

Sources of Carbon Emissions from Buildings

Four-part Technical Series on Buildings & Carbon-Neutrality

Part 1 – Sources of Carbon Emissions from Buildings

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As we begin our journey into our four-part series we must first frame how buildings use energy and how these end uses are ultimately responsible for the emissions of carbon dioxide into the atmosphere.

Buildings of all typologies use energy for each of the following building systems and loads:

- Heating – Heating a space or fresh air to a space (fan energy may be incl. or separate),
- Cooling – Cooling a space or fresh air to a space (fan energy may be incl. or separate),
- Ventilation – Energy needed to bring air/exhaust air, etc. for a space or piece of equipment,
- Domestic Hot Water – End user hot water at showers, sinks, etc.
- Lighting – Both interior/exterior, and
- Plug Loads – Appliance and end user plug loads like computers, TVs, etc.

A building's envelope is an indirect contributor to heating and cooling energy, so while it is important to the above, it nearly never consumes energy itself (ask us about envelope types that do consume explicit energy and how that can be beneficial (!)).

Now that we understand how buildings use energy *on-site*, often referred to as *site energy*, let's discuss where this energy is *sourced* from. *Source energy* typically comes from the following sources:

- Explicit fossil-fuel usage:
 - Natural gas delivered via gas pipeline
 - Diesel fuel oil delivered via tanker truck
 - Propane typically delivered via tanks
- Indirect fossil-fuel usage:
 - Off-site electricity from the electric grid
 - Steam delivered via utility company piping network

In cases involving the explicit use of fossil fuels, equipment at a building would typically combust a fossil fuel directly and carbon dioxide would be emitted to the atmosphere directly. This would occur when a boiler burns oil or a gas cooktop uses natural gas for example. In contrast, in cases where a building takes electricity from the grid or steam from the Consolidated Edison steam piping network for example, no combustion of direct carbon dioxide emissions occur at the building directly. Instead, carbon dioxide emissions occur at a source power plant which, in blended average, results in an amount of emissions.

In Part 2 of our series on carbon neutrality, we will learn more about how equivalent carbon dioxide emissions are calculated and how NYC's Local Law 97 (LL97) has attached economic drivers to the reduction of such at a building level.

Stay tuned for our next release!

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