Alphabetical Glossary of RFP Template Terms and Abbreviations

Abatement Price

- The cost of system changes that reduce greenhouse gas emissions. It is expressed in dollars per metric ton of carbon dioxide eliminated, $/t$CO_2$e eliminated

ASHRAE

- The American Society of Heating, Refrigerating and Air-Conditioning Engineers.

Carbon Dioxide Equivalents, CO_2e

- An amount of CO_2 that has the equivalent global warming potential (GWP) as some other amount of a greenhouse gas (GHG). For example, measured over a 20 year period it takes 83 units of CO_2 to have the equivalent warming potential of 1 unit of methane. Or said another way, methane has 83 times the ability to warm the atmosphere as carbon dioxide does.
- Reporting greenhouse gas measurements in units of CO_2e has the advantage of enabling comparisons between sites. For example, a mixture of CO_2, methane, and refrigerants found at one site can be converted to one amount of CO_2e that can then be compared to the CO_2e from another site which may have a completely different mixture of GHG's. Additionally, reporting measurements or calculations as CO_2e implies one has measured the pertinent greenhouse gases of a site. Thus a site releasing 1 metric ton of methane per year (1t methane/yr) can be reported as releasing 83 metric tons of CO_2e per year (83t CO_2e/yr).

Carbon Footprint

- A visual metaphor of foot size to the size of GHG's some entity, e.g. a person, a manufacturing facility, a building, or a household, is releasing into the atmosphere. The metaphor utilizes the fact that most GHG's have carbon as a constituent, and that the creator of a footprint is clearly responsible and easily identified. One's carbon footprint may be reported in any of a number of units, but most usefully in units of CO_2e per annum.

CO_2e

- Carbon dioxide equivalents

Department of Energy

- An executive department of the U.S. feral government created in 1977 that oversees U.S. energy policy and energy production. It has origins in the Manhattan Project and the oil embargo of 1973.

DOE

- Department of Energy

Embodied Carbon

- The amount of CO_2e produced by an entity over its lifetime minus the CO_2e produced by its utilization of "operating" energy. For example the amount of CO_2e produced by creating building materials, transporting them, constructing a building, maintaining a building, and tearing down a building. The CO_2e produced by running the building is not included. The idea is how much of GHG's is the "body" of the building responsible for.

Emission Reduction Measure

- Any action that reduces the GHG's emitted by anything.

EMR

- Emission Reduction Measure

Energy Use Intensity

- The average thousands of British thermal units produced per square foot of a building's footprint, kBtu/ft^2. Other energy units, e.g. kilojoules, therms, kWh or conversion to them is possible.

EUI

- Energy Use Intensity

Fugitive GHG Emissions

- Inadvertently released, e.g. leaks or accidents, GHG's, e.g. natural gas, refrigerants or other fluorinated gases, into the atmosphere.

GHG

- Greenhouse gas

GHG Protocol

- "GHG Protocol establishes comprehensive global standardized frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions.
  Building on a 20-year partnership between World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), GHG Protocol works with governments, industry associations, NGOs, businesses and other organizations."
  Available at: https://ghgprotocol.org/about-us, Accessed on: 5/2/25
- See scope 1 and 2 below.

Global Warming Potential

- Global Warming Potentials (GWP) are numbers that convey the relative ability of different gases to cause planetary warming. These are very helpful simple numbers that let one calculate CO_2e and ignore all the rest of the explanation below. For example, methane for a twenty year period has a GWP of 83. This means that it takes 83 metric tons of CO_2 is equal to 1 metric ton of methane. (83 X units of methane = units of CO_2e)
- The GWP of CO_2 is defined as 1.

- GWP is a ratio scale that quantifies the radiative forcing of a greenhouse gas relative to that of CO_2 over a specific time period.
    - Radiative forcing is the difference between the energy transmitted to the planet surface via more or less visible light and the energy transmitted out of the atmosphere by more or less infra-red radiation. The CO_2 molecule is a greenhouse gas because it has vibrational frequencies corresponding to two infra-red frequencies, thus some of the leaving earth infra-red radiation is transformed into the energy of the vibrational motion of the molecule and is not transmitted any further. Different gas molecules will have different abilities to absorb and emit infra-red radiation.
- A period of time must be specified because a volume of gas released into the atmosphere today will gradually be removed from the atmosphere, and different gases are removed at different rates giving them different half lives in the atmosphere. Even if two gases equally absorb infra-red radiation, the one that is around longer will over longer periods of time cause more global warming.
- For example, over a 20 year period of time the energy retained (watts/meter$^{2)}$ in the atmosphere by methane will be 83 time greater than that retained by CO_2. Methane's GWP is 83, and CO_2's is defined as one. Over a 100 year period of time Methane's GWP is 30.

Green House Gases (GHG)

- Any gas in the atmosphere that behaves like a greenhouse: does not interact with inward bound visible light and but absorbs and emits outward bound infra-red radiation resulting in an increase of energy/heat in the atmosphere as if it were a green house. Common examples are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons, fluorinated ethers, chlorofluorocarbons, and dichlorodifluoromethane (R-12) (Freon) with a 20 yr GWP of 10,800!

GWP

- Global Warming Potential

HVAC Systems

- Heating, Ventilation, and Airconditioning systems.

IPCC Synthesis Report

- The United Nation's Intergovernmental Panel on Climate Change. It issues periodic reports that help inform the Paris agreement.
- "The Synthesis Report of the Sixth Assessment Report *(2023*) provides an overview of the state of knowledge on the science of climate change, emphasizing new results since the Fifth Assessment Report (AR5) in 2014." Italics mine. Available at: https://www.ipcc.ch/synthesis-report/, Accessed on: 5/2/25.

Metric Ton

- 1 metric ton = 1,000 kilograms; 1 kilogram = 1,000 grams; "tonne" is a synonym for "metric ton", and a metric ton's symbol is "t".

Net Present Value

- It's idea is to calculate the value now of money expended and gained during (over the time into the future of) some process. Central to that calculation is the notion that a dollar gained tomorrow is worth less than a dollar in hand today. For example, purchasing a bond is an initial loss of money while its future coupons and repayment are gains, but the gains are *discounted* a certain amount because their value to one now, if one had them, would be more than that of their nominal future value (the main drivers of this discounting beyond the psychological are interest rates, inflation rates, or alternative investments). The losses and gains are summed to give the net present value (NPV).
- The NPV may be calculated with the formula:

$$NPV = \sum_{t=0}^{n} \frac{R_t}{(1+i)^t}$$

Where:

R_t = Net cash inflow-outflows during a single period, t
i = Discount rate or return that could be earned in alternative investments
t = Number of the time period in chronological order, e.g. 1st time period, 2nd time period, …

One can see that the denominator grows (and thus the NPV diminishes) the greater i is and the greater t is (the further out in time one is).

NPV

- Net Present Value

Paris Agreement

- "The Paris Agreement is a **legally binding international treaty on climate change**. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016." Available at: https://unfccc.int/process-and-meetings/the-paris-agreement, Accessed on: 5/2/25. It is an outgrowth of the UN Framework Convention on Climate Change (UNFCCC) adopted in 1992.
- It's main goal is to limit climate warming to less than 1.5°C above pre-industrial levels, and it states explicitly, "To limit global warming to 1.5°C, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030." Available at: https://unfccc.int/process-and-meetings/the-paris-agreement, Accessed on: 5/2/25.

SCC

- Social Cost of Carbon

Scopes: 1, 2, and 3

- These are areas of a business's, or city's, or any organization's greenhouse gas accounting that are defined and are periodically updated in the GHG protocol which is created and maintained by a partnership between World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). See: https://ghgprotocol.org

- It is important to recognize that the scope's use the frame of reference of an organization while a life cycle accounting of GHG's uses the frame of reference of non-organizational entities, e.g. a building, a car, a piece of clothing, a computer, a road, etc.
    - Scope 1 are the greenhouse gases emitted by the processes directly under the control of an organization. For example, the CO_2 and methane emitted by the gas furnaces of a life plan community.
    - Scope 2 are the greenhouse gases emitted in the production of products the organization purchases for its use. For example, the CO_2 emitted by the coal burning plant producing the electricity purchased by a life plan community.
    - Scope 3 are the greenhouse gases emitted further back or forward on the "value chain" of an organization – sometimes referred to as "everything else". For example the GHG's emitted in the mining and transportation of coal to the generating plant making the electricity, or the GHG's emitted during the renovation of an apartment and disposal of materials from the apartment.
        - One can see this is beginning to border on a life cycle analysis, and could represent a tremendous amount of greenhouse gases not under the direct control of a life plan community. For that reason scope 3 has not been emphasized in the RFP template.
    - A life cycle analysis of GHG emissions accounts for the GHG's accruing from the creation, operation, maintenance, and de-construction or disposal of a non-organizational entity. For a building for example, it is the GHG's associated with the procuring of building materials, construction, operation, maintenance, and de-construction of the building. If one subtracts out the operationally produced GHG's one is left with what is called the "embodied carbon". Embodied carbon often shows up in the scope three's of organizations, while scopes 1 & 2 tend to represent the "operational" GHG production.

Simple Payback Period

- This does not consider current devaluing of future money as does the NPV. For example, if one installs a heat pump and decommissions a gas furnace for $10,000 and thus saves $100 a month in operational costs, then the simple payback period is 100 months.

Social Cost of Carbon

- The cost of the damages caused by a metric ton of CO_2e emissions. It includes such things as changes in agricultural productivity, changes in health outcomes, sea level rise and coastal property damage, costs incurred from floods, fires, and storms, and declines in labor productivity. These costs often do *not* make their way into the fossil fuel markets and thus into end user operational costs, but remain economic externalities to both of them.
- Obtaining the data and building integrated climate-economic models is a difficult enough task that it may, of itself, lead to varying estimates of the social cost of carbon (SCC). The models are necessarily based upon past data and thus may underestimate developing positive feedback loops which in turn will underestimate the damage costs.
- Political power applied to governmental agencies and funding streams may have a strong effect on the estimates of SCC.
    - 1st Trump - $3-$5 per tonne CO_2e

- Biden - $51 per tonne
- IPCC - $100 per tonne
- Recent 2024 research paper - $1,367/tonne
  Available at:
  https://www.nber.org/papers/w32450?utm_campaign=ntwh&utm_medium=email&utm_source=ntwg1. Accessed on: 5/2/25

t

- Metric ton or tonne

U.S. Nationally Determined Contribution

- The progress report of the U.S. giving national climate action plans as called for by the Paris accord. It lists sector by sector pathways to the goal of a 61% to 66% reduction below 2005 levels of GHG emissions by 2035.