero;

g) In the case that heat is recovered from a process from which heat was already recovered or from a new process (i.e. a process coming into operation less than 6 months prior to the commencement of the carbon removal activity), and that process is not directly related to the carbon removal activity (i.e. the emissions associated with the energy or fuel supplied to that process are not considered within $GHG_{associated}$) the indirect effect associated with competing demands for waste heat shall be considered by setting the emission factor to the EU ETS benchmark emission factor for heat;

h) In the case that heat is supplied from a heat network, set to the EU ETS benchmark emission factor for heat.

7.4.3. Biomass

When biomass or biomass-derived fuel is consumed for an activity, any CO_2 produced by chemical processes from the carbon atoms contained in the biomass shall be treated as having zero associated CO_2 emission, but the supply chain emissions for provision of the biomass must be accounted for, and any non-CO_2 emissions associated with biomass combustion (primarily CH_4 and N_2O) must be accounted.

The emission factor applied in the calculation of supply chain emissions associated with any consumption of biomass for the activity shall be calculated following the rules for calculating the GHG emissions associated with biomass supply as delineated under Annex V and Annex VI of [the RED III], considering the emissions up to the point of consumption associated with the terms e_{ec}, e_l, e_p, and e_{td} as defined in those annexes, and converting where necessary from emissions per unit of energy produced by a bioenergy facility to emissions per unit of feedstock consumed. Emissions for transport of the biomass raw materials to the capture facility shall be calculated based on the actual distance travelled and mode of transport, the disaggregated default emissions values listed for the e_{td} term shall not be used. While indirect land-use change (ILUC) emissions are within the scope of the calculation of $GHG_{associated}$, it is not expected that there would be any significant ILUC emission associated with the increase in biomass consumption required to provide on-site heat and/or electricity used for the capture process specifically, as it is not considered likely that this heat and/or electricity would be supplied by consumption of the resources (cereals and starch-rich crops, sugars, or oil crops) listed in Part A of that annex, and as Part B of that annex confirms that feedstock not listed in Part A of the annex are considered to have estimated ILUC emissions of zero. There is therefore no requirement to report ILUC emissions.

7.4.4. Inputs and fuels

Where the specifications for an activity require the calculation of emissions associated with the use of inputs to that activity, including fossil fuels and materials used in the construction of capital equipment, lifecycle emission factors for those inputs shall be taken either from lists of defaults provided by the certification schemes or from the sources in the following data

hierarchy list, sourcing data from the first source in the list from which it is available and using where possible the most recent available version of the source:

1. Part B of the Annex to Commission Delegated Regulation (EU) 2023/1185;
2. The JRC document, "Definition of input data to assess GHG default emissions from biofuels in EU legislation";
3. The JEC Well-to-Wheels report;
4. The ECOINVENT database, version 3.5 or a more recent version;
5. Official sources such as the IPCC, IEA or government;
6. Other reviewed sources such as the E3 and GEMIS database; peer reviewed publications.

The ECOINVENT database is a proprietary data source, and as such not all operators will have access to this data. If an operator does not have access to ECOINVENT it is therefore permitted to take data from sources at level 5 or 6 of the hierarchy.

The lifecycle emission factors should reflect the emissions associated with supplying those inputs up to the point of use by the activity. If necessary, lifecycle emissions values taken from these sources shall be adjusted to exclude any carbon contained within the input material itself. If such carbon is oxidised and emitted as a result of processes associated with the activity this shall be counted as an emission source directly. The use of data from divergent sources may lead to slight inconsistencies in the scope of lifecycle accounting applied to different inputs, e.g. the JEC Well-to-Wheels study does not consider capital emissions associated with fuel production. Operators are not expected to recalculate data from these sources to achieve full consistency in lifecycle scope across the utilised input data.

Certification schemes may choose to facilitate the quantification of emissions associated with the use of inputs and/or fuels by providing lists of default emission factors. This may include tabulating emission factors available in the data hierarchy above for the convenience of operators. If there is uncertainty in the best estimate of these values or if some degree of variability can be expected in these values (e.g. variability in the emissions intensity of processes operated by different producers) then such default emission factors must be set conservatively, i.e. must be set in such a way that the use of those default emission factors is likely to lead to a marginal underestimation of delivered net carbon removals. Where standard deviation is quoted for a value, the default should be set to the mean value plus one standard deviation. Where a 95% confidence interval is quoted for a value, the default value should be set halfway between the mean value and the 95% confidence limit. These adjustments must always be made in the direction that reduces the estimated net carbon removal benefit for an activity. Where default values are made available the certification scheme must also document the basis for treating these values as conservative.

7.4.5. Transport

Emissions from transport, whether of CO_2 or of bulk materials, may be calculated either based on assessment of the fuel consumption and consequent emissions associated with the specific vehicles/routes utilised or based on conservative default factors provided by the certification scheme. If certification schemes choose to facilitate applications by providing additional conservative default emission factors for specific forms of CO_2 transport, they must clearly document the basis for these values and demonstrate that they are conservative.

Where default values are not used, the operator may either undertake the calculation by recording the actual fuel consumption of the vehicles or other infrastructure utilised or as the product of the average GHG emissions associated with operating the specific vehicle or infrastructure (in gCO_2e/tkm) and the distance travelled. GHG emission factors for fuel consumption must be set on a lifecycle basis (i.e. including upstream emissions). GHG emission factors for vehicles transporting CO_2 must account for the mass of the CO_2 containment equipment and for energy expenditures to compress/liquefy the CO_2 and maintain it in that state. Operators must assume that vehicles used to transport CO_2 or bulk materials will undertake an empty return trip and must account for the emissions associated with that return trip, unless able to demonstrate that the return trip will be used to provide another useful transport service (in which case the return emissions allocated to the activity may be treated as zero).

7.5. CAPITAL EMISSIONS

If the specifications for the activity require the consideration of capital emissions associated with one or more facilities then:

a) If any facility first came into operation or has been expanded or refitted within 20 years of the certification date of the activity, or will be expanded or refitted within the activity period, the capital emissions associated with that construction/expansion/refit of that facility must be considered;

b) For any other facility, the capital emissions shall be considered to be zero;

c) A materiality assessment shall be undertaken for the sum of all capital emissions across all relevant facilities. If the certification body concludes on the basis of this assessment that capital emissions may be material, then the capital emissions must be assessed;

d) Any capital emissions associated with non-biomass renewable energy generating equipment shall be excluded from the calculation;

e) Capital emissions shall only be assessed for the part of facilities/the equipment that is directly required for the performance of the activity – so, for example, in the case of capture equipment at a bioenergy plant, capital emissions must be assessed of the capture unit but not for the parts of the facility required only for energy-generation and supply.

If capital emissions must be assessed, then the total capital emissions for each facility or facilities shall be calculated by taking an inventory of the construction materials utilised and fuel and energy consumed in the construction of the facility and summing the associated emissions. Emissions factors used in assessing capital emissions should consider the full lifecycle of the materials and energy utilised. The calculated capital emissions for each facility shall then be amortised by dividing them across twenty years. In the case that a facility has equal or lower material requirements for construction than a previously constructed facility of the same type, then it is permissible for the operator to use the capital emission for that previous facility as an estimate of capital emissions for the new facility.

Certification schemes may choose to facilitate emissions calculations by providing conservative capital emissions factors that may be used for specific activity types/activity stages/facility sizes as an alternative to undertaking a project-specific materiality assessment or full calculation. Such conservative values should be set in such a way that they can be reasonably expected to be higher than the actual capital emissions for the relevant facility in at

least 95% of cases. If providing a default-based option, the certification scheme must clearly document the basis for treating the provided values as conservative.

> ***Note on amortisation:*** *A twenty-year amortisation period is suggested for capital goods, as indicated in the Technical Assessment Paper, as it is likely to be comparable to the intended lifetime of new installations and is consistent with the amortisation on land use change accounting under the RED.*

This amortised emission shall be added to the associated GHG emissions for the activity for each year until the twentieth year following the year in which the facility came into operation/was expanded/was refitted, as relevant:

$$GHG_{capital} = \frac{(GHG_{combustion} + GHG_{electricity} + GHG_{heat} + GHG_{materials})}{20} \quad [42]$$

where $GHG_{combustion}$ shall be calculated as in Equation [19], $GHG_{electricity}$ shall be calculated as in equation [20], GHG_{heat} shall be calculated as in Equation [21] and $GHG_{materials}$ shall be calculated in accordance with the following equation:

$$GHG_{materials} = \sum_{electricity\ source} Q_{materials} * EF_{materials} \quad [43]$$

where:

$Q_{materials}$ = quantity of materials utilised in the construction of the facility, expressed in tonnes;

$EF_{materials}$ = lifecycle emission factor for the utilised materials, expressed in tonnes of CO_2 per tonne of material, selected in accordance with section 4(7.5).

7.6. MEASURED DATA AND UNCERTAINTIES

Where data is measured, this measurement should be undertaken in accordance with relevant best practices, using methods based on relevant EN standards where applicable. Measurements, including measurements of CO_2 flows (for example at the exit point between the capture facility and the first transport infrastructure segment, or at the injection point) should be undertaken in a way consistent with the requirements of Article 42 of [the MRR]. Certification schemes may choose to facilitate consistent measurement practices by providing additional guidelines for specific types of measurement.

7.6.1. Assessment of uncertainty

Where measured, estimated and/or default data are used as the basis for calculations of sources or sinks, the operator shall assess the uncertainty introduced into the calculation of net carbon removals. Certification schemes shall facilitate the consistent assessment of uncertainty by setting requirements for each type of activity, having regard to the principles for combining uncertainties of section 3 of chapter 6 ("Quantifying Uncertainties in Practice")

of the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.[2] In setting these requirements, certification schemes must balance the need to provide a meaningful characterisation of uncertainty and to respect the principle of conservatism with the need to avoid creating a disproportionate burden for operators.

If the total resulting uncertainty estimate is ≤ ± 2.5%, then no adjustment is necessary (i.e. $F_C = 1$).

If the total resulting uncertainty estimate is > ± 2.5% and ≤ ±5%, then a conservatism factor of 0.975 shall be applied to the net carbon benefit (i.e. $F_C = 0.975$).

If the total resulting uncertainty estimate is > ± 5% and ≤ ±10%, then a conservatism factor of 0.9 shall be applied to the net carbon benefit (i.e. $F_C = 0.9$).

If the total resulting uncertainty estimate is > 10% and ≤ ±20%, then a conservatism factor of 0.8 shall be applied to the net carbon benefit (i.e. $F_C = 0.8$).

If the total resulting uncertainty estimate is greater than ±20% than the activity may not be issued units for that certification period.

Certification schemes may choose to facilitate uncertainty calculations by providing more detailed instructions on the calculation of uncertainty for specific activity types.

7.7. MONITORING AND REPORTING

At certification all activities must propose a monitoring plan detailing the parameters to be monitored and the associated measurement or estimation approaches.

The monitoring plan shall be consistent with the Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council. In particular, the monitoring plan:

- Shall consist of at least those elements required by Paragraph 1 of Annex I of [the MRR] that are relevant to the activity.
- Shall apply the minimum frequencies for analysis listed in Annex VII of [the MRR] where applicable.
- Shall apply the standard for quality assurance set by Article 60 of [the MRR].
- Shall include a record keeping requirement for all relevant data and information consistent with the record keeping requirements set by Article 67(1) of [the MRR].

Certification schemes may choose to facilitate the development of monitoring plans by providing additional guidance specifying which elements must be included for each type of activity, specifying minimum measurement frequencies for measurements not listed in Annex VII of [the MRR], and/or specifying best practice requirements for quality assurance.

Operators shall obtain, record, compile, analyse and document monitoring data, including assumptions, references, activity data and calculation factors in a transparent manner that enables the checking of performance achieved during at the various activity stages, and report this information to the certification bodies and/or certification schemes when requested.

[2] https://www.ipcc-nggip.iges.or.jp/public/gp/english/

Each parameter monitored shall be accompanied with the following information:

a) Area / Department responsible for collection and archiving;

b) Data source;

c) Equipment used for monitoring, including details on accuracy and calibration;

d) Monitoring frequency;

e) QA/QC Procedures;

f) Brief description, including measurement methods and procedures;

g) Reliability.

All measurements shall be conducted with calibrated measurement equipment according to industry standards, following the requirements in Section 3 of Chapter III of [the MRR] where applicable, and in line with relevant [EU ETS] requirements where applicable.

7.7.1. Confirmation of origin of CO_2 stream

Operators shall provide access, immediately at request, to representatives of certification bodies, certification schemes or relevant national authorities to allow C14 testing of the CO_2 stream leaving the facility to confirm its atmospheric or biogenic origin. Certification scheme must operate programmes of unannounced random testing on the CO_2 streams leaving certified facilities with sufficient frequency to provide assurance that streams are correctly identified as atmospheric/biogenic, and must disclose immediately to the Commission and to any relevant national authorities any evidence of fossil CO_2 streams being mislabelled as atmospheric/biogenic. Certification schemes should use a risk-based approach in determining the appropriate frequency for random testing.

SECTION 5: STORAGE MONITORING AND LIABILITY

Where CO_2 is stored in geological formations, the CO_2 shall be permanently stored in storage site for which a storage permit has been granted in compliance with the requirements of Directive 2009/31/EC. The storage site operator is subject to the liability provisions laid down by Directive 2003/87/EC and Directive 2009/31/EC of the European Parliament and of the Council.

SECTION 6: SUSTAINABILITY REQUIREMENTS

(i) The activity shall comply with the criteria set out in Appendix A to Annex 1 to Commission Delegated Regulation (EU) 2021/2139.

(ii) Any potential risks due to the activity to the good status or the good ecological potential of bodies of water, including surface water and groundwater, or to the good environmental status of marine waters from the researched technology, product or other solution shall be evaluated and addressed. In the case that pollutants that are scrubbed from flue gases in order to reduce air pollution may be released to a body of water, the air pollution benefit and the availability of alternative discharge strategies should be taken into consideration when evaluating the impact on water quality.

(iii) Any potential risks to the circular economy objectives from the activity shall be evaluated and addressed, by considering the types of potential significant harm as set out in Article 17(1), point (d), of Regulation (EU) 2020/852.

(iv) Any potential risks to generate a significant increase in the emissions of pollutants to air, water or land from the researched technology, product or other solution shall be evaluated and addressed.

(v) Any potential risks to the good condition or resilience of ecosystems or to the conservation status of habitats and species, including those of Union interest, from the researched technology, product or other solution shall be evaluated and addressed.

(vi) All biomass/biomass-derived fuel that is used to generate the CO_2 captured by the activity and any additional biomass/biomass derived fuel consumed to produce energy for the activity shall comply with the sustainability requirements detailed in Article 29 of [the RED III], as further specified in the following subparagraphs:

a. Where the text of Article 29 of [the RED III] sets requirements that must be met in order for "biofuels, bioliquids and biomass fuels" to be "taken into account for the purposes referred to in points (a), (b) and (c) of the first subparagraph of paragraph 1 [of the RED III]", in the context of the CRCF these requirements shall be applied by the certification body also to biomass/biomass-derived fuel consumed in relation to an activity that seeks to generate carbon removal units, even if the activity does not generate renewable energy that is taken into account under the RED III.

b. All biomass/biomass-derived fuel used must be recorded by the operator in batches grouped by sustainability characteristics (feedstock; whether the biomass/biomass-derived fuel constitutes a waste or residue under the RED III; the GHG intensity assigned to the supply of the biomass/biomass-derived fuel).

c. The requirements of paragraph 10 of Article 29 apply only in the case of a capture activity taking place at a facility producing heat or electricity or a biofuel or biogas; in those cases the requirements must be satisfied in relation to that produced heat, electricity, biofuel or biogas.

d. In the case that the biomass/biomass-derived fuel is produced from wastes or residues other than agricultural, aquaculture, fisheries and forestry residues, it must meet only the greenhouse gas emissions saving criteria laid down in paragraph 10 of Article 29, where required by the subparagraph preceding this one. All other

biomass/biomass derived fuels must meet the requirements of paragraphs 2 to 7 and 10 of Article 29.

Voluntary schemes approved by the Commission in relation to the provision of accurate data for the demonstration of compliance with requirements of [the RED III] (cf. Paragraph 4 of Article 30 of [the RED III]) shall be treated as providing accurate data in relation to the demonstration of compliance with these requirements.

(vii) Where the process that generates the CO_2 captured by the activity generates energy that is taken into account under the RED III:

a. The certification body shall verify that the national implementation of [the RED III] applies to the operator, and that the operator complies with this national implementation.

b. The certification body shall verify that the operator complies with any measures in national implementations of [the RED III] that are introduced to ensure that woody biomass is used according to the list of priorities established in paragraph 3 of Article 3 of [the RED III].

c. If the operator receives direct financial support for the process from the Member State, the certification body shall verify that the biomass consumed does not include saw logs, veneer logs, industrial grade roundwood, stumps and roots.

(viii) Any biomass from which emitted CO_2 is captured shall be consumed with the primary purpose of generating a product other than CO_2 for capture, and the process shall not be adjusted in order to increase the generation of CO_2 to allow it to be captured.

(ix) The biomass from which emitted CO_2 is captured must not be identified as a high indirect land use change-risk feedstock under the RED III.

In order to ensure the avoidance of unsustainable demand of biomass raw material, where the activity involves CO_2 capture from a facility (other than a waste to energy facility), where the primary purpose of biomass consumption is to produce heat and/or electricity and that was already operational at least a year before the start of the activity period, the activity operator shall demonstrate that the nameplate biomass consumption capacity of the facility has not increased by more than the amount necessary to supply energy for the capture process, as compared to the nameplate capacity on whichever date is later out of the date on which the facility became operational and the date [three years] prior to the start of the activity period. This includes facilities at which biomass is combusted for heat and/or power for onsite use for an industrial process.

This restriction on capacity increase is not applicable to waste-to-energy facilities combusting wastes or residues other than agricultural, aquaculture, fisheries and forestry residues. There is no restriction on capacity increase for facilities using biomass for non-energy applications or for energy applications where heat and or electricity are not the primary outputs. For example, there is no capacity restriction on the capacity of fermentation vessels at breweries, whiskey distilleries or ethanol plants producing ethanol as a transport fuel. The restriction on capacity increase does not apply in cases in which biomass is used as part of a chemical reaction in an industrial process aimed at producing a product other than heat or electricity, even if energy is also extracted from the biomass in this process, for example the case that CO_2 is captured from biochar used as a coke substitute at a steel mill.

Where the activity takes place at a newly constructed facility that became operational not more than twelve months before the start of the activity period, it must be demonstrated that if

the facility had been constructed without carbon capture capacity it would still be economically viable, i.e. that the net present value would be positive for a version of the facility without the cost of carbon capture or the revenue from carbon removal units or any other support predicated on the delivery of carbon removals.

SECTION 7: INFORMATION TO BE INCLUDED IN THE CERTIFICATE OF COMPLIANCE

The certificate of compliance for activities certified under the DACCS and BioCCS specifications shall include the information listed below. The certificate of compliance shall be issued after the certification audit and updated following each recertification audit. At an initial certification audit this information should reflect expectations for the whole activity period. Operators shall not be penalised if details of the activity diverge from these initial expectations during the activity period. At re-certifications this information should reflect the actual recorded outcomes of the certification period immediately preceding the audit. All information included in the certificate of compliance must be checked by the certification body. Certification schemes may choose to require further public reporting from operators in addition to the information included in the certificate of compliance and registry.

(a) The name of the activity and whether it is a DACCS or BioCCS activity. The name and contact details of the operator responsible for the activity. The practices and processes involved in the activity, which shall include:

- For DACCS activities, whether the activity uses a solid or liquid CO_2 capture process;
- For BioCCS activities, the nature of the process that gives rise to the captured biogenic CO_2 stream and the biomass feedstock or feedstock mix consumed (including % contribution of each feedstock to the resulting CO_2 stream), disaggregating feedstock to the level required in RED III reporting. Operators must also include explicit identification of:
  - The fraction of the CO_2 stream that comes from saw logs for which no temporary carbon removal units have been cancelled;
  - The fraction of the CO_2 stream that comes from saw logs for which temporary carbon removal units have been cancelled;
  - The fraction of the CO_2 stream that comes from veneer logs for which no temporary carbon removal units have been cancelled;
  - The fraction of the CO_2 stream that comes from veneer logs for which temporary carbon removal units have been cancelled;
  - The fraction that comes from feedstock identified as wastes and residues under the RED III;
  - The fraction that comes from mixed material that may include

industrial grade roundwood, stumps and roots;

- The fraction that comes from material that can be verified as not including saw logs, veneer logs, industrial grade roundwood, stumps and roots.

Note that these fractions may not be mutually exclusive.

(b) The location of the activity, including geographically explicit location of the capture site (activity boundaries), respecting 1:5000 mapping scale requirements for the Member State;

(c) The duration of the activity period, including start date and end date;

(d) The name of the certification scheme;

(e) The name, address and logo of the certification body;

(f) The unique number or code of the certificate of compliance issued by the certification scheme;

(g) The place, date of issuance and validity period of the certificate of compliance. For a certification audit the validity period is the first 12-month certification period. For a re-certification audit the validity period is the preceding 12-month certification period, plus the subsequent 12-month certification period if the activity period has not yet ended;

(h) Reference to the applicable certification methodology operated by the certification scheme;

(i) The permanent net carbon removal benefit, NCR_P, in tonnes CO_2e, as specified in Section 4(1);

(j) The carbon removals under the baseline in tonnes CO_2, $CR_{baseline}$, as specified in Section 4(1) (this term shall always be zero for DACCS and BioCCS activities);

(k) The total carbon removals CR_{total} in tonnes CO_2, as specified in Section 4(1). This shall be accompanied by a breakdown of the stored CO_2 across each of the identified storage sites;

(l) The increase in direct and indirect emissions $GHG_{associated}$ in tonnes CO_2e, as specified in Section 4(1). This shall be accompanied by a breakdown of the term $GHG_{associated}$ into the terms $GHG_{capture}$, $GHG_{transport}$ and $GHG_{storage}$, with each of these three terms further disaggregated to identify:

- The contribution of each greenhouse gas (CO_2, CH_4, N_2O, other);
- What fraction of the emissions the operator believes to have been reported under the EU ETS/ETS2. In the absence of evidence to the contrary, the operator may assume that emissions in the terms $GHG_{transport}$, $GHG_{electricity}$, GHG_{heat}, $GHG_{capital}$, and $GHG_{storage}$ are reported under the ETS, and that emissions under the terms GHG_{bio} and $GHG_{bio\text{-}storage}$ have not been reported under the ETS. In the absence of evidence to the contrary emissions under the

term $GHG_{combustion}$ at the storage facility may be assumed to be reported under the ETS, but emissions under the term $GHG_{combustion}$ at the capture facility should be assumed not to be reported. Emissions under the term GHG_{inputs} should be considered based on the operator's understanding of where the inputs were produced and whether the relevant industry falls under the scope of the EU ETS.

(m) The duration of the monitoring period of the activity. As the monitoring period is dependent on the future data of transfer of responsibility for the utilised storage sites to the relevant national authorities, this may be reported based on the latest of the expected dates of transfer of responsibility for the utilised storage sites;

(n) The amount of biomass used and confirmation of the voluntary scheme or other assurance basis used prove of compliance with the minimum sustainability requirements;

(o) A reference to any other international or national certification of the activity, including the unique certification number or code;

(p) The quantity and validity of certified units;

(q) An identification of the major uncertainties in the calculation of permanent carbon removal benefit and a short description of measures taken to ensure that the permanent carbon removal is calculated conservatively;

(r) Acknowledgement and description of any state aid received by the project.

(s) The quantity, if any, of CO_2 that is captured in association with the activity and that is stored with recognition outside the CRCF framework (e.g. CO_2 stored and certified under CORSIA).

SECTION 8: INFORMATION TO BE INCLUDED IN THE ACTIVITY PLAN

Prior to the initial certification audit the operator must submit an activity plan to the certification body. The activity plan must include a detailed description of the activity, including its location and operator and start and final dates of the activity. The description must include details of the activity's compliance with these specifications.

In particular, the activity plan must include:

1. The information required for the Certificate of Compliance.
2. A general description of the project and the technologies to be utilised.
3. A description of the transport infrastructure that the activity expects to use to transfer CO_2 from the capture facility to the storage site(s), including a description of the operator's understanding of the transport infrastructure segments involved.
4. Details of all entities other than the operator that will be involved in delivery of the activity. For example, if the expected storage site operator(s) is/are different to the activity operator the details of the storage site operator(s) should be provided.
5. Identify and demonstrate compliance of the project with all and any relevant local, regional and national laws, statutes and regulatory frameworks.

6. A description of measures that will be taken by the activity to minimise the risk of leakage.
7. A list of emissions sources and sinks that are considered relevant to the activity.
8. An explanation of how the activity will ensure compliance with the sustainability requirements.
9. A description of the required assessment of uncertainty.
10. A statement of commitment to compliance with the CRCF requirements on double counting.
11. The monitoring plan.
12. Any other information required by the certification scheme.