Electrical Utilities Criteria

The Electrical Utilities Eligibility Criteria of the Climate Bonds Standard & Certification Scheme

Draft for public review

NOTE: *These Criteria can be used to certify Use-of-Proceeds Instruments, Sustainability-Linked Debt Instruments, Assets and Entities per the Climate Bonds Standard v4.0*

Revision	Date	Summary of Changes
Rev. 0.1	05 December 2023	Draft for public review

Acknowledgements

Climate Bonds gratefully acknowledges the Technical and Industry Working Group members who provided their time and expertise during the development of these Criteria. The full list of members are provided in ***Appendix D***.

Special thanks are given to ***Dr Ana Díaz Vazquez***, the Global Energy transition lead at Climate bonds, and ***Francisco Moreno Castro*** for coordinating the development of the Criteria through the Technical Working Group.

The Industry Working Group provided critical and useability focused consultation and feedback on the Criteria, but this does not automatically reflect endorsement of the criteria by all members.

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1 Introduction

1.1 The Climate Bonds Standard

Investor demand for climate bonds is strong and is expected to increase in line with the delivery of quality products into the market. However, investor concerns about the credibility of green labelling are also growing. Standards, assurance & Certification will be essential to improve confidence and transparency, which in turn will enable further strong growth in the market.

Today, the Climate Bonds Standard and Certification Scheme is an easy-to-use screening tool that provides a clear signal to investors and intermediaries on the climate integrity of Certified Climate Bonds.

A key part of the Standard is a suite of sector-specific eligibility Criteria. Each sector-specific Criteria sets climate change benchmarks for that sector that are used to screen debt instruments, assets and/ or entities, so that only those that have climate integrity, either through their contribution to climate mitigation, and/or to adaptation and resilience to climate change, will be certified.

These sector-specific Criteria are determined through a multi-stakeholder engagement process, including a technical working group (TWG) and an industrial working group (IWG), convened, and managed by Climate Bonds, and are subject to public consultation. Finally, they are reviewed and approved by the Climate Bonds Standard Board (CBSB).

The second key part of the Climate Bonds Standard (CBS) is the overarching Climate Bonds Standard v4.0. This document the cross-sectoral criteria all certified instruments/ assets/ entities must meet, in addition to meeting the sector specific Criteria.

1.2 Environmental scope of the Electricity Utilities criteria

Currently, certification requirements address:

- Climate change mitigation; and
- Climate adaptation and resilience.

1.3 What can be certified under the Electricity Utilities criteria

The following can be certified under these criteria following the update of the Overarching Climate Bonds Standard v4.0:

- Entities (Electrical Utilities) and Sustainability-Linked Debt (SLD) issued by those entities - see ***Section 3***
- Use-of-Proceed (UoP) bonds financing mitigation measures (e.g., Carbon Capture and Storage (CCS), Carbon Capture Utilization and Storage (CCUS), and co-firing) - see ***Section 4***

See also the Climate Bonds Standard v4.0 for any cross sectoral requirements for Use-of-Proceeds, Sustainability-Linked Debt, Asset or Entity Certification. These cross sectoral requirements must be met in addition to the electrical utilities-specific requirements described in this document.

To demonstrate compliance with the following Criteria, in accordance with the CBS, it is the applicant's responsibility to provide the information to prove compliance with each component of these Criteria. Verifiers must include this information in the scope of verification.

1.4 Documents supporting these criteria

Electrical Utilities-specific information to support Applicants and Verifiers is available at Electrical Utilities Climate Bonds Initiative as follows:

- Electrical Utilities ***Background Paper*** that details because the criteria were chosen.
- Electrical Utilities ***Frequently Asked Questions*** (FAQ's)
- Electrical Utilities Criteria ***public consultation feedback and responses summary***

In addition, the following cross cutting information to support Applicants and Verifiers is available as follows:

- The Climate Bonds Standard v4.0: contains the requirements of the overarching CBS.
- The Climate Bonds Standard v4.0 Entity and Sustainability-Linked Debt Checklist documents: provides further information on the cross-sectoral requirements for Entity and Sustainability-Linked Debt Certification respectively.

For more information on Climate Bonds and the Climate Bonds Standard and Certification Scheme, see www.climatebonds.net.

1.5 Revisions to these Criteria

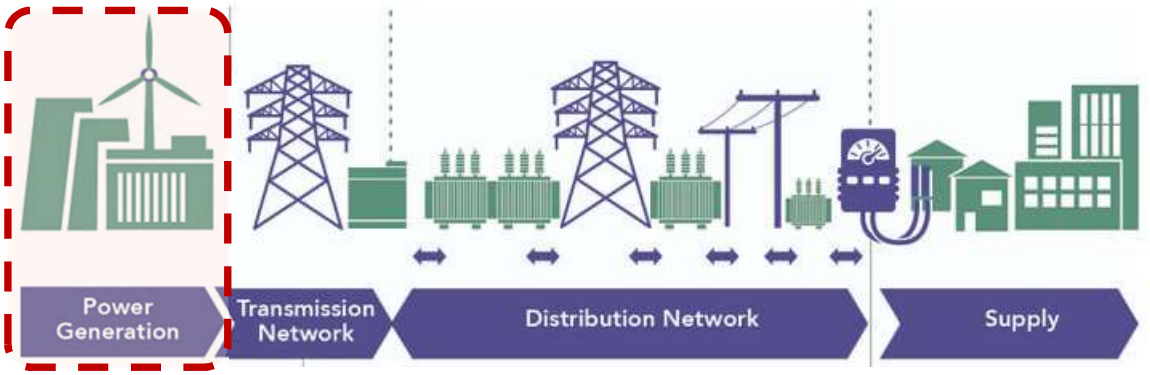
These Criteria will be reviewed on a regular basis, at which point the TWG will take stock of the deals that are printed in the early stages and any developments in improved methodologies and data that can increase the climate integrity of future deals. As a result, the Criteria are likely to be refined over time, as more information becomes available. **Certification will not be withdrawn retroactively from bonds certified under earlier versions of the Criteria.**

2 Electrical Utilities activities in scope

The electricity generation systems are now the largest source of global greenhouse gas (GHG) emissions, accounting for over 40% of energy-related CO_2 emissions[1] . Its transformation over the coming decades plays a crucial role in the decarbonisation of the global economy. Low-carbon electricity is essential for decarbonising transport, industrial and buildings sectors via end-use electrification.

2.1 Electricity supply chain in scope

These Criteria apply to eligible electrical utilities entities with transition plans. It covers the electricity generation segment of the overall electricity supply chain framed in red in ***Figure 1*** and the entity's electricity purchased from the grid for distribution or trading in the retail market. The rest of the power sector supply chain is partially or wholly covered by other sector criteria, see ***section 2.2.***



Source: Development Bank of Singapore

Figure 1: Simplified representation of the power system value chain that covers generation, distribution, and supply.

Applicants of certification must meet the compatible **emission intensity transition pathway** of the sector specific criteria, refer to ***section 3.1.1***.

For the power sector the specific measure of emissions intensity is the GHG emissions emitted per unit of electricity produced. **Average entity's emission intensity** must include the direct combustion emission of the electricity generation portfolio**,** and the emission resulting from activities such as the electricity purchased for distribution or trading in the retail market. Moreover, compatible emissions intensity thresholds are included in these Electrical Utilities Criteria for non-combustion emissions related to renewable electricity generation, see ***Table 1***.

The criteria must also incorporate, since 01 January 2023, a commitment by the parent Company on behalf of the parent group to zero future expansion of fossil fuel activities, covering the exploration, extraction, transport, refining of fossil fuels[2], detailed in Clause D.4.1.1 of the Climate Bonds Standard v4.0.[3]

[1] International Energy Agency, 2023, www.iea.org/energy-system/electricity

[2] Statement by the Parent Company on behalf of the Parent Group that no entity within the Parent Group has expanded any of the activities detailed in Clause D.4.1.1 since 1 January 2023. Climate Bonds Standard version 4.0 www.climatebonds.net/files/files/CBI_Standard_V4.pdf.

[3] Climate Bonds Standards Version 4.0. *Globally Recognised, Paris-aligned certification of debt Instruments, Entities and Assets using robust, science-based methodologies*. Updated version 2023. Please assure that this is the latest version on www.climatebonds.net/files/files/CBI_Standard_V4.pdf

NOTE **The Parent Group**[4] is defined as any legal entity within the parent group is in the business of the exploration or extraction of fossil fuels, or is a utility company generating or supplying power or heat generated from fossil fuels, the Parent Company has, within the last year, publicly (re)committed to no expansion on any of the following activities across the Parent Group after 01 January 2023

(i) The exploration and extraction of proven conventional and unconventional fossil fuel reserves; and

(ii) The exploration of new conventional and unconventional fossil fuel resources; and

(ii) Natural gas production; and

(iv) Refining crude oil to produce derivate products; and

(v) The supply and/or use of fossil fuels for power generation and heat

Table 1: How Entity' climate mitigation performance indicators meet Climate bond standard sector specific criteria, and the way emissions are assessed.

Entity Climate Mitigation Performance indicator	Climate Bonds Standard Sector Specific Criteria	Emissions assessed
Average entity's Emissions intensity	CO_2 Emissions intensity transition pathway, ***section 3.1.1***	Direct CO_2 combustion emissions and emissions related to the electricity purchased
LCA emissions of low carbon electricity generation	Intensity CO_2e emission thresholds for renewable electricity generation supply chain, ***section 3.1.2 and section 3.1.3.***	Non-combustion emissions Cross-cutting Criteria, ***section 5***
Cofiring and CCS/CCUS	Capture and cofiring rates thresholds ***section 3.1.2***	CO_2 leakage control and monitoring Cross-cutting Criteria for low carbon fuels, and biomass, ***section 5***
Date to phase out fossil electricity generation	Benchmarks for phase out fossil electricity generation, ***section 3.1.2***	

Source: Climate Bonds own elaboration

The Electricity supply chain in scope is summarised in **Table 2**. Heat production is excluded from these criteria; in the case of facilities with combined heat and power generation, emissions will be allocated to electricity from combined heat and power (CHP) power plants following the efficiency method of the GHG Protocol methodology[5], see **Box 3.**

[4] Climate Bonds Standards Version 4.0. *Globally Recognised, Paris-aligned certification of debt Instruments, Entities and Assets using robust, science-based methodologies*. Updated version 2023. Please assure that this is the latest version on Climate Bonds Standards.

[5] Allocation of GHG emissions from a combined heat and power (CHP) plant. WRI/WBCSD. September 2006

Table 2: Business segments of the electricity supply chain in scope for these criteria.

Business segment of the Electricity Supply chain	Eligible entities or section of the entity	Emissions Scope considered
Electricity generation	• The electricity generation portfolio	• Scope 1 direct combustion emission of fossil fuels. • Scope 1 Non-combustions emissions for hydropower and geothermal electricity generation. • Scope 3 for biomass electricity generation.
Electricity purchased	• the electricity purchased from the grid for distribution or trading in the retail market.	• Scope 3 for electricity purchased from the grid for distribution or trading in the retail market.
Fossil Fuel Activities other than electricity production	• Commitment of no expansion of exploration, extraction, transport, refining of fossil fuels	• Scope 1,2,3

Source: Climate Bonds own elaboration

In addition, these criteria incorporate eligible mitigation measures for fossil fuel electricity generation aimed at decarbonizing the fossil fuel generation, **Table 3.**

Table 3: Mitigation measures in the Electrical Utilities Criteria.

Power plants	Eligible Mitigation measures	Thresholds
Coal and Gas	• CCS for CO_2 capture, transport, and storage. • CCUS for CO_2 capture, transport, and utilisation.	• Capture rate 90% • Cross-cutting criteria for CO_2 leakages and storage • Utilisation Criteria
	• Cofiring with low-carbon synthetic fuels comprising liquid and gaseous biofuels, hydrogen, and hydrogen-derived fuels. • Cofiring with solid biomass	• Cofiring rate 100% • Cross-cutting criteria for cofiring low-carbon fuels • Cross cutting criteria for cofiring with biomass

Source: Climate Bonds own elaboration

2.2 Alignment with other sector criteria

Climate Bonds has developed other criteria across the electricity supply chain. The most common examples, and the appropriate sector criteria to use, are clarified in **Table 4.**

Table 4: Assets or projects partially or wholly covered by other sector criteria.

Part of the Electrical utility supply chain	Cover by other the criteria	Climate Bonds Criteria
Low carbon fuel transportation	• Low carbon gas transport by ship • Low carbon gas pipeline transportation • Low carbon gas transport by truck	Hydrogen Criteria
Transmission and distribution electricity network	• Electricity grids	Electrical Grid and Storage criteria
Storage facilities	• Electricity storage	Electrical Grids and Storage
End-users	• Use of electricity in other sectors	Steel, cement, Basic chemicals, transport, Agriculture, criteria
Low carbon fuels	• Hydrogen, Ammonia, Biomass for electricity production	Hydrogen, Waste management, and Bioenergy Criteria
Renewable electricity generation facilities	• Solar, Wind, Marine, Hydropower, Geothermal and bioenergy	Solar, Wind, Geothermal, Hydropower, Bioenergy and Marine Criteria.

Source: Climate Bonds own elaboration

3 Electrical Utilities Entity certification criteria and SLD

The following sections detail similar, yet distinct, electricity generation-specific criteria depending on what is being certified:

- A whole Entity (in this case, a business segment or part of the company producing, purchased and trading electricity) - See ***Section 3.1***
- SLD issued by an entity dedicated to produce, purchase, and trade electricity - See ***Section 3.2***
- ***Section 3.1.1***, ***Section 3.1.2*** and ***Section 3.1.3*** contain methodological notes applicable to these criteria.

See also the Climate Bonds Standard v4.0 for the cross sectoral requirements for Entity and SLD Certification relating to Transition Plans and Disclosure for the Certified Entity and requirements in respect of the Parent Group (if any). These cross sectoral requirements must be met in addition to the electrical utility-specific requirements described here.

> ***NOTE:*** *Current proposals would allow for the certification of only part of a company or group of companies, or SLD that relates to only part of a company or group of companies. See the Climate Bonds Standard v4.0 for full details. This flexibility enables the certification of the part of a company or group of companies relating to electricity generation, separate from the certification of other activities of the company or group of companies of which it forms a part.*

3.1 Electrical Utilities criteria to certify entities

To be eligible for certification, the entity must be in compliance with the Climate Bonds Standard Sector Criteria. Two levels of entity certification are available, depending on when the Climate Mitigation Performance Targets align with the Climate Bonds Standard Sector Criteria**,** see the Climate Bonds Standards v 4.0., Box C4 [6].

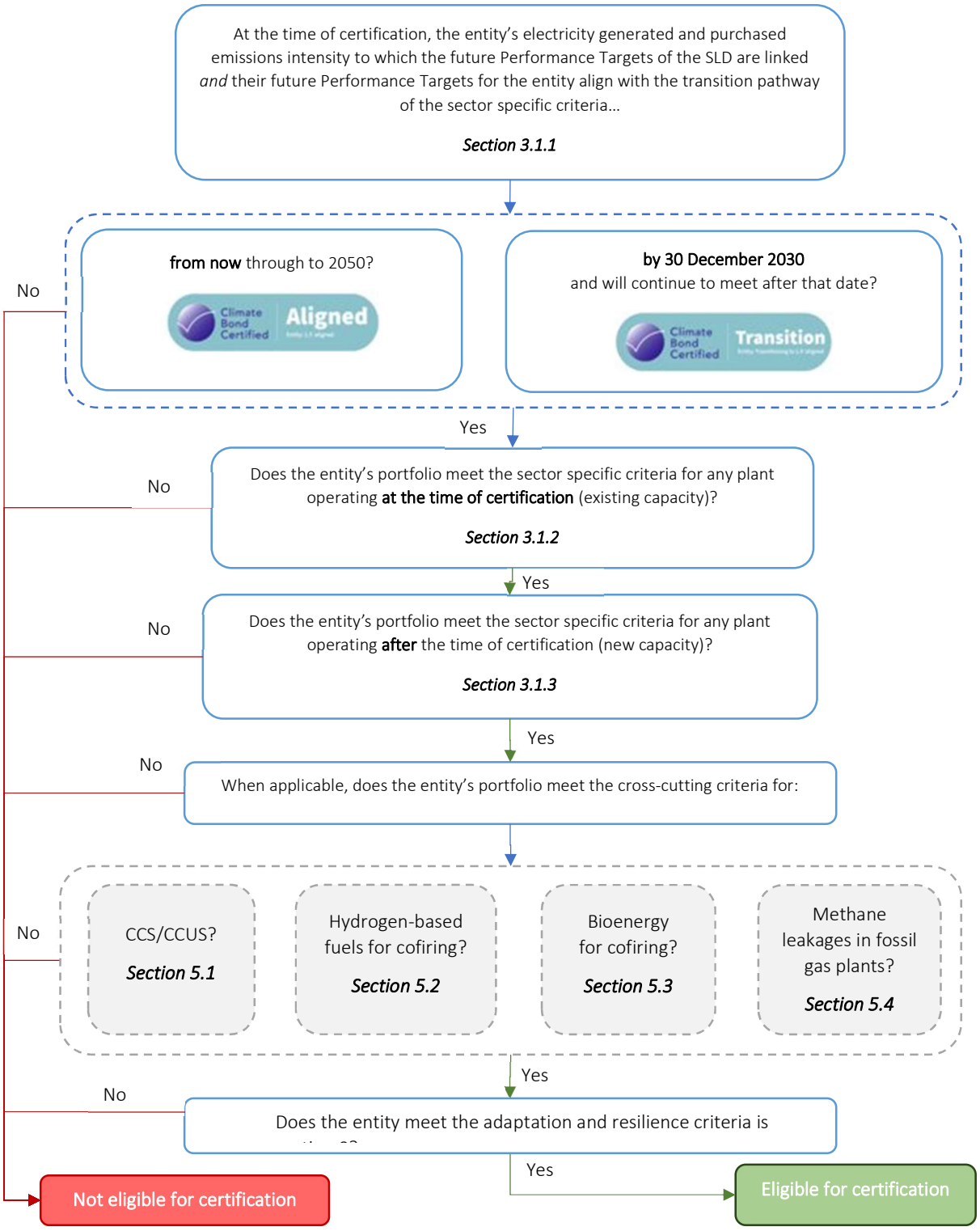
[6] Climate Bonds Standards Version 4.0. *Globally Recognised, Paris-aligned certification of debt Instruments, Entities and Assets using robust, science-based methodologies*. Updated version 2023. Please assure that this is the latest version on Climate Bonds Standards.

Table 5: Entities Tiered Certifications.

Entity Tier	Entity Certification Requirements
Tier 1: "Aligned"	**Climate Mitigation Criteria** 1. At the time of certification, the certified entity's average emissions intensity meets the sector specific criteria transition pathway, and its future **Climate Mitigation Performance Targets** continue to align with the transition pathway through out to 2050, see ***Section 3.1.1***; *and* 2. At the time of certification, all the Certified Entity's existing capacity meet the sector specific criteria for existing capacity, including any plant operating at the time of certification, ***section 3.1.2*** 3. At any time after the certification date, all the Certified Entity's new capacity meet the sector specific criteria for new capacity, from day 1 of commencing operation, including any plant becoming operational post certification date, ***section 3.1.3.*** 4. At the time of certification, and at any time after the certification date all the Certified Entity's facilities using CCS/CCUS, meet the cross-cutting criteria for CO_2 transport, storage, and utilization ***section 5.1*** 5. At the time of certification, and at any time after the certification date all the Certified Entity's facilities using hydrogen and biomass, meet the cross-cutting criteria in ***section 5.2 and section 5.3*** 6. At the time of certification, and at any time after the certification date all the Certified Entity's facilities using fossil gas, meet the cross-cutting criteria for methane leakages in ***section 5.4.*** **Adaptation and Resilience Criteria** 1. The Certified Entity meet the adaptation and resilience criteria described in ***Section 6,*** and that is reassessed and reconfirmed every five years.
Level 2: "Transitioning"	The criteria are the same as for Level 1, except: The certified entity's average emissions intensity does NOT meet the sector specific criteria transition pathway at the time of certification, but their future Performance Targets align by 30 December **2030** and continue to align thereafter through to 2050. See ***Section 3.1.1***

Source: Climate Bonds own elaboration

The scheme detailed in ***Figure 2,*** explains that for an entity to be certified in addition to meet the transition emission intensity pathway of the sector specific criteria, ***section 3.1.1***, the different generation technologies must also comply with thresholds of sector specific criteria for existing, ***section 3.1.2*** and new capacity ***section 3.1.3***, addressing by this way, the global emissions of the entity and align it with the goal of Paris agreement.



Source: Climate Bonds own elaboration

Figure 2: Shows the scheme of the Sector Specific Criteria for entities' certification.

3.1.1 Transition pathway for sector specific criteria

At the entity level a comprehensive approach of company's GHG emissions are assessed to certify the entity. Applicants of certification must comply with the sector specific criteria. A compatible CO_2 emissions[7] intensity transition pathway for the power sector is included, see **Table 6**, allowing the transition to net zero emissions by 2040, aligned to the goal of limiting global warming to 1.5-degrees Celsius (IEA, update 2023). Discussions and assumptions to set this pathway can be found in the Electrical Utilities Background Document.

The emission intensity transition pathway of the sector specific criteria is illustrated in in **Table 6.**

Table 6: Transition pathway of the Electrical Utilities Criteria values.

Transition pathway of the sector specific criteria						
Year	2025	2030	2035	2040	2045	2050
Emissions Intensity (gCO_2/kWh)	460	186	48	3	0	0

Source: Own elaboration based on IEA data **(IEA, update 2023)**

The average entity's emissions intensity needs to align with this transition pathway of the sector-specific criteria by 2030 at the latest, see an example for a worked example of meeting the targets in **Box 1**

To certified whether the entity's electricity generation activities meet the transition pathway, see **Table 6**, the entity's average emissions intensity for the Climate Mitigation Performance must be calculated following the GHG Protocol, (Gillenwater, 2005), detailed below:

- Scope 1 direct emissions: GHG Protocol for direct emissions from stationary combustion.[8] **Box 2**
- Scope 3 emissions related to the electricity purchased by the entity. The calculation is made following the **Location-based method** in the GHG Protocol.[9], that reflects the average emissions intensity of grids on which energy consumption occurs. The calculation is made by multiplying the country-specific emission factors, reflecting the average emissions intensity of the grid, by the amount of energy purchased.
- If CHP plants are included in the entity's generation portfolio, total emissions should be allocated both to heat and power. Different methods are described in the GHG Protocol.[10] These criteria suggest the efficiency method, described in **Box 3**

Direct CO_2 emissions from the combustion of biomass shall not be included in scope 1. Negative emissions can be included in the net average entity's emissions intensity only when electricity generation from biomass power plant includes CCS/CCUS technologies (BECCS).

[7] Carbon dioxide accounts for the majority of greenhouse gas emissions from most stationary combustion units. When weighted by their Global Warming Potentials (GWPs) CO_2 typically represent over 99 percent of the greenhouse gas emissions from the stationary combustion of fossil fuels. (Potential exceptions include CH4 from open burning processes and N_2O from some engines with catalytic NOx emissions controls)

[8] Calculation Tool for Direct Emissions from Stationary Combustion. WRI/WBCSD. July 2005

[9] GHG Protocol Scope 2 Guidance. WRI

[10] Allocation of GHG emissions from a combined heat and power (CHP) plant. WRI/WBCSD. September 2006.

Box 1: Example on meeting the transition pathway of the Electrical Utilities Criteria.

Applicants issuing an Entity's certification may meet: (Climate Bonds Standards v 4.0. Section 3.1)

- Time horizon targets: the climate mitigation performance targets cover the time from the date of certification to the date the activity is intended to hit net zero emissions, or 2050, whichever is sooner.
- Interim climate mitigation performance targets: the climate mitigation performance targets include interim targets on a three-yearly basis for the nine years following the date of certification and a five-yearly basis thereafter over the full-time horizon.
- Alignment with the transition pathway of the Electrical Utilities Criteria described in ***Section 3.1.1***: the climate mitigation performance targets are benchmarked against the transition pathway and align with it by 31 December 2030 at the latest.

A linear trajectory should be assumed for time periods between the dates and thresholds provide:

Example: Compliant

An entity applying for certification in 2024 with next climate mitigation performance targets.

Climate Mitigation Performance Targets						
Year	**2024**	**2027**	**2030**	**2033**	**2038**	**2043**
Average emission intensity (gCO_2/kWh)	564	350	170	50	10	0

Compared against the sector transition pathway.

Sector Specific Criteria						
Year	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Average emission intensity (gCO_2/kWh)	460	186	48	3	0	0

The entity's tied of certification is **"Transition"** because:

- At the time of certification, the entity's average emissions intensity is higher than the sector specific criteria values, but
- In 2030 the entity is aligned with the transition pathway and
- Is aligned until the end of the time horizon of the certification.

Annual verification report from an approved verifier is required to maintain the certification.

However, the entity's average emissions intensity doesn't cover **non-combustion or indirect emissions**, which must be also addressed by the entity's Climate Mitigation Performance Targets. These indirect emissions depend vastly on the technologies and within the generation technology also vary hugely on regional and technology variants (Michaja Pehl, 2017). Furthermore, as the electricity mix is decarbonised, indirect emissions will become an increasingly important part of power sector emissions. Therefore, other non-combustion emissions need to be addressed in order to achieve near-zero emissions targets in the power sector.

Hence, to be certified, an entity must address also **non-combustion or indirect emission criteria.** These criteria include thresholds for different generation technologies, detailed in following ***Sections 3.1.2*** and ***section 3.1.3.***

Box 2: Example of accounting and reporting CO_2 direct emissions for combustion process following GHG Protocol methodology.

GHG Protocol suggest two methodologies to measure direct combustion emissions:

- Direct measures of the mass of CO_2 in the exhaust gas usually as continuing emissions monitoring (CEM)
- **Calculation of CO_2 emissions based on proxy data.**

GHG Protocol recommends the used of calculation-based method for estimating CO_2 emissions due to cost and practicability reasons.

Calculation based methods needs data from:

- **Fuel consumption**
- **Emissions factors**

An example of an equation based on fuel consumption data is:

Equation 1: Calculation based method for CO_2 emissions

$$E = A_{f,v} \cdot F_{c,v} \cdot F_{ox} \cdot (44/12) \quad \text{or} \quad E = A_{f,m} \cdot F_{c,m} \cdot F_{ox} \cdot (44/12) \quad \text{or} \quad E = A_{f,h} \cdot F_{c,h} \cdot F_{ox} \cdot (44/12)$$

Where,

E =	Mass emissions of CO_2 (short tons or metric tons)
$A_{f,v}$ =	Volume of fuel consumed (e.g., L, gallons, ft^3, m^3)
$A_{f,m}$ =	Mass of fuel consumed (e.g., short tons or metric tons)
$A_{f,h}$ =	Heat content of fuel consumed (GJ or million Btu)
$F_{c,v}$ =	Carbon content of fuel on a volume basis (e.g., short tons C/gallon or metric tons C/m^3)
$F_{c,m}$ =	Carbon content of fuel on a mass basis (e.g., short tons C/short ton or metric tons C/metric ton)
$F_{c,h}$ =	Carbon content of fuel on a heating value basis (e.g., short tons C/million Btu or metric tons C/GJ)
F_{ox} =	Oxidation factor to account for fraction of carbon in fuel that remains as soot or ash
(44/12) =	The ratio of the molecular weight of CO_2 to that of carbon

Note: Activity data and carbon content factors should be in the same basis (i.e., volume, mass, or energy). For gaseous fuel quantities in terms of volume, care should be taken to ensure all data are on a consistent temperature and pressure basis.

Source: GHG Protocol (Gillenwater, 2005)

Other emissions factors can lead to different equations. GHG Protocol also provides direct CO_2 emissions factors to fuel consumption by type of fuel.

Average emissions intensity for the Climate Performance Targets of the entity.

To calculate the average emissions intensity of the entity, the total CO_2 emissions (from generation and related to electricity purchased) are divided by the total electricity of the entity (generated and purchased) In the example CO_2 emissions from generated electricity are calculated through emissions factors. Low-carbon electricity generation, including nuclear, solar, wind, hydropower, bioenergy and marine, account for 0 gCO_2/kWh in direct combustion emissions.

CO_2kWh for electricity generation =

$$= \frac{\sum_{fuels} \left\langle \left(Input_{Electricity\ plants} + Input_{CHP\ plants/Ele} + Own\ use_{Plants/Ele} \right) \times EF_{fuel} \right\rangle}{Ele_{Inland}}$$

Where:

- CO_2kWh : Carbon factors (in CO_2/kWh) calculated at the generation point
- $\sum_{fuels}$: Sum over the fuels.
- $Input_{plants}$: Fuel input into the plants (both main activity and autoproducer) expressed in energy unit.
- $Input_{CHP\ plants/Ele} = Input_{CHP\ plants} - \frac{Heat\ output}{\eta_{heat}}$
- η_{heat} efficiency of heat generation - assumed to be 0.9 (*i.e.* 90%) except when the observed efficiency of CHP generation is higher than 90%, in which case emissions are allocated using the proportionality approach ($EFF_{HEAT} = EFF_{ELEC} = EFF_{CHP}$).
- $Own\ use_{Plants/Ele} = Own\ use_{Plants} \times \frac{Total\ electricity\ output}{Total\ electricity\ output + Total\ heat\ output}$
- EF_{fuel} : default emission factors as provided in the *2006 IPCC Guidelines*.
- Ele_{Inland} :
  - For the total emission factor: includes the generation from all sources (i.e. as well the non-emitting sources).
  - For the emission factors by fuel (oil, coal, gas, non-renewable waste and Memo: biofuels): includes only the electricity generated by the corresponding fuel.

Source: IEA (Emissions Factors 2021)

Box 3: Example of allocating emissions to electricity from CHP power plants following GHG Protocol methodology.

GHG Protocol details several methods to assign emissions to the electricity generated in a CHP plant. Most commons are:

- Efficiency method.
- Energy content method.
- Work potential method.

The **efficiency method** is the preference for the "Allocation of GHG emissions from a combined heat and power (CHO) plant" document. Steps detailed in this document are:

- Step 1: Determine the total direct emissions and the total steam and electricity outputs for the CHP systems. (As detailed in **Box 2**)
- Step 2: Estimate the efficiencies of steam and electricity production.
- Step 3: Determine the fraction of total emissions to allocate to steam and electricity production.

$$E_H = \frac{H/e_H}{H/e_H + P/e_P} * E_T \qquad \text{and} \qquad E_P = E_T - E_H$$

where:

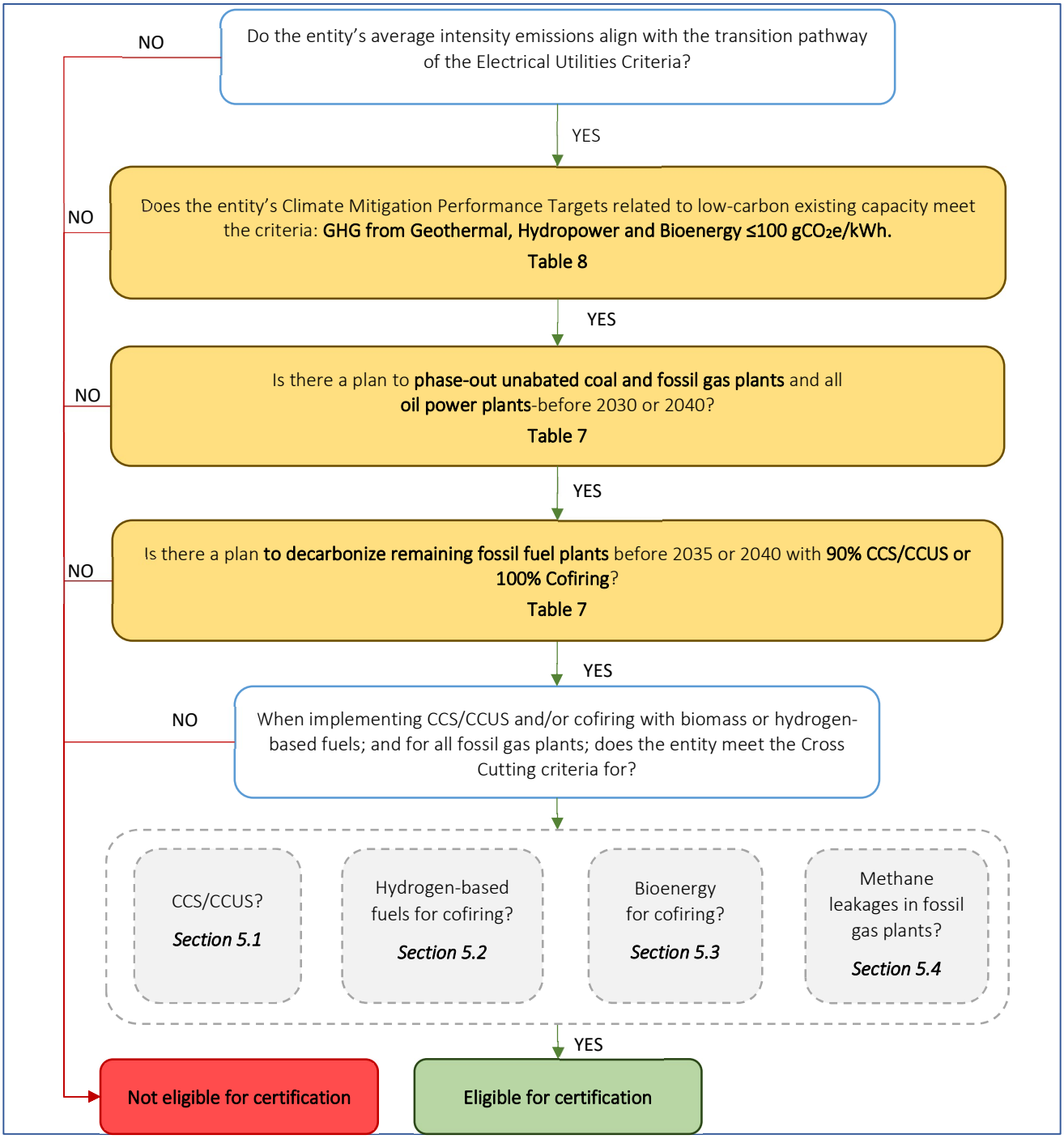
E_H	=	emissions allocated to steam production
H	=	steam output (energy)
e_H	=	assumed efficiency of steam production
P	=	delivered electricity generation (energy)
e_P	=	assumed efficiency of electricity generation
E_T	=	total direct emissions of the CHP system
E_P	=	emissions allocated to electricity production

Source: GHG Protocol (Allocation of GHG emissions from a CHP Plant. 2006)

- Step 4: Calculate emissions rates for steam and electricity production dividing the total emissions from electricity production by the total amount of electricity produced to get an emissions rate.

3.1.2 Criteria for facilities operating at the time of certification (existing capacity)

Existing capacity includes any plant operating at the time of certification of the Certified Entity. The operating generation plants must meet the sector specific criteria for existing capacity. and ***Table 7*** shows the thresholds of sector specific criteria for the entity's existing capacity. Additionally, cross-cutting criteria for CCS/CCUS, cofiring and methane leakages in fossil gas plants are detailed in ***Section 5.***



Source: Climate Bonds own elaboration

Figure 3: Electrical Utilities Criteria for entity's existing capacity.

Table 7: Thresholds and benchmarks of the Electrical Utilities criteria for fossil fuel existing capacity.

Mitigation criteria for Fossil Fuel Existing Capacity		Advanced economies[11]	Emerging economies[12]
COAL	Phasing-out unabated plants	2030	2040
	If NOT • Co-firing with 100% low-carbon fuels • CCS Retrofit with a carbon capture rate 90% and storage	2035	2040
FOSSIL GAS	Phasing-out unabated plants	2040	2040
	If NOT • Co-firing with 100% low-carbon fuels • Retrofit with a carbon capture rate 90% and storage	2040	2040
OIL	Phase out all plants	2030	2040

Source: Own elaboration based on IEA **(IEA, update 2023)**

These criteria do not allow for any new fossil fuel capacity, although for transitional purposes the replacement of coal-fired capacity to accelerate the shift from more polluting activities to gas may be considered only under certain circumstances, see (**Box 4**)

Box 4: Switching coal to gas only in the case.

- when security of electricity supply is at risk,
- The fossil gas capacity must replace an existing coal generation plant.
- The fossil gas plant cannot exceed **the replaced facility's capacity by more than 15%**
- Direct average emissions intensity of the entity remains below the emission intensity pathway of these sectoral criteria.
- the entity has a **coal and gas phaseout** plan in place.

Safeguards:

- Critical grid security - needs to be demonstrated, and agreed to on an ad hoc, basis.
- Fully system-wide proof that renewable energy systems not suitable

Criteria for low-carbon technologies existing plants are shown in **Table 8**.

[11] Advanced and emerging economies follows the definition of the IEA

[12] Advanced and emerging economies follows the definition of the IEA

Table 8: The sector specific criteria's thresholds for low-carbon existing capacity.

Power generation for Low carbon technologies	Scope 1 emissions threshold	Scope 3 emissions threshold
Solar	No direct emissions	Automatically eligible
Wind	No direct emissions	Automatically eligible
Hydropower	Threshold: 100 gCO_2e/kWh[13] (Methane emissions from the reservoir)	Negligible
Geothermal.	Threshold: 100 gCO_2e/kWh[14]	Negligible
Bioenergy and BECCS	No direct emissions (combustion emissions compensate with the carbon captured during the growth of the biomass)	Threshold: 100 gCO_2e/kWh[15] (emissions from processing and transport the biomass) Meet Cross-Cutting Criteria. ***Section 5.3***

Source: Climate Bonds own elaboration

Life-cycle analysis (LCA) is required to account the no-combustion emissions, Scope 1 for hydropower and geothermal, as well as Scope 3 for processing and transporting biomass for electricity production. These emissions are calculated by considering the amount of carbon dioxide equivalent (CO_{2e}) emissions released during the LCA per unit of electricity generated.

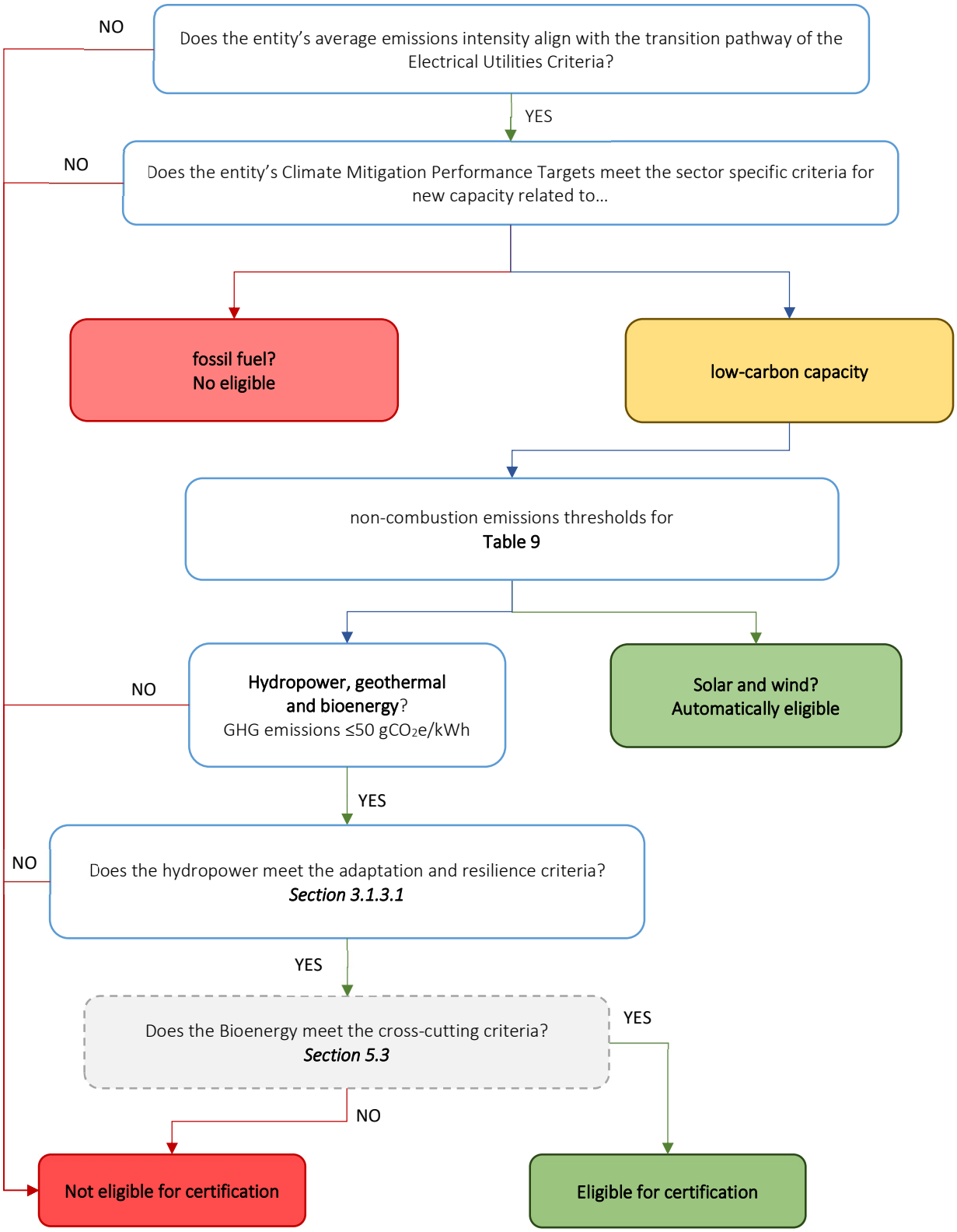
[13] Accounting the GHG emissions must follow **The G-RES Tool** methodology as required in section 3.2 of the Climate Bonds Hydropower Criteria

[14] Accounting the GHG emissions must follow the methodology detailed in ***Appendix C*** of the Climate Bonds Geothermal Criteria. Appendix C: Proposed method for estimating GHG emissions in geothermal power plants

[15] Accounting the GHG emissions must follow the **BioGrace II** methodology as required in ***section 3.2*** of the Climate Bonds Bioenergy Criteria

3.1.3 Criteria for new facilities after the certification date (new capacity)

At any time after the certification date, all the Certified Entity's new capacity must meet the sector specific criteria for new capacity, from day 1 of commencing operation, including any plant becoming operational post certification date. Figure 4 and *Table 9* shows the thresholds of the Electrical Utilities criteria for the entity's new capacity. Cross-cutting criteria for bioenergy is detailed in *Section 5.3*



Source: Climate Bonds own elaboration.

Figure 4: Electrical Utilities Criteria for entity's new capacity.

Table 9: Thresholds of the Electrical Utilities criteria for low-carbon new capacity.

Power generation for Low carbon technologies	Scope 1 emissions do not exceed the threshold:	Scope 3 emissions do not exceed the threshold:
Solar	No direct emissions	Automatically eligible
Wind	No direct emissions	Automatically eligible
Hydropower	**Threshold: 50 gCO_2e/kWh** (Methane emissions from the reservoir) Demonstration of compliance: See ***section 3.1.3.1***	Negligible (The direct and indirect emissions associated with the construction of the plants are not material due to the long-life span of the plant)
Geothermal	**Threshold: 50 gCO_2e/kWh** (non-condensable gases from the geothermal fluid) Demonstration of compliance: See: Climate Bonds Geothermal Criteria See ***Appendix C***	Negligible
Bioenergy	No direct emissions (combustion emissions compensate with the carbon captured during the biocycle of the biomass)	**Threshold: 50 gCO_2e/kWh** (Emissions from processing and transport the biomass) Meet Cross-Cutting Criteria. ***Section 5.3*** Demonstration of compliance: See ***section 3.1.3.2***
Bioenergy with BECCS	Negative emissions form CO_2 captured.	

Note: these are emission thresholds
Source: Climate Bonds own elaboration

3.1.3.1 Hydropower safeguards for these criteria

According to literature (Kumar, 2011), in most cases, hydropower is a good alternative to fossil fuelled power generation. But for some hydropower plants specially in tropical climates, theoretical calculations have shown that reservoir emissions could be very high. These criteria have set a threshold of **50 gCO_2e/kWh** for any new hydropower capacity built after the entity' certification**.** The **G-RES Tool**[16] is the methodology identified by these criteria to estimate and report net greenhouse gas emissions from a reservoir.

Additionally, new hydropower facilities must undergo under a specific site assessment following the guides laid-out by the IEA Hydro Framework**,** The Hydropower Sustainability ESG Gap Analysis Tool (HESG)[17]. This analysis must be carried out by an accredited assessor. This sustainable analysis too will identify any significant gaps that the facility demonstrates against international good practise. If any significant gaps are identified, an environmental and social action plan (ESAP) must be established to address those gaps including details on how and when these gaps will be closed. Further details in Climate Bonds Hydropower Criteria.

3.1.3.2 Methodological notes for bioenergy

Bioenergy, whose direct emissions are assumed to be 0 gCO_2/kWh, could be responsible for higher indirect emission than fossil coal power plant, (Michaja Pehl, 2017). Emissions from electricity production with biomass are mostly dependent on the type of feedstock, the biomass processing and transportation, and land use change.

In these criteria, we have stablished an emission intensity threshold of **50 gCO_2e/kWh** when using biomass for electricity production (aligned to 5 gCO_2e/MJ biomass consumed in a power plant with 40% of electricity efficiency), these emissions embed the emissions produced during the processing and transportation of the biomass.

Biomass power plants equipped with CCS/CCUS systems can contribute with negative emissions to the entity's net balance. As detailed in **Table 9**, the negative emissions will be reported in the average entity's emissions intensity. Furthermore, the biomass used as a fuel in the power plant must meet the cross-cutting criteria for biomass develop in ***Section 5.3.***

Based on Climate Bonds Bioenergy Criteria propose the **BioGrace II** methodology to account the emissions embedded in the production and transportation of biomass to be used as a fuel for electricity generation. See **Table 10**

Table 10: Emissions addressed in bioenergy.

GHG emissions accounting methodology for bioenergy	
Methodology	**Emissions included**
BioGrace II	• Feedstock Production. • Feedstock processing. • Biofuel/bioenergy production. • Biofuel storage and blending • Intermediate and final transport steps.

Source: Climate Bonds Bioenergy Criteria

Additionally, biomass used to produce electricity must meet the cross-cutting criteria detailed in ***section 5.3***.

3.2 Electrical Utilities criteria to certify SLDs

To certified SLD bonds, two levels of SLD Certification levels are available, depending on when the Climate Mitigation Performance Targets align with the Climate Bonds Standard Sector Criteria, see the Climate Bonds Standards v 4.0., Box D4 [18].

Table 11: SLD Tiered Certifications.

SLB Tier	SLD Certification Requirements
Tier 1: "Aligned"	**Climate mitigation criteria** 1. At the time of certification, the certified Entity's electrical utility average emissions intensity meets sector specific criteria transition pathway to which the **Climate Mitigation Performance Targets** of the debt are linked *and* its future Performance Targets to which the debt is linked continue to align with the sector specific criteria transition pathway through to 2050 (see ***Section 3.1.1***); *and* 2. At the time of certification, all the Certified Entity's existing capacity meet the sector specific criteria for existing capacity, including any plant operating at the time of certification, ***section 3.1.2)*** 3. At any time after the certification date, all the Certified Entity's new capacity meet the sector specific criteria for new capacity, from day 1 of commencing operation, including any plant becoming operational post certification date, ***section 3.1.3.*** 4. At the time of certification, and at any time after the certification date all the Certified Entity's facilities using CCS/CCUS, meet the cross-cutting criteria for CO_2 transport, storage, and utilization ***section 5.1.*** **5.** At the time of certification, and at any time after the certification date all the Certified Entity's facilities using hydrogen and biomass, meet the cross-cutting criteria in ***section 5.2 and section 5.3*** 6. At the time of certification, and at any time after the certification date all the Certified Entity's facilities using fossil gas, meet the cross-cutting criteria for methane leakages in ***section 5.4.*** **Adaptation and Resilience Criteria** 7. The Certified Entity meet the adaptation and resilience criteria described in ***Section 6,*** and that is reassessed and reconfirmed every five years.
Tier 2: "Transitioning"	The criteria are the same as for Level 1, except: At the time of certification, the average emissions intensity of the electrical utility to which the **Climate Mitigation Performance Targets** of the debt are linked do not meet the sector specific criteria transition pathway, but its future Climate mitigation Performance Targets align by 30 December **2030** and continue to align thereafter through to 2050 (see ***Section 3.1.1***).

Source: Climate Bonds own elaboration

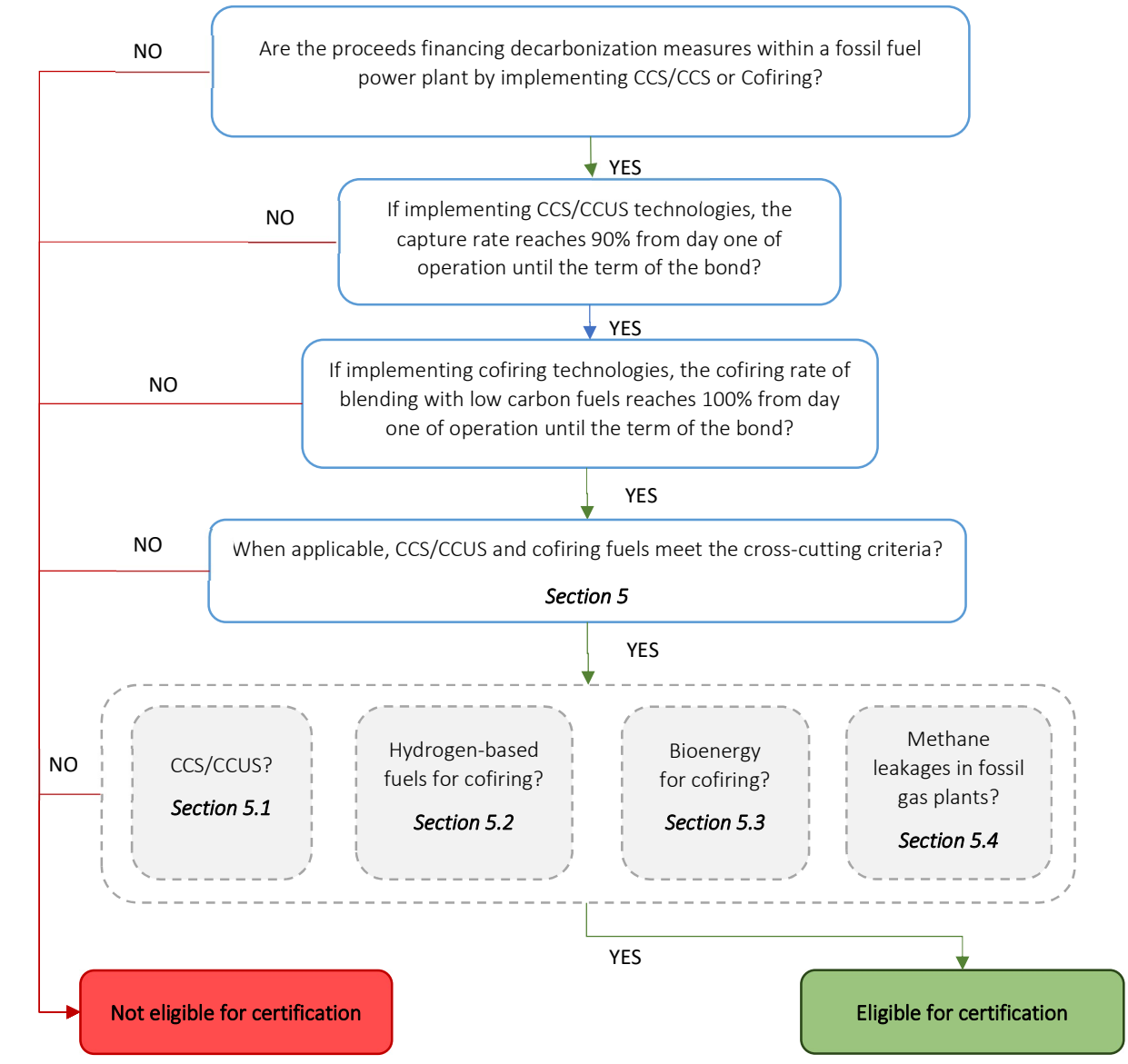
[18] Climate Bonds Standards Version 4.0. *Globally Recognised, Paris-aligned certification of debt Instruments, Entities and Assets using robust, science-based methodologies*. Updated version 2023. Please assure that this is the latest version on Climate Bonds Standards.

4 Use of Proceed bonds for mitigation measures

4.1 Mitigation measure criteria

These criteria can also cover UoP bonds for mitigation measures applied to fossil fuel power plants. Capital investments should be focussed on achieving significant emissions savings at the facility level. Due to their CO_2 emissions mitigation potential, two main decarbonisation measures can be certified: CCS/CCUS technologies for power plants and preparing the turbine burner/combustion chamber for cofiring with low-carbon fuels, comprising liquid and gaseous biofuels, hydrogen, and hydrogen-derived fuels (ammonia and synthetic hydrocarbon fuels produced from hydrogen and CO_2), see Source: Climate Bonds own elaboration

Figure 5



Source: Climate Bonds own elaboration

Figure 5: Criteria for specific mitigation measures within fossil fuel power plants.

4.1.1 Demonstration of compliance

The applicant shall provide evidence of the decarbonization measures that will be implemented; and have a contract or agreement with a certified energy auditor demonstrating in an annual report that the assets performance is equivalent to the performance requirements shown in **Source:** Climate Bonds own elaboration

Figure 5**, from day one of operation to the term of the bond.**

5 Cross-cutting criteria

5.1 Additional criteria for Carbon Capture and Storage and Carbon Capture Utilisation & Storage (CCS/CCUS)

Carbon capture and storage and carbon capture and utilization, both as an individual measure and as part of a whole facility being evaluated, is eligible so long as there is evidence[19] that demonstrates the CO_2 will be suitably transported, stored and /or used in line with the criteria in the ***Table 12*** below.

Table 12: Criteria for CO_2 transport, storage, and utilisation.

Component	Requirements
Transport[20]	1. The CO_2 transported from the installation where it is captured to the injection point does not lead to CO_2 leakages above 0.5 % of the mass of CO_2 transported. 2. Appropriate leakage detection systems are applied, and a monitoring plan is in place, with the report verified by an independent third party.
Storage[21]	1. Characterisation and assessment of the potential storage complex and surrounding area, or exploration[22] is carried out in order to establish whether the geological formation is suitable for use as a CO_2 storage site. 2. For operation of underground geological CO_2 storage sites, including closure and post-closure obligations: a. appropriate leakage detection systems are implemented to prevent release during operation. b. a monitoring plan of the injection facilities, the storage complex, and, where appropriate, the surrounding environment is in place, with the regular reports checked by the competent national authority. 3. For the exploration and operation of storage sites, the activity complies with ISO 27914:2017225[23] for geological storage of CO_2.
Utilisation	Utilisation of direct CO_2 emissions from electricity generation is only eligible when the CO_2 is used for the manufacture of durable products (e.g., construction materials stored in buildings, or recyclable products e.g., PET). CO_2 should not be used for products that release the CO_2 immediately when these are used (such as in urea, carbonated beverages, or fuels), nor for enhanced oil recovery, and the production of other forms of fossil energy sources.

Source: Criteria based on EU taxonomy[24]

Furthermore, the use of any certification scheme would be encouraged. Examples of certification schemes include the U.S. EPA Class VI well certification, which includes Reservoir Characterisation[25]. Another example includes the DNV GL certification framework to verify compliance with the ISO 27914:2017 Carbon dioxide capture, transportation, and geological storage - Geological storage[26].

[19] Either directly from the applicants or through contracts or agreements with a third party.

[20] From the technical screening criteria for qualifying as contributing substantially to climate change mitigation for "Transport of CO_2" in Annex 1 of the Commission Delegated Regulation (EU) 2021/2139 (EU taxonomy)

[21] From the technical screening criteria for qualifying as contributing substantially to climate change mitigation for "Underground permanent geological storage of CO_2" in Annex 1 of the Commission Delegated Regulation (EU) 2021/2139

[22] "Exploration' means the assessment of potential storage complexes for the purposes of geologically storing CO_2 by means of activities intruding into the subsurface such as drilling to obtain geological information about strata in the potential storage complex and, as appropriate, carrying out injection tests in order to characterise the storage site

[23] ISO Standard 27914:2017, Carbon dioxide capture, transportation and geological storage - Geological storage: www.iso.org/standard/64148.html)

[24] https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

[25] www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-co2

[26] www.dnv.com/news/dnv-gl-launches-certification-framework-and-recommended-practice-for-carbon-capture-and-storage-ccs--108096

5.2 Additional criteria when using hydrogen or hydrogen derived fuels for cofiring

Utilisation of cofiring with low-carbon gaseous fuels based on hydrogen is only eligible when the hydrogen used meet the Climate Bonds Hydrogen Production and Delivery Criteria. These criteria establish limit on the emissions intensity for the hydrogen production and delivery ***Table 13.***

Table 13: Hydrogen carbon intensity thresholds[27].

Asset Type	Criteria			
	2023[28]	2030	2040	2050
Production and delivery of hydrogen	3.0 $kgCO_2e/kgH_2$	1.5 $kgCO_2e/kgH_2$	0.7 $kgCO_2e/kgH_2$	0 $kgCO_2e/kgH_2$

Source: Climate Bonds Hydrogen production and delivery criteria

To demonstrate compliance with any of the emissions intensity thresholds, applicant is required to carry out an LCA for hydrogen production and calculate GHG delivery emissions as described in **Appendix A.** The total GHG emissions to be benchmarked against the threshold shall include both production and transportation emissions.

5.3 Additional criteria when using biomass or biofuels as a fuel

The use of biomass for electricity production can have a negative impact on climate change mitigation and/or the resilience of ecosystems to climate risks. High emissions can be generated where land with pre-existing high carbon stocks is converted for feedstock cultivation, and/or where feedstocks are transported long distances from cultivation sites to bioenergy facilities.

Utilisation of cofiring with low-carbon gaseous fuels based on biomass is only eligible when the biomass used meet the following mitigation and adaptation and resilience criteria from the Climate Bonds Bioenergy Criteria. (See ***Appendix B***)

Mitigation:

- **Biomass sources allowed**. (*Section 2* at the Climate Bonds Bioenergy Criteria)
- **Reducing the risk of Indirect Land Use impact (iLUC)**. (*Section 3.2.2* of the Climate Bonds Bioenergy Criteria)
- **GHG Emissions**: GHG emissions of biomass must not exceed **5.5 gCO_2e/MJ** (that implies **50 gCO_2e/kWh** in an electrical plant with a 40% efficiency) for embedded emissions in biomass production and transporting, according with the ClimateBonds Bioenergy criteria.

Adaptation & Resilience:

- Conduct a **climate risk assessment** and have an adaptation plan where high risk are identified - assessed via the Adaptation and Resilience Checklist (Section 3.3.1 of the Climate Bonds Bioenergy Criteria); and
- Demonstrate that their **source feedstock** is compliant with established and approved best practice standards for the industry to make sure feedstock production is environmentally sustainable and climate resilient; and (Section 3.3.2 of the Climate Bonds Bioenergy Criteria)
- **Identify food risk,** if any; and have a plan to address it when the risk is significant (Section 3.3.3 of the Climate Bonds Bioenergy Criteria)

A no deforestation plan is required. Details can be found in DSF criteria, (publish 2024)

[27] Hydrogen Production and Delivery Criteria under the Climate Bonds Standards. Climate Bonds Initiative. December 2023.

5.4 Cross-cutting for methane leakages in fossil gas plants

Although fossil gas has been considered as a transition fuel due to its low combustion emissions, recent studies[28] have shown that, due to methane leakages in transportation of fossil gas, it can be as high emitting as coal. For that reason, in these criteria when investments involve fossil gas plants, actions are required to limit methane leakages These include the detection and reparation of methane leakages at operation, physical measurement of emissions is reported, and leak is eliminated, or a leak detection and repair programme is introduced, following EU Taxonomy regulation[29].

[28] https://gas-vs-coal-calculator.rmi.org/

[29] Electricity generation from fossil gaseous fuels

6 Adaptation and Resilience criteria

This section describes the Adaptation & Resilience (A&R) Component of the eligibility Criteria for certifying entities. The aim of these Adaptation and Resilience (A&R) is to assure that the entity is wholly resilient and adapted to climate and can provide the electricity within global climate changes without harming other facilities resilience.

To demonstrate compliance, all the certified entity's facilities (including existing and new capacity) must satisfy the requirements of the checklist detailed in ***Table 14***.

The checklist is a tool to verify that the applicant has implemented sufficient processes and plans in the design, planning and decommissioning phases of facilities to ensure that the operation and construction of the asset minimises environmental harm and the asset is appropriately adaptive and resilient to climate change and supports the adaptation and resilience of other stakeholders in the surrounding system, if applicable.

All elements of the checklist must be addressed, and appropriate evidence provided that these requirements are being met or are not applicable in respect of the specific facilities related to the certification. It is expected that the applicant's evidence will encompass a range of assessment and impact reports and associated data, including but not limited to those reports required to meet national and local licensing and approval processes. This might include Development Consent Orders, planning regulations adhered to, Environmental Impact Assessments, Vulnerability Assessments, and associated Adaptation Plans.

It is the applicant's responsibility to provide the relevant information to the verifier. Verifiers must include this information in the scope of verification.

For each question in the scorecard:

- A 'yes' indicates sufficient proof given.
- A 'no' indicates insufficient proof.
- In case of a 'n/a,' please justify why the question is not applicable.

Table 14: Adaptation and Resilience Checklist for electricity generation entities looking for certification.

No.	Adaptation and Resilience checklist for Electrical Utilities.	Proof Given	Overall Assessment
		For verifier to complete	
Area 1: Clear boundaries and critical interdependencies between the facilities and the system it operates within are identified.			
1.1	Boundaries of the facilities are defined using: 1. a listing of facilities associated with the use of the bond proceeds, 2. a map of their location, and 3. identification of the expected operational life of the equipment.		
1.2	Critical interdependencies between the infrastructure/s and the system within which it/they operate(s) are identified. Identification of these interdependencies should consider the potential for adverse impacts arising from, but not limited to: 1. The effects of supply disruption or interruption on dependent electricity users or populations; 2. Exacerbation of wildfires; 3. Relationships of the facilities to nearby flood zones; 4. Relationships of the facilities to surrounding water bodies and water courses; 5. Relationship of the facility to residential neighbourhoods surrounding the plant. 6. Damage or reduction in value of neighbouring property due to boundary structures and risk of falling during storm events. 7. Reduction in pollinating insects and birds; 8. Reduction in biodiversity or High Conservation Value[30] habitat; 9. Fire, dust and other practices that affect air quality; 10. Appropriation of land or economic assets from nearby vulnerable groups[31].		
Area 2: An assessment has been undertaken to identify the key physical climate hazards to which the facility will be exposed and vulnerable to over its operating life.			
2.1	Key physical climate risks and indicators of these risks are identified in line with the following guidelines: • Risks are identified based on (a) a range of climate hazards, and (b) information about risks in the current local context, including reference to any previously identified relevant hazard zones, e.g., flood zones. In order to be confident that facilities are robust and flexible in the face of climate change uncertainties, it is essential that the climate risks being assessed and addressed cover those that are of greatest relevance to electricity generation plants and infrastructure. The physical characteristics of climate change that must be considered in the risk assessment include: • Temperature rise o High temperatures can impact the operation and efficiency of certain types of equipment. o Increase of water and energy consumed for cooling purposes. • Increasing intense precipitation events		

[30] High Conservation Value (HCV) habitat criteria in accordance with www.hcvnetwork.org.

[31] According to IFC Performance Standards

No.	Adaptation and Resilience checklist for Electrical Utilities.	Proof Given	Overall Assessment
		For verifier to complete	
	o Heavy rainfall can result in flash pluvial flooding, which could significantly impact electrical assets[32]. o The site may experience reduced access or egress due to site flooding. • Landslides/ground movements o Damage on buildings, equipment, and infrastructure. o The site may experience reduced access or egress. • Drier seasons o Drought may alter or reduce availability of water with temperature increase. o Potential increased use or resilience on mains water for dust suppression and cleaning. o Potential for increase in dust emissions from the site. • Decrease river flow o Risk in the availability of raw materials o Risk to transport routes for supply chains • Changes in cloud cover, wind speed or increasing temperature extremes. o Poses risks to the availability of reliable energy, both electrical and/or thermal. • Sea-level rises o Potential for flooding of coastal infrastructure and assets at risk from storm surge events. o Reduction of useful life of assets due to frequent exposure to salty water • Increased coastal/ river erosion. o Risk in the availability of raw materials o Risk to transport routes for supply chain. • Increased soil erosion o Risks to the availability of raw materials. o Risk to transport routes for supply chains. • Wildfires o Severe damage on buildings, equipment, and infrastructure. o Explosions o Supply chain disruption **Guidance for carrying out Risk Assessments:** • Users should apply climate scenarios based on representative concentration pathway (RCP) 4.5 and 8.5 or similar/ equivalent to ensure consideration for worst case scenario. • Risk assessments should use both top-down methods and bottom-up methods that look at inherent system vulnerabilities in local context. • A broad range of models can be used to generate climate scenarios. • For risk assessment, The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities (TCFD) is recommended.		
Area 3: The measure that have or will be taken to address those risk, mitigate them to a level such that the infrastructure is suitable to climate change conditions over its operational life			
3.1	The following examples of risk management activities that applicants might consider, or that might be adopted as part of regulations (e.g. codes and standards). This list is not exhaustive, and applicants should fully assess the		

[32] Flood risk and resilience will likely have interdependencies with local and national agencies, for example related to local flood defences, coastal flood risk management, shoreline management plans etc.

No.	Adaptation and Resilience checklist for Electrical Utilities.	Proof Given	Overall Assessment
		For verifier to complete	
	mitigation measures that are relevant to the climate risk and impacts identified in the risk assessment. **Temperature** • Design standards that maintain equipment rating over its lifetime performance in the face of all potential ranges of temperature rise. • Resilience measures that ensure employees can continue to work at more extreme temperatures (e.g., air conditioning). • Water can be cleaned and recirculated for reuse on site. • Alternative cooling systems. • Assess how efficient the current cooling system is, and to propose upgrades or modifications where necessary. **Extreme Rainfall** • Design for resilience to pluvial flooding. • Assessment of site drainage requirements. • Make sure there are suitable alternative transport routes to and from the site. **Drier Seasons** • Measures are in place to review and minimise water use and to maximise collection and use of rainfall. • Mains water capacity is adequate, taking into account reduced availability of rainwater for activities such as dust suppression and cleaning. **Changes in cloud cover, wind speed or increasing temperature extremes.** • Reduced reliance on imported energy and storage infrastructure. **Sea-level rises** • Prevent corrosion. Measures could include making sure that plant or equipment prone to corrosion are protected, such as by being painted with resistant coating, regularly inspected and maintained. • Flood risk assessment and planning. **Increased flooding** • Flood risk assessment and planning. • Site installations outside of potentially affected zones. • Ensure flood defence systems and coastal management plans are adequate. **Increased coastal/ river erosion** • Shoreline management plans/ coastal erosion assessment **Landslides/ ground movement** • The potential for ground movement and landslides should be taken into account when assessing sites for steel production infrastructure. **Wildfires** • Implement active fire prevention measures such as fire detector, gas detector, design of sprinkler systems. • Wildland and vegetation management **General risk mitigation measures:** • Business continuity plans • Production restoration plans • System security standards • Employee capacity building		

No.	Adaptation and Resilience checklist for Electrical Utilities.	Proof Given	Overall Assessment
		For verifier to complete	
3.2	Risk reduction measures must be tolerant to a range of climate hazards and not lock-in conditions that could result in maladaptation.		
Area 4: The facilities do no harm to the climate resilience of the defined system they operate within, as indicated by the boundaries of and critical interdependencies with that system as identified in item 1 in this checklist.			
4.1	The facilities themselves do not pose significant risk of harm to the system they are located within or others' natural, social, or financial assets according to the principle of best available evidence during the investment period, taking into account the boundaries and critical interdependencies as defined in item 1 in this checklist. Harm is defined as an adverse effect on any of the following items: 1. Adverse effects on local water bodies and water courses; 2. Air pollution from dust and other pollutants; 3. Relationships of the facilities to nearby flood zones; 4. Reduction in pollinating insects and birds; 5. Reduction in biodiversity or High Conservation Value[33] habitat; 6. Appropriation of land or economic assets from nearby vulnerable groups[34].		
Area 5: The applicant is required to demonstrate that there will be ongoing monitoring and evaluation of the relevance of the risks and resilience measures and related adjustments to those measures will be taken as needed (reporting is required based on the term of certification, which depends on the finance instrument or asset being certified).			
5.1	Indicators for risks identified under item 2 in this checklist are provided.		
5.2	Indicators for risk mitigation measures identified under item 3 in this checklist are provided.		
5.3	Indicators for "fit for purpose" resilience benefit measures identified under item 4 in this checklist are provided.		
5.4	Applicants have a viable plan to annually monitor a) climate risks linked to the infrastructure, b) climate resilience performance, c) appropriateness of climate resilience measure(s) and to adjust as necessary to address evolving climate risks.		
5.5	Where production or operation has been interrupted, the extent of disruption (for example in reduction in volume output or revenue) should be measured and reported, together with the cause of the interruption. Any actions taken to reduce the risk of further impacts should also be recorded.		

Source: Climate Bonds own elaboration

[33] High Conservation Value (HCV) habitat criteria in accordance with www.hcvnetwork.org

[34] According to IFC Performance Standards

Definitions

Adaptation and Resilience Criteria: Rules or principles for evaluating and preventing the physical climate risk and asses the vulnerability of an asset or entities aiming to reduce of this vulnerability to the effects of climate change. These rules also tend to guarantee that the activities don't do any significative harm to other assets within their system boundaries which covers the area affected by the activity.

Advanced economies: OECD regional grouping and Bulgaria, Croatia, Cyprus, Malta and Romania

Applicant: The term or name for any potential bond issuer, or non-financial corporate entity that might seek certification under the Electrical Utilities Criteria.

Base load: It is the minimum level of electricity demand required over a period of 24 hours. It must be guaranteed by the electricity system.

Carbon Capture and Storage (CCS): describes a suite of technologies that capture waste CO_2, usually from large point sources, transport it to a storage site, and deposit it where it will not enter the atmosphere. Stored CO_2 is injected into an underground geological formation; this could be a depleted oil and gas reservoir or other suitable geological formation.

Carbon Capture, Utilisation, and storage (CCUS): describes a suite of technologies that capture waste CO_2, usually from large point sources, to then use it in other processes, or to make products.

Certified Entity: The entity or part thereof which is being certified under the Climate Bonds Standard. Currently, Entity Certification is limited to non-financial Entities or segregated segments thereof, for which the Climate Bonds Initiative has Climate Bonds Standard Sector Criteria for Entity Certification.

Climate Bond Certification: allows the applicant to use the Climate Bond Certification Mark in relation to that bond. Climate Bond Certification is provided once the independent CBSB is satisfied the bond conforms with the CBS.

Climate Bonds Initiative (Climate Bonds): An investor focused not-for-profit organisation, promoting large-scale investments that will deliver a global low carbon and climate resilient economy. Climate Bonds seeks to develop mechanisms to better align the interests of investors, industry and government to catalyse investments at a speed and scale sufficient to avoid dangerous climate change.

Climate Bonds Standard (CBS): A screening tool for investors and governments that allows them to identify green bonds the proceeds of which are being used to deliver climate change solutions. This may be through climate mitigation impact and/or climate adaptation or resilience. The CBS is made up of two parts: the parent standard (CBS v4.0) and a suite of sector specific eligibility Criteria. The parent standard covers the certification process and pre-and post-issuance requirements for all certified bonds, regardless of the nature of the capital projects. The Sector Criteria detail specific requirements for assets identified as falling under that specific sector. The latest version of the CBS is published on the Climate Bonds website.

Climate Bonds Standard Board (CBSB): A board of independent members that collectively represents $34 trillion of assets under management. The CBSB is responsible for approving (i) Revisions to the CBS, including the adoption of additional sector Criteria, (ii) Approved verifiers, and (iii) Applications for Certification of a bond under the CBS. The CBSB is constituted, appointed, and supported in line with the governance arrangements and processes as published on the Climate Bonds website.

Climate Change: A change in global or regional climate patterns attributed to the increased levels of CO_2 in the atmosphere, produced mainly by the combustion of fossil fuels.

Climate Goals: Objectives that aim to reduce GHG emissions to limit the global temperature increase to 2.0°C or even 1.5-degrees above pre-industrial levels.

Climate Mitigation Performance Targets: The performance targets that define the measurable climate mitigation performance to be achieved.

Climate resilience and adaptation: Measures or assessments related to protecting communities or ecosystems from the effects of climate change. Adaptation refers to the protection and resilience is the ability to adapt and recover from the impacts of climate change.

Climate Targets: Limits that scientist and policymakers set in plans to combat climate change.

CO_2 equivalent: A unit to measure the effect of all greenhouse gases according to their global warming potential that express the warming effect of each greenhouse gas over a set period of time (usually 100 years) in comparison to CO_2. Thus, an amount of a GHG can be expressed by the amount of CO_2 that will have the equivalent warming effect over 100 years.

CO_2 geological storage: It is the process of keeping the CO_2 in underground geologic formation, usually pressurizing the carbon dioxide until it becomes a liquid.

CO_2 transport leakages: Undesired CO_2 losses to the atmosphere during the transportation from where sequestered to where storage.

Critical interdependencies: The asset or activity's boundaries and interdependencies with surrounding infrastructure systems. Interdependencies are specific to local context but are often connected to wider systems through complex relationships that depend on factors 'outside the asset fence' that could cause cascading failures or contribute to collateral system benefits.

Decarbonisation pathways: Transformation process, strategies, or indications to be implemented in energy sector aiming to reduce emissions and the use of fossil fuels. They involve measures as shifting the energy mix, increasing energy efficiency, utilizing circular economy, or managing demand for energy.

Decarbonize: Moving away from energy systems that produce carbon dioxide and other greenhouse gas emissions and remove the amount of carbon gaseous compounds in the atmosphere.

Distribution: It is the final stage of the electricity value chain. Electricity is carried from the transmission system to individual consumers.

Electricity generation portfolio: The strategic collection of investments and assets in electricity generation technologies and projects by energy source.

Electrification: The process of using electricity to provide services that were previously met by other energy sources, usually fossil fuels. If the electricity come from renewable sources, it can help to the decarbonization of the economic system.

Emerging economies: All other countries not included in the advanced economies regional grouping.

Emissions intensity: Volume of emissions per unit of a representative factor in the assessed sector. In the electricity utilities sector this factor is kWh generated, so, the emissions intensity is the grams of CO_2 eq per kWh generated: gCO_2/kWh.

Emissions target: Limits that scientist set focused on the quantity of emissions that needs to be aligned with the Paris Climate Agreement.

Energy Utilities: A Company that provides energy, mainly electricity and fossil gas but also heat.

Fossil Gas: It is a hydrocarbon fuel mostly composed by methane produced from the decay of organic material over millions of years.

Green Bond: A green bond is a bond of which the proceeds are allocated to environmental projects or expenditures. The term generally refers to bonds that have been marketed as green. In theory, green bonds proceeds could be used for a wide variety of environmental projects or expenditures, but in practice they have mostly been earmarked for climate change projects.

Industry Working Group (IWG): A group of key organisations that are potential applicants, verifiers and investors convened by Climate Bonds. The IWG provides feedback on the draft sector Criteria developed by the TWG before they are released for public consultation.

Investment Period: The interval between the bond's issuance and its maturity date. Otherwise known as the bond tenor.

Life-cycle emissions analysis: It is a methodology for assessing or accounting environmental emissions associated with all the stage of the life cycle of a product or process. IT covers emissions from the initial design phase to the moment it's thrown away or recycled.

Low-carbon fuels: They are materials, that, when burned, provide thermal energy with fewer emissions than fossil fuels. This thermal energy can be used to generate electricity.

Low-carbon technologies: Technologies referred to as innovative technical solutions that are characterized by a low-emission intensity, compared to state-of-the-art alternatives. They can be seen as best-in-class technologies with a focus on environmental impact. For electricity utilities low-carbon technologies could be solar, wind, marine, bioenergy, hydropower, geothermal and nuclear.

Mitigation Criteria: Rules and principles containing thresholds, benchmarks and milestones for sector activities whose objective is the reduction of the harmful effects of greenhouse gases emissions.

Mitigation Technologies: Actions within technological process implemented to reduce and curb greenhouse gas emissions.

Natural Gas: A naturally occurring mixing of gaseous hydrocarbon consists primarily of methane in addition to other alkanes.

Negative emissions: It refers to processes in which more CO_2 is taken off and stored from the atmosphere than added into it, so the final GHG emissions balance is negative. It can be achieved by natural processes or a variety of technological solutions. Negative emissions are necessary to meet the Paris Agreement.

Net Zero Emissions Scenario (NZE): A science-based scenario designed to show what is needed across the main sector by various actor, and by when, for the world to achieve net-zero energy-related and industrial process CO_2 emissions by 2050. It also aims to minimize methane emissions for the energy sector.

Net zero emissions: It is a situation where global greenhouse gases emissions from human activity are in balance with emissions reductions. To achieve this situation human-caused emissions should be reduced as close to zero as possible.

Net-zero targets: Global policy instruments of international GHG reductions to achieve net zero emissions.

Non-fossil renewable gaseous and liquid fuels: Fuels produced using energy from other renewable energy sources.

Offsetting: A climate action that enables organizations to compensate for the emissions they put into the atmosphere, by supporting worthy projects that reduce emissions in separated regions of the world.

Parent Company/Group: A company is considered a parent company of another entity (a subsidiary) if it exercises control over the subsidiary. The terms "control" and "subsidiary" have the meaning assigned to them under International Financial Reporting Standard 10 (IFRS 10). A Parent Group consists of the Parent Company and all the companies that the Parent Company exercises control over. Where the Applicant does not belong to a group of companies, the term Parent Company applies to the Applicant.

Paris Agreement: A legally binding international treaty on climate change. It was adopted 196 Parties. Its overarching goal is to hold the increase in the global average temperature to well below 2-degrees above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5-degrees above pre-industrial levels.

Pathways: Science-based trajectories for different sectors indicating the way to achieve targets related to relevant indicators. In the electricity sector, these trajectories are referred usually to the emissions intensity.

Scenarios: Science-based plausible descriptions of how the future my unfold based on several assumptions (economic, social, behavioural, technological) Usually they are one of a ser of alternative pathways. Most common scenarios are the IEA Net Zero Emissions Scenario, the NDC's Scenario…

Scope of emissions: The boundaries within the emissions will be taken into account. Usually for business, companies, or organizations, the GHG Protocol has divided all the companies' emissions into 3 categories. Scope 1, 2 and 3.

Standards Criteria: Principles settled to evaluate processes, assets, or entities referred to benchmarks, targets, or goals aimed to achieve.

Sustainability-Linked Debt (SLD): Any debt instrument for which the financial and structural characteristics can vary depending on whether the issuer achieves predefined Sustainability/ ESG objectives. Such objectives are measured through predefined KPIs and assessed against predefined performance targets. Proceeds of SLD are intended to be used for general purposes.

Synthetic Fuels: Liquid or gaseous fuels produced artificially that can come from renewable raw materials or electricity generated using renewable energy sources. They tend to have the same properties as fossil fuels and can replace them.

Technical Working Group (TWG): A group of key experts from academia, international agencies, industry and NGOs convened by Climate Bonds. The TWG develops the Sector Criteria - detailed technical criteria for the eligibility of projects and assets as well as guidance on the tracking of eligibility status during the term of the bond. Their draft recommendations are refined through engagement with finance industry experts in convened Industry Working Groups (see below) and through public consultation. Final approval of Sector Criteria is given by the CBSB.

Transition targets: Thresholds, benchmarks, and milestones based on key assumptions and dependencies used by scientist and policymakers to develop a plan to achieve climate targets.

Unabated fossil fuel: Fossil Fuels without any intervention that substantially reduce the amount of greenhouse gas emitted throughout their life cycle.

Acronyms

BECCS	Bioenergy equipped with CCUS
CAPEX	Capital expenditures
CBS	Climate Bonds Standard
CBSB	Climate Bonds Standard Board
CCGT	Combined circle gas turbine
CCS	Carbon capture and storage
CCU	Carbon capture and utilisation
CCUS	Carbon capture, utilisation, and storage
CEM	Continuing emissions monitoring
CHP	Combined Heat and Power
CO_2	Carbon dioxide
CSP	Concentrating solar power
EU	European Union
FSC	Forest Stewardship Council
GHG	Greenhouse gases
IAMC	Integrated alarm, monitoring and control systems
IEA	International Energy Agency
IGCC	Integrated gasification combined cycle
IPPC	Intergovernmental Panel on Climate Change
ISCC	International Sustainability & Carbon Certification
IWG	Industrial working group
LCA	Life cycle analysis
NGCC	Natural gas combined cycle
NZE	Net zero emissions by 2050 scenario
O&M	Operation and maintenance
PV	Photovoltaic
RSB	Roundtable on Sustainable Biomaterials Association
RTRS	Round Table of Responsible Soy
SBTi	Science Based Targets initiative
SLB	Sustainability-linked bond
SLD	Sustainability-linked debt
T&D	Transmission and distribution
TPI	Transition Pathway Initiative
TWG	Technical working group
UoP	Use of process
WRI	World Resource Institute
WBCSD	World Business Council for Sustainable Development

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Appendix A: Life Cycle Assessment for hydrogen[35]

The Life Cycle Assessment (LCA) should follow the latest releases of ISO Standard[36] (ISO 14040, ISO 14044 for life-cycle assessment, and ISO 14067 for product carbon footprint). The Recommendation 2013/179/EU will be acceptable for assets located in the EU. Results should be verified by an independent third party.

GHG emissions must be estimated for a purity of 99.9% vol, and a gauge pressure of at least 3 MPa using correction factors. For pressures higher than 3 MPa, additional energy compression emissions must be included as well.

The methodology factor in a Global Warming Potential for a period of 100 years (GWP100) for methane should be 30[37].

GHG emissions accounting:

$$Etotal = E1 + E2 + E3 + E4 + E5 - E6 + E7 + E8$$

E total: Total emissions

E1: Upstream feedstock related emissions (including sourcing[38], processing, transport, and storage)

E2: Upstream energy related emissions (including sourcing, processing, transport, and storage)

E3: Fugitive emissions (Including hydrogen emissions)

E4: Process emissions

E5: CCS/CCUS emissions related to energy consumption and leakages.

E6: Carbon emissions captured.

E7: Compression and purification emission (Energy required to compress and purify hydrogen)

E8: Transportation emissions to the site where hydrogen will be used (energy and electricity related emissions, and fugitive emissions during transportation)[39]

Additional Guidance for different production pathways up to the point of production [40]:

The International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) methodology working paper contains guidelines to a calculation method for GHG accounting for the following production pathways up to the point of production[41]:

- Steam Methane Reforming combined with CCS/CCUS: Appendix P1 of IPHE working document.
- Biomass as a feedstock combined with CCS/CCUS: Appendix P5 of IPHE working document.
- Manure-based production: P5.4 Biodigestion.
- Land fill gas-based production: P5.4 Biodigestion.
- Biomass from secondary sources: P.5.5 Biomass gasification.
- The IPHE working document also has guidelines for emission sources and allocation for biomass-based production:
  - Emissions sources in Biomass-Based Hydrogen Routes/CCS/CCUS: Appendix P.5.6
  - Allocation for the Biomass/CCS/CCUS pathway: Appendix P.5.7

[35] Climate Bonds Standards Version 4.0. *Globally Recognised, Paris-aligned certification of debt Instruments, Entities and Assets using robust, science-based methodologies*. Updated version 2023. Please assure that this is the latest version on Climate Bonds Standards.

[36] ISO standards available at: www.iso.org/standard/38498.html; www.iso.org/standard/37456.html

[37] Sixth Assessment Report - IPCC

[38] Depending on the feedstock, it can be extraction, cultivation, or collection

[39] Transportation infrastructure emissions are not included

[40] The IPHE methodology will develop guidelines for transport emissions accounting in the coming months.

[41] www.iphe.net/_files/ugd/45185a_6159cefcd88f4d9283ab0e60f4802cb4.pdf

Appendix B: Requirements for biomass when used as a fuel

Biomass sources allowed in the criteria[42].

Feedstock selected for bioenergy must have high energy content, readably obtainable in large number of quantities and be flexible to conversion process. Cultivation requires low energy input, high yields, low processing energy input, high cellulose, and hemicellulose content[43]. For this reason, the criteria only cover bioenergy as a fuel for cofiring or BECCS when generated from:

- Lignocellulosic biomass:
- Energy crops:
- Residues:

Feedstock excluded are:

- Third generation biofuels (algae)
- Wood (and all woody biomass)
- Biodegradable municipal solid waste (MSW)

Criteria for indirect Land Use Change[44] (iLUC).

Bioenergy facilities must either:

- Be certified under the Roundtable on Sustainable Biomaterials Association (RSB) low indirect land use change (iLUC) optional module to demonstrate that they have low indirect land use impact; or
- Provide evidence and documentation to demonstrate that they meet low iLUC risk biomass criteria and compliance indicators under the RSB optional module, i.e:
    - Yield increase: issuers demonstrate that source feedstock for the facility is produced through an increase in yield compared to a reference date, without any additional land conversion. The biomass that is produced above the baseline scenario is eligible.
    - Unused/degraded land: issuers demonstrate that source feedstock for the facility is produced from land that was not previously cultivated or was not considered arable land.
    - Use of waste/residues: issuers demonstrate that the raw material used is derived from existing supply chains and does not require dedicated production out of arable land.

GHG Emissions threshold for bioenergy.

GHG emissions of biomass must not exceed **5.5 gCO_2e/MJ** (that implies **50 gCO_2e/kWh** in an electrical plant with a 40% efficiency) for embedded emissions in biomass production, according with the Climate Bonds Bioenergy criteria. Although the actual criteria only cover electricity generated from cogeneration plants, the thresholds is established for the production and delivery of the biomass before its combustion, thus, the value is applicable to these criteria.

To demonstrate compliance with these values, issuers are required to use one of these tools in ***Table 15*** below for GHG emissions calculation.

[42] Section 2 of the Bioenergy Criteria. Climate Bonds Initiative, August 2022

[43] https://academic.oup.com/ijlct/article/doi/10.1093/ijlct/ctac068/6628805

[44] Bioenergy Criteria under the Climate Bonds Standards. Section 3.2.2. Climate Bonds Initiative. August 2022

Table 15: Endorsed GHG Calculation Tools.

Name	Technical Scope	Origin
BIOGRACE II	Biomass for electricity	EU
UK Solid and Gaseous Biomass Carbon Calculator	Solid biomass and biogas used for heat and electricity generation	UK

Source: Climate Bonds Bioenergy

Checklist for adaptation and resilience:[45]

The checklist is a tool to verify that the issuer has implemented sufficient processes and plans in the design, planning and decommissioning phases of the asset or project to ensure that the operation and construction is appropriately adaptive and resilient to climate change and also supports the adaptation and resilience of other stakeholders in the surrounding ecosystem.

All elements of this checklist must be addressed with appropriate evidence that these requirements are being met or are not applicable in respect of the specific assets and projects linked to the bond. It is expected that this evidence will encompass a range of assessment and impact reports and associated data, including but not limited to those reports required to meet national and local licensing and approval processes. This might include Development Consent Orders, Environmental Impact Assessments, Vulnerability Assessments, and associated Adaptation Plans.

Table 16: Checklist for evaluating the Issuer's Adaptation & Resilience performance in respect of a Bioenergy facility.

No.	Adaptation and Resilience checklist for Bioenergy facility	Proof Given	Overall Assessment
		For verifier to complete	
Section 1: The issuer identifies the climate related risks and vulnerabilities to the asset/ site			
1.2	Processes are in place (as part of both the asset design and ongoing management) to assess key risks to the assets from a changing climate. These key risks should include the following, plus any others felt to be of concern for the operation of these assets. The risks should be identified and interpreted in terms of the impact on the asset and the related effects for the business - e.g. impact on operating feasibility and schedules and potential system outages, impact on maintenance requirements etc. NB This list taken from World Banks Climate and Disaster Risk Assessment Tool • Temperature changes, and extremes in temperature • Extreme precipitation and flooding • Drought • Sea level rise and storm surge • Strong winds How these affect the asset or site in question will be highly variable and will be for the issuer to identify and relate to their operations. These assessments should use climate information, modelling, and scenarios from a peer reviewed source. This assessment should be done regularly. The frequency of the assessment will depend on the nature of the climate related risks and vulnerabilities and should be specified by the issuer and reporting against in subsequent annual reporting.		

[45] Bioenergy Criteria under the Climate Bonds Standards. Section 3.3.1. Climate Bonds Initiative. August 2022

No.	Adaptation and Resilience checklist for Bioenergy facility	Proof Given	Overall Assessment
		For verifier to complete	
Section 2: The issuer identifies the impacts in larger context (spatially and temporally) beyond the asset/site (i.e. the impacts of the linked assets and projects on the broader ecosystem and stakeholders in that ecosystem)			
2.1	Processes are in place (as part of both the asset design and ongoing management) to assess the impact of the bioenergy asset on the climate resilience of other stakeholders in the social, economic and environmental system in which it operates and how to mitigate or reduce any negative impacts. These assessments address: • Any ways in which bioenergy facilities might affect the climate resilience of other users/stakeholders? • Any ways in which bioenergy facilities improve the adaptation capacity of other users/stakeholders? For example, they may include: • Impact on water quality and quantity for other users in the basin • Waste and pollution emitted. • Fire hazards		
Section 3: The issuer has designed and implemented strategies to mitigate and adapt to these climate risks and vulnerabilities to the underlying assets and projects and the broader ecosystem and its stakeholders.			
3.1	An adaptation plan has been designed and is being implemented to address the risks identified in assessments above. The issuer has designed or amended investment and maintenance plans for the assets or projects and the broader ecosystem and its stakeholders. This is to ensure that the asset and its scheduled maintenance is sufficient to cope with the ongoing impacts of climate change and a plan has been established to govern how they approach emergency maintenance needs arising from sudden climate change impacts (e.g. extreme storms) The issue has training, capacity and governance arrangements in place for how the organization will deal with the impacts of exception events (e.g. droughts, floods, severe pollution events, extreme storms, winds etc.) The issuer has monitoring and reporting systems and processes to identify high risk scenarios. The issuer has contingency plans to address disruption to operations or loss of the asset and any resulting broader environmental or social damage. The issuer has processes for feeding risk assessment back into decision making. The issuer has a budget allocated to implementing the adaptation plan and has a named member of staff responsible for its implementation. The issuer complies with any existing broader or higher-level adaption plans, such as NAPAs.		

Source: Climate Bonds Bioenergy

Criteria for source feedstocks adaptation and resilience [46]

Issuers are required to demonstrate that they are sourcing feedstocks that is produced in an environmentally sustainable manner and therefore support climate resilience. Climate Bonds recognise two options to achieve this successfully.

- Option A: Feedstock used are certified under one of the following, pre-approved best practices standards.
  - RSB
  - Round Table of Responsible Soy (RTRS)
  - Forest Stewardship Council (FSC)
  - International Sustainability & Carbon Certification (ISCC) Plus
  - Climate Bonds Agriculture Criteria
- Option B: Feedstocks are certified under a standard or a similar scheme where issuer can prove the standard has sufficient requirements and thus is robust.

Where approved, certification of all source feedstock must be maintained for the full duration of the entity's certification.

Criteria for food security[47]

Issuers are required to identify food security risk, if any; and have a plan to address it when the risk is significant.

The requirement for addressing food security risk is based on RSB Food Security Assessment Guidelines[48]. Issuers are required to first evaluate food security at national level by checking latest International Food Policy and Research Institute's Global Hunger Index (GHI)[49] to see whether their sourcing feedstock are produced in food insecure nations. If the feedstock production is located in a country with low or moderate ranking on the GHI, there is no further requirement.

[46] Bioenergy Criteria under the Climate Bonds Standards. Section 3.3.2. Climate Bonds Initiative. August 2022

[47] Bioenergy Criteria under the Climate Bonds Standards. Section 3.3.3. Climate Bonds Initiative. August 2022

[48] RSB Food Security Guidelines. Version 3.0. January 2018.

49 www.globalhungerindex.org/

Appendix C: Proposed method for estimating GHG emissions in geothermal power plants

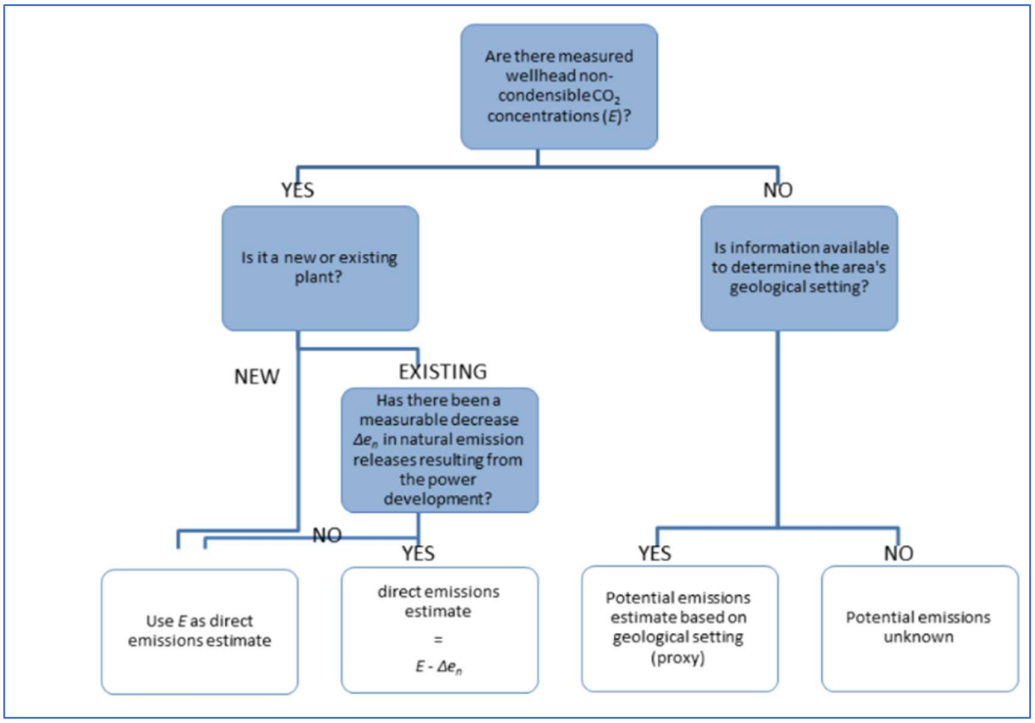

Figure 6: Methodologies required for GHG assessment of geothermal assets.

Source: Climate Bonds Geothermal Criteria

Appendix D: TWG and IWG members

Climate Bonds Coordinator:	
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Technical Lead Advisor:	
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TWG Members			
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Ryan Foelsk	Manager on Utility Transition Finance Team, RMI		

Members of the following organizations have participated in IWG meetings and provided critical and useability focused consultation and feedback on the Criteria, but this does not automatically reflect endorsement of the criteria by all members.

IWG Members			
Adrian Ghita	Romanian Energy Efficiency Fund	**Lazeena Rahman**	ADB (Asia Development Bank)
Alison Chan	NAB (National Australian Bank)	**Margaret Onije**	BGI Resources Limited
April Strid	Kestrel	**Mitra Apurba**	KPMG
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