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CERTIFIED RENEWABLE ENERGY PROFESSIONAL REP EXAM QUESTION BANK

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Additionality

A criterion often applied to GHG projects, stipulating that project-based GHG reductions should only be quantified if the project activity "would not have happened anyway"—i.e., that the project activity (or the same technologies or practices it employs) would not have been implemented in its baseline scenario and/or that project activity emissions are lower than baseline emissions.

Allowances

The basic tradable commodity within GHG emission trading systems. Allowances grant their holder the right to emit a specific quantity of pollution once (e.g., one tonne of CO2eq). The total quantity of allowances issued by regulators dictates the total quantity of emissions possible under the system. At the end of each compliance period, each regulated entity must surrender sufficient allowances to cover their GHG emissions during that period.

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Barriers

Any factor or consideration that would (significantly) discourage a decision to try to implement the project activity or its baseline candidates.

Base Year

A historic datum (a specific year or an average over multiple years) for tracking corporate GHG emissions over time. This term applies only to corporate or entity-wide GHG accounting, not to project-based GHG accounting.

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Base Year Emission

GHG emissions in the base year. This term applies only to corporate or entity-wide GHG accounting, not to project-based GHG accounting.

Baseline Candidates

Alternative technologies or practices within a specified geographic area and temporal range that could provide the same product or service as the project activity.

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Baseline Emissions	An estimate of GHG emissions, removals, or storage associated with a baseline scenario or derived using a performance standard (see baseline procedures).
Baseline Parameter	Any parameter whose value or status can be monitored in order to validate assumptions about base- line emissions estimates or to help estimate baseline emissions.

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Baseline Procedures

Methods used to estimate baseline emissions. The Project Protocol presents two optional procedures: the project-specific procedure and the performance standard procedure.

Baseline Scenario

A hypothetical description of what would have most likely occurred in the absence of any considerations about climate change mitigation.

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Cogeneration

sequential production of either electrical or mechanical power and useful thermal energy (heating or cooling) from a single energy form

Cooling load

the difference in temperature between the outdoor mean temperature over a 24-hour period and a given base temperature, used in estimating heating and cooling energy use. For any one day, there are as many degree days (Kelvin-days) as there are degrees Fahrenheit (degrees Celsius) departure of the mean temperature for the day from the base temperature

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Density

mass per unit of volume

Global Environmental Issues

Few examples of environmental issues of global significance are:

- Ozone layer depletion
- Global warming
- Loss of biodiversity

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Benefits

The benefits that would be expected to accrue to decision-makers involved with the activities in each baseline scenario alternative, excluding all potential benefits resulting from GHG reductions.

Carbon Dioxide Equivalent (CO_2eq)

The universal unit of measurement used to indicate the global warming potential of greenhouse gases. It is used to evaluate the impacts of releasing (or avoiding the release of) different greenhouse gases.

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Carbon Stock

The absolute quantity of carbon held within a GHG sink at a specified time (see GHG sink).

Common Practice

The predominant technology(ies) implemented or practice(s) undertaken in a particular region or sector.

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Energy use intensity (EUI)

an expression of the annual energy used or calculated to be used by a building or building space per unit of gross floor area. Expressed in MBtu/ft2·yr (watts-hours/m2·yr)

Decision-Makers

ny parties who might be involved in the decision to implement a project activity or one of its baseline candidates. In most cases, the project developer will be the sole "decision-maker" with respect to the project activity. However, other parties could be the "decision-makers" for baseline candidates.

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Direct GHG Emissions	Emissions or removals from GHG sources or sinks that are owned or controlled by the project developer.
Dynamic Baseline Emissions	Baseline emission estimates that change over the valid time length of the baseline scenario. Dynamic baseline emissions are often estimated for land-use and forestry projects.

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Emission Factor

A factor relating GHG emissions to a level of activity or a certain quantity of inputs or products or serv- ices (e.g., tonnes of fuel consumed, or units of a product). For example, an electricity emission factor is commonly expressed as t CO2eq/megawatt-hour.

Gross floor area

the sum of the floor areas of all the spaces within the building, with no deductions for floor penetrations other than atria. The exterior faces of exterior walls or the centerline of walls separating buildings are used to measure gross floor area. However, covered walkways, open roofed areas, porches, and similar spaces are not included. Neither are pipe trenches, exterior terraces or steps, roof overhangs, parking garages, surface parking, and other similar features.

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Heat capacity

1) the amount of heat necessary to raise the temperature of a given mass by one degree; numerically, the mass multiplied by the specific heat. (2) the capacity of a body to store heat

Heat gain (heat uptake)

quantity of heat a system or enclosed space absorbs

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Fuel Switching

Using an alternative fuel (usually of lower carbon intensity) to produce required energy.

Geographic Area

A physical area that helps define the final list of baseline candidates. The area can be defined by a number of factors including sociocultural, economic, or legal factors; the availability of necessary physical infrastructure; and/or biophysical characteristics.

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GHG Assessment Boundary	Encompasses all primary effects and significant secondary effects associated with the GHG project. Where the GHG project involves more than one project activity, the primary and significant secondary effects from all project activities are included in the GHG assessment boundary.
GHG Emissions	GHGs released into the atmosphere.

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GHG Program

A generic term for: (1) any voluntary or mandatory, government or non-government initiative, system, or program that registers, certifies, or regulates GHG emissions; or (2) any authorities responsible for developing or administering such initiatives, systems, or programs.

GHG Project

A specific activity or set of activities intended to reduce GHG emissions, increase the storage of carbon, or enhance GHG removals from the atmosphere. A GHG project may be a stand-alone project, or a component of a larger non-GHG project.

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GHG Protocol Initiative (GHG Protocol)

A multi-stakeholder partnership of businesses, nongovernmental organisations, governments, academics, and others convened by the World Business Council for Sustainable Development and the World Resources Institute to design and develop internationally accepted GHG accounting and report- ing standards and/or protocols, and to promote their broad adoption.

GHG Reductions

A decrease in GHG emissions or an increase in removal or storage of GHGs from the atmosphere, rela- tive to baseline emissions. Primary effects will result in GHG reductions, as will some secondary effects. A project activity's total GHG reductions are quantified as the sum of its associated primary effect(s) and any significant secondary effects (which may involve decreases or countervailing increases in GHG emissions). A GHG project's total GHG reductions are quantified as the sum of the GHG reductions from each project activity.

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GHG Sink

Any process that removes GHG emissions from the atmosphere and stores them.

Life-cycle assessment

the process of evaluating a component, product, assembly, building, etc. and its development from the moment of extraction of raw materials, transportation, processing, manufacturing, use, recyclability, and disposal and assigning a value or assessment of its cumulative and ultimate social, environmental, and economic costs, benefits, and impacts. This is often referred to as a cradle-to-grave or cradle-to-cradle assessment.

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Life-cycle cost	cost of equipment over its entire life, including operating, maintenance, and repair/replacement costs. May also include decommissioning costs.
GHG Source	Any process that releases GHG emissions into the atmosphere.

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Greenhouse Gases (GHGs)

Greenhouse gases are gases that absorb and emit radiation at specific wavelengths within the spec- trum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. The six main GHGs whose emissions are human-caused are: carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF_6).

Indirect GHG Emissions

Emissions or removals that are a consequence of a project activity, but occur at GHG sources or sinks not owned or controlled by the project developer.

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Legal Requirements

Any mandatory laws or regulations that directly or indirectly affect GHG emissions associated with a project activity or its baseline candidates, and that require technical, performance, or management actions. Legal requirements may involve the use of a specific technology (e.g., gas turbines instead of diesel generators), meeting a certain standard of performance (e.g., fuel efficiency standards for vehicles), or managing operations according to a certain set of criteria or practices (e.g., forest management practices).

Market Response

The response of alternative providers or users of an input or product to a change in market supply or demand caused by the project activity.

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One-Time Effects

Secondary effects related to the construction, installation, and establishment or the decommissioning and termination of the project activity.

Performance Metric

A rate that relates the level of consumption of relevant inputs to the level of production for different baseline candidates, or that relates GHG emissions to the size or capacity of different baseline candi- dates. Performance metrics are used in developing performance standards.

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Performance Standard	A GHG emission rate used to determine baseline emissions for a particular type of project activity. A performance standard may be used to estimate baseline emissions for any number of similar project activities in the same geographic area.
Owner's project requirements (OPR)	a written document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. (The term project intent is used by some owners for their commissioning process, Owner's Project Requirements.)

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Performance Standard Procedure

A baseline procedure that estimates baseline emissions using a GHG emission rate derived from a numerical analysis of the GHG emission rates of all baseline candidates. A performance standard is sometimes referred to as a multi-project baseline or benchmark, because it can be used to estimate baseline emissions for multiple project activities of the same type.

Primary Effect

The intended change caused by a project activity in GHG emissions, removals, or storage associated with a GHG source or sink. Each project activity will generally have only one primary effect.

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Production-Based Performance Standard

A performance standard defined as a rate of GHG emissions per unit of a product or service produced by all identified baseline candidates. This type of performance standard will generally apply to energy efficiency, energy generation, and industrial process project activities.

Project Activity

A specific action or intervention targeted at changing GHG emissions, removals, or storage. It may include modifications or alterations to existing production, process, consumption, service, or manage- ment systems, as well as the introduction of new systems.

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Project-Specific Procedure

A baseline procedure that estimates baseline emissions through the identification of a baseline scenario specific to the proposed project activity.

Relevant Input

Any kind of material or energy that is: (1) required to produce the product or service common to all baseline candidates, and (2) related to the project activity's primary effect.

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Retrofit Project	Any GHG project that involves modifying existing equipment, or replacing existing equipment with new parts, devices, or systems.
Secondary Effect	An unintended change caused by a project activity in GHG emissions, removals, or storage associated with a GHG source or sink. Secondary effects may be "positive" (i.e., resulting in GHG reductions) or "negative" (i.e., resulting in GHG emissions).

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Sequestration

The uptake and storage of CO2, which can be sequestered by plants or in underground or deep-sea reservoirs.

Static Baseline Emissions

Baseline emission estimates that do not change over the valid time length of the baseline scenario.

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Stringency Level

A GHG emission rate that is more restrictive than the average GHG emission rate of all baseline candi- dates. Stringency levels may be specified as a GHG emission rate corresponding to a certain percentile (better than the 50th percentile) or to the lowest-emitting baseline candidate. Stringency levels are defined in the course of developing a performance standard.

Temporal Range

A contiguous time period that helps define the final list of baseline candidates. The temporal range can be defined by a number of factors, such as the dominance of a single technology for an extended period of time, the diversity of options in a sector or region, and/or a discrete change in an area's or a region's policy, technology, practice, or resource.

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Time-Based Performance Standard

A performance standard defined as a rate of GHG emissions per unit of time and unit of size or capacity of the baseline candidates. This type of performance standard will generally apply to project activities involving storage or removals of CO2 by biological processes, fugitive emissions and waste emissions

Upstream/Downstream Effects

Secondary effects associated with the inputs used (upstream) or the products produced (downstream) by a project activity.

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Bilan Carbone (carbon balance)

The Bilan Carbone and its database of emission factors provide a comprehensive methodological basis. Since late 2011, the Association Bilan Carbone (Carbon Balance Association) has managed licenses for the tool and the Institut de Formation Carbone (Carbon Training Institute) has organized training in the method.

Cap and trade

A mechanism for limiting emissions in which emission rights are defined and capped, and can then be traded. If a participant does not have enough allowances to match its emissions at the end of the compliance period, the participant must buy additional allowances on the market to make up the shortfall. If the opposite is the case, the participant can sell allowances. This system is sometimes linked to a project mechanism that generates carbon credits that are fungible with quotas if certain conditions are met.

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Carbon footprint

A carbon footprint is defined as a measure of total GHG emissions caused directly or indirectly by a person, an organization, a territory, a product or a service.

Carbon leakage

Carbon leakage occurs when a company delocalizes to a country with climate regulations that are more lax or non-existent. This type of situation reduces the emissions of environmentally progressive countries without any environmental benefit at the global level.

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Emissions conversion factor

A factor that can be used to convert a unit of energy into a unit of GHG emissions, where GHG emissions are typically expressed in mass units of CO2e,

Normalization

used in the context of metrics, performance targets, and measured building performance. Metric normalization refers to the process of adjusting metrics to a common scale or unit, such as building floor area. Performance target normalization refers to the process of adjusting the performance targets for a building based on specific factors that may influence its performance, such as weather, occupancy, and high-energy applications, among others.

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Performance target

The specific level of performance or performance threshold that buildings are expected to meet as part of the BPS used interchangeably with target.

Policy makers

Representatives of the jurisdiction's governing body that develops and adopts the BPS may include legislators, building department staff, council members, and others, depending on the jurisdiction.

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Policy scope

The buildings covered by the standard, i.e., buildings that are required to meet a performance target,

Scope 1 and Scope 2 emissions

In the context of emissions reporting, the scope of emissions is defined in terms of whether the reporting entity owns and controls the asset producing the emissions. Scope 1 emissions are direct GHG emissions resulting from fuel combustion from sources owned by the reporting entity

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GHG offsets

GHG offsets are discrete GHG reductions used to compensate for (i.e., offset) GHG emissions elsewhere, for example to meet a voluntary or mandatory carbon cap.

Carbon neutrality

"Carbon neutrality" refers to reducing or offsetting the carbon impact of a given entity, product, or activity so that it results in no net carbon emissions to the atmosphere.

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Cradle-to-gate	All emissions that occur in the life cycle of purchased products, up to the point of receipt by the reporting company (excluding emissions from sources that are owned or controlled by the reporting company).
Direct emissions	Emissions from sources that are owned or controlled by the reporting company.

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Emissions

The release of greenhouse gases into the atmosphere.

Financial control approach

A consolidation approach whereby a company accounts for 100 percent of the GHG emissions over which it has financial control. It does not account for GHG emissions from operations in which it owns an interest but does not have financial contro

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Global warming potential (GWP)

A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO2.

Greenhouse gas inventory

A quantified list of an organization's GHG emissions and sources.

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Indirect emissions

Emissions that are a consequence of the activities of the reporting company, but occur at sources owned or controlled by another company.

Life cycle

Consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to end of life.

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Life cycle assessment

Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.

Operational boundaries

The boundaries that determine the direct and indirect emissions associated with operations owned or controlled by the reporting company.

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Organizational boundaries

The boundaries that determine the operations owned or controlled by the reporting company, depending on the consolidation approach taken (equity or control approach).

Reporting

Presenting data to internal management and external users such as regulators, shareholders, the general public or specific stakeholder groups.

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Scope 1 emissions	Emissions from operations that are owned or controlled by the reporting company.
Scope 2 emissions	Emissions from the generation of purchased or acquired electricity, steam, heating or cooling consumed by the reporting company.

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Scope 3 emissions

All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

Material discrepancies”

A material discrepancy is an error (for example from an oversight, omission, or miscalculation) that results in the reported quantity being significantly different to the true value to an extent that will influence performance or decisions. Also known as material misstatement."

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Demand response (DR)

event a specific period of time when the utility or independent service operator calls for a change in the pattern or level of use of grid-based electricity from its program participants. Also known as a curtailment event.

Load shedding

an intentional action by a utility to reduce the load on the system. Load shedding is usually conducted during emergency periods, such as capacity shortages, system instability, or voltage control.

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Peak demand	the maximum electricity load at a specific point in time or over a period of time
Permanent peak load shifting	the transfer of energy consumption to off-peak hours, when demand for power is lower and energy is therefore less expensive.

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Solar garden

a shared solar array or other renewable energy system with grid-connected subscribers who receive credit for the use of renewables using virtual net metering. Also known as a community renewable energy system. (Adapted from solargardens.org)

Natural refrigerant

a compound that is not manmade and is used for cooling. Such substances generally have a much lower potential for atmospheric damage than manufactured chemical refrigerants. Examples include water, carbon dioxide, and ammonia.

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Carbon offset

a unit of carbon dioxide equivalent that is reduced, avoided, or sequestered to compensate for emissions occurring elsewhere (World Resources Institute)

District energy system (DES)

a central energy conversion plant and transmission and distribution system that provide thermal energy to a group of buildings (e.g., a central cooling plant on a university campus). It does not include central energy systems that provide only electricity.

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Green power	a subset of renewable energy composed of grid-based electricity produced from renewable energy sources
Scope 1 emissions	direct greenhouse gas emissions from sources owned or controlled by the entity, such as emissions from fossil fuels burned on site. Electricity produced on site through the burning of fossil fuels is measured by the Scope 1 emissions associated with that fossil fuel.

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Scope 2 emissions

indirect greenhouse gas emissions associated with the generation of purchased electricity, heating, cooling, or steam on site through a utility provider for the entity's consumption. Transmission and distribution losses related to hot water, chilled water, and steam are included in Scope 2 emissions, but transmission and distribution losses associated with electricity are not included.

Chloroluorocarbon (CFC)-based refrigerant

A chloroluorocarbon (CFC)-based refrigerant is a fluid containing hydrocarbons that absorbs heat from a reservoir at low temperatures and rejects heat at higher temperatures. When emitted into the atmosphere, CFCs cause the depletion of the stratospheric ozone layer.

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Carbon neutrality

"Carbon neutrality" refers to reducing or offsetting the carbon impact of a given entity, product, or activity so that it results in no net carbon emissions to the atmosphere.

Global Reporting Initiative

The GRI seeks to harmonize global organizational reporting on economic, environmental, and social performance according to financial reporting. The Reporting Framework facilitates transparency and accountability by organizations — companies, public agencies, non-profits - of all sizes and sectors, across the world.

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“Boundaries” in a GHG inventory	Boundaries are imaginary lines encompassing the emissions to be included in a GHG inventory
Uncertainty	parameter associated with the result of quantification which characterizes the dispersion of the values that could be reasonably attributed to the quantified amount

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Verifier	competent and independent person, or persons, with responsibility for performing and reporting on the verification process
Verification	systematic, independent and documented process for the evaluation of a greenhouse gas assertion against agreed verification criteria

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Validator	competent and independent person or persons with responsibility for performing and reporting on the results of a validation
Validation statement / verification statement	formal written declaration to the intended user that provides assurance on the statements in the greenhouse gas assertion of the responsible party

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Validation criteria/ verification criteria	policy, procedure or requirement used as a reference against which evidence is compared
Intended user	individual or organization identified by those reporting GHG-related information as being the one who relies on that information to make decisions

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Greenhouse gas inventory	an organization's greenhouse gas sources , greenhouse gas sinks , GHG emissions and removals
Greenhouse gas project	activity or activities that alter the conditions identified in the baseline scenario which cause GHG emission reductions or GHG removal enhancements

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Greenhouse gas report	stand-alone document intended to communicate an organization's or project's GHG-related information to its intended users
Carbon dioxide equivalent CO2e	unit for comparing the radiative forcing of a GHG to carbon dioxide

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Greenhouse gas reservoir

physical unit or component of the biosphere, geosphere or hydrosphere with the capability to store or accumulate a GHG removed from the atmosphere by a greenhouse gas sink or a GHG captured from a greenhouse gas source

Greenhouse gas source

physical unit or process that releases a GHG into the atmosphere

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Greenhouse gas emission

total mass of a GHG released to the atmosphere over a specified period of time

Greenhouse gas emission or removal factor

factor relating activity data to GHG emissions or removals

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Agronomy	The science of plant production and soil management.
Anaerobic	Life or biological processes that occur in the absence of oxygen.

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Biogenic emissions (CO2(b))

Emissions produced by living organisms or biological processes, but not fossilized or from fossil sources.

Carbon Dioxide Removal (CDR)

Carbon dioxide removal measures refer to processes that remove CO2 from the atmosphere by either increasing biological sinks of CO2 or using chemical processes to directly bind CO2.

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Biobased Product

Commercial or industrial products, other than food or feed, derived from biomass feedstocks. Many of these products possess unique properties unmatched by petroleum-based products or can replace products and materials traditionally derived from petrochemicals.

Biocatalyst

Usually refers to enzymes and microbes, but it can include other catalysts that are living or that were extracted from living organisms, such as plant or animal tissue cultures, algae, fungi, or other whole organisms.

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Biochemical Conversion Process

The use of living organisms or their products to convert organic material to fuels.

Biodiesel

Conventionally defined as a biofuel produced through transesterification, a process in which organically-derived oils are combined with alcohol (ethanol or methanol) in the presence of a catalyst to form ethyl or methyl ester. The biomass- derived ethyl or methyl esters can be blended with conventional diesel fuel or used as a neat fuel (100% biodiesel). Biodiesel can be made from soybean or rapeseed oils, animal fats, waste vegetable oils, or microalgae oils. Note: Biodiesel can in certain circumstances include ethanol-blended diesel. This is an evolving definition.

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Bioenergy

Useful, renewable energy produced from organic matter. The conversion of the complex carbohydrates in organic matter to energy. Organic matter may either be used directly as a fuel processed in to liquids and gases, or be a residual of processing and conversion.

Biofuels

Fuels made from biomass resources, or their processing and conversion derivatives. Biofuels include ethanol, biodiesel, and methanol.

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Biogas

A methane-bearing gas from the digestion of biomass.

Biomass

Any organic matter that is available on a renewable or recurring basis, including agricultural crops and trees, wood and wood wastes and residues, plants (including aquatic plants), grasses, residues, fibers, animal wastes, and segregated municipal waste, but specifically excluding unsegregated wastes; painted, treated, or pressurized wood; wood contaminated with plastic or metals; and tires. Processing and conversion derivatives of organic matter are also biomass.

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Biopower

The use of biomass feedstock to produce electric power or heat through direct combustion of the feedstock, through gasification and then combustion of the resultant gas, or through other thermal conversion processes. Power is generated with engines, turbines, fuel cells, or other equipment.

Biorefinery

A processing and conversion facility that (1) efficiently separates its biomass raw material into individual components and (2)converts these components into marketplace products, including biofuels, biopower, and conventional and new bioproducts

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Biotechnology	A set of biological techniques developed through basic research and now applied to research and product development. In particular, biotechnology refers to the use by industry of recombinant DNA, cell fusion, and new bioprocessing techniques
British Thermal Unit	Measure of energy based on the amount of heat required to raise the temperature of one pound of water from 59°F to 60°F at one atmosphere pressure

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Cellulose

The main carbohydrate in living plants. Cellulose forms the skeletal structure of the plant cell wall.

Co-Firing

The simultaneous use of two or more different fuels in the same combustion chamber of a power plant.

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Cogeneration

The sequential production of electricity and useful ther-mal energy from a common fuel source. Reject heat from industrial processes can be used to power an electric generator (bottoming cycle). Conversely, surplus heat from an electric generating plant can be used for industrial processes, or space and water heating purposes (topping cycle).

Carbon neutrality

A state where annual GHG emissions are completely cancelled out or removed through offsetting or carbon dioxide removal (CDR) or emissions removal measures.

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Combined Cycle

Two or more generation processes in series, configuredto optimize the energy output of the system.

Combined Cycle

Two or more generation processes in series, configured to optimize the energy output of the system.

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Conservation Reserve Program

The USDA's Commodity Credit Corporation (CCC) offers agricultural landowners annual rental payments and cost-share assistance for resource conserving covers on eligible farmland. The program, administered by the CCC through the Farm Service Agency, is supported by various agencies and local forestry districts.

Renewable Energy Credits (RECs)

A type of energy attribute certificate used in several countries. In the U.S., a REC is defined as representing the property rights to the generation, environmental, social, and other non-power attributes of renewable electricity generation. RECs are a different tool from carbon credits and the two should neither be conflated nor considered interchangeable.

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Corn Wet Milling

A wet mill ethanol plant steeps (soaks in warm water) the corn. This enables separation of the germ, oil, starch, etc.

Densification

A mechanical process to compress biomass (usually wood waste) into pellets, briquettes, cubes, or densified logs.

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Scope 1 (territorial) emissions	GHG emissions from sources located within the city boundary.
Scope 2 emissions	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary.

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Scope 3 emissions	All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary.
Transboundary emissions	Emissions from sources that cross the geographic boundary.

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Cities	Complex human-dominated social-ecosystems that interrelate dynamically with the economic and technological systems and the built environment
Global climate models (GCMs)	Physics-based mathematical representations of the Earth's climate system over time that can be used to estimate how sensitive the climate system is to changes in atmospheric concentrations of greenhouse gases and aerosols.

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Green cities

Planning paradigms emphasizing ecological restoration and connected multifunctional green infrastructure in dense, compact cities. These prioritize walkable and mixed land uses and respond to the needs of people and ecosystems.

Green infrastructure

Combined engineering and ecological systems that provide ecological services such as cooling, stormwater management, urban heat island reduction, carbon storage, flood protection, and recreation.

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Electric Utility

A corporation, person, agency, authority, or other legal entity or instrumentality that owns and/or operates facilities for the generation, transmission, distribution, or sale of electric energy primarily for public use. Utilities provide electricity within a designated franchised service area and file form listed in the Code of Federal Regulations, Title 18, Part 141. Includes any entity involved in the generation, transmission, or distribution of power.

Energy Crops

Crops grown specifically for their fuel value. These crops may include food crops such as corn and sugarcane, and nonfooccrops such as poplar trees and switchgrass.

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Energy Density

The energy content of a material measured in energy per unit weight of volume.

Resilience

The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change

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Sustainable development goals (SDGs)

Goals passed by the United Nations in September 2015 intended to inspire, guide, and promote sustainable development.

Environmentally Sustainable

An ecosystem condition in which biodiversity, renewability, and resource productivity are maintained over time.

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Enzyme

A protein that acts as a catalyst, speeding the rate at which a biochemical reaction proceeds but not altering the direction or nature of the reaction.

Ethanol

Ethyl alcohol produced by fermentation and distillation. Analcohol compound with the chemical formula CH,CH,OH formed during sugar fermentation.

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Feedstock	Any material converted to another form or product.
Fermentation	The biological conversion of biomass.

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Forest Residues

Material not harvested or removed from logging sitesin commercial hardwood and softwood stands as well as material resulting from forest management operations such as pre-commercial thinnings and removal of dead and dying trees.

Fossil Fuel

Solid, liquid, or gaseous fuels formed in the ground aftermillions of years by chemical and physical changes in plant andanimal residues under high temperature and pressure. Oil, natural gas, and coal are fossil fuels.

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Fuel Cell

A device that converts the energy of a fuel directly to electricity and heat, without combustion.

Gasification

A chemical or heat process to convert a solid fuel to agaseous form.

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Genetics

The study of inheritance patterns of specific traits.

Genetically Engineered Organism

An organism developed by inserting genes from another species.

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Genomics	The study of genes and their function.
Grid	A system for distributing electric power.

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Grid Connection

Joining a plant that generates electric power to an electric system so that electricity can flow in both directions between the electric system and the plant.

Hydrolysis

Conversion of biomass into sugars and sugar substrates viachemical or biological processes or through biocatalysis.

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Industrial Sector

An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses manufacturing; agriculture, forestry, and fisheries; mining; and construction.

Inorganic Compounds

A compound that does not contain carbon chemically bound to hydrogen. Carbonates, bicarbonates, carbides, and carbon oxides are considered inorganic compounds, even though they contain carbon.
Kilowatt: (kW) A measure of electrical power equal to 1,000 Watts. 1 kW = 3.413 Btu/hr = 1.341 horsepower.

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Kilowatt hour

(kWh) A measure of energy equivalent to the expenditure of one kilowatt for one hour. 1 kWh = 3,413 Btu.

Landfill Gas

Gas that is generated by decomposition of organic material at landfill disposal sites.

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Lipid

Any of various substances that are soluble in non-polar organic solvents (as chloroform and ether), that with proteins and carbohydates constitute the principal structural components of living cells, and that include fats, waxes, phosphatides, cerebrosides, and related and derived compounds.

Lignin

An amorphous polymer related to cellulose that, together with cellulose, forms the cell walls of woody plants and acts as the bonding agent between cells.

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Life Cycle Assessment (LCA)

LCA is an internationally recognized assessment model of a product's impact on energy, economic, andenvironmental values. CA extends from "cradle-to-grave": frommaterial acquisition and production, through manufacturing, product use and maintenance, and finally, through the end of the product's life in disposal or recycling. The LCA is particularly useful in ensuring that benefits derived in one area do not shift the impact burden to other places within a product's life cycle.

Methane

An odorless, colorless, flammable gas with the formula CH4 that is the primary constituent of natural gas.

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Municipal Solid Waste (MSW)

Garbage. Refuse includes residential commercial, and institutional wastes and includes organic matter,metal, glass, plastic, and a variety of inorganic matter.

Organic Compounds

Compounds that contain carbon chemically bound to hydrogen. They often contain other elements (particularly O, N, halogens, or S).

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Precommercial Thinning

Thinning for timber stand improvement purposes, generally in young, densely stocked stands

Pyrolysis

The thermal decomposition of biomass at high temperatures(greater than 400°F, or 200°C) in the absence of air. The end product of pyrolysis is a mixture of solids (char), liquids (oxygenated oils), and gases (methane, carbon monoxide, and carbon dioxide) with proportions determined by operating temperature, pressure, oxy.gen content, and other conditions.

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Quad

One quadrillion Btu (10 15 Btu). An energy equivalent to approximately 172 million barrels of oil.

Residential Sector

An energy-consuming sector that consists of living quarters for private households. The residential sector excludes institutional living quarters.

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Residue	Unused solid or liquid by-products of a process.Rural: Of or relating to the small cities, towns, or remote communities in or near agricultural areas.
Sewage	The wastewater from domestic, commercial, and industrial sources carried by sewers.

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Silviculture

A branch of forestry dealing with the development and care of forests.

Syngas

A syntheses gas produced through gasification of biomass. Syngas is similar to natural gas and can be cleaned and conditioned to form a feedstock for production of methanol.

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Therm

A unit of energy equal to 100,000 Btus; used primarily for natural gas.

Transportation Sector

An energy-consuming sector that consists of all vehicles whose primary purpose is transporting people and/ or goods from one physical location to another. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts) are classified in the sector of their primary use.

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