GREEN VEHICLES AND HOW TO IMPLEMENT THEM FOR LEED PROJECTS

Image source: evwind.es

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Green vehicles are becoming increasingly popular as the general public becomes more aware of their advantages. It is critical to comprehend what green vehicles are, why they exist, and how they benefit the environment.

A green vehicle is clean or environmentally friendly and has fewer adverse environmental impacts than comparable conventional internal combustion engine vehicles that run on gasoline or diesel.

Green vehicles help to reduce air pollution and our reliance on fossil fuels such as oil because they do not use gasoline and emit fewer greenhouse gases into the atmosphere than their traditional counterparts.

There is no single definition of a "green vehicle" and each vehicle manufacturer may claim and want us to believe that their vehicles are green.

However, in this course, we will discuss green vehicles as defined by the LEED rating system, specifically the **LEED v4 BD+C: New Construction; Location and Transportation - Green Vehicles credit.**

HOW DOES THE LEED RATING SYSTEM DEFINE A GREEN VEHICLE?

The LEED rating system defines green vehicles as those that can achieve a minimum green score of 45 on the American Council for an Energy-Efficient Economy (ACEEE) annual vehicle rating guide (or local equivalent for projects outside the U.S.).

The credit does not specify what type of engine or fuel source a vehicle must have to qualify as a green vehicle. As a result, assuming that an electric car is green but a biodiesel car is not would be incorrect.

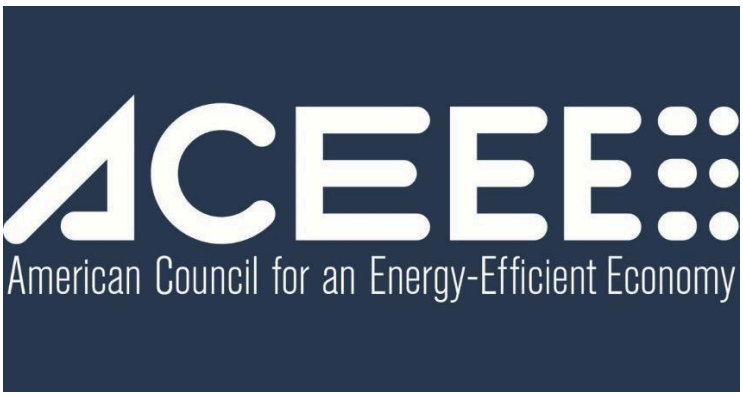

Image source: aceee.org

Most modern electric vehicles meet the aforementioned threshold and are considered green vehicles. However, the credit does not imply that it is the only way to achieve the green vehicle goal.

Other technologies that allow conventional gasoline-powered vehicles to meet the green vehicle threshold may be developed.

American Council for an Energy-Efficient Economy (ACEEE) is a non-profit research organization that provides research, analysis, and education on the benefits of energy efficiency in buildings and transportation to reduce energy waste and combat climate change.

ACEEE also maintains a "Greenest List," which rates vehicles according to environmental performance. It is designed for consumers considering purchasing or leasing a new car to determine how much pollution it will generate and its impact on global warming.

WHAT ARE THE BENEFITS OF GREEN VEHICLES?

Image source: untsystem.edu

The benefits of green vehicles are:

- Reduced pollution in the air we breathe resulting in fewer respiratory problems and a lower risk of cancer.
- Reduced global warming and climate change result from decreased greenhouse gas emissions.
- Fuel efficiency leads to savings on gas. It also means that the vehicle is more efficient with energy consumption, reducing greenhouse gases and climate change emissions from being emitted into the environment.
- Green cars use up to 75% less fuel than conventional ones. This can save drivers thousands of dollars over time and reduce our dependence on oil.

Last but not least, it's better for pedestrians who have to share city streets with these vehicles.

WHAT IS EVSE, AND WHAT CHARGING CAPABILITIES DOES IT OFFER?

EVSE (electrical vehicle supply equipment) is the equipment that delivers electricity to a plug-in electric vehicle, such as an EV (electric vehicle) or PHEV (plug-in hybrid).

Some EVSEs have different charging capabilities. They are classified as Level 1 (L1), Level 2 (L2), and DC Fast Charger (DCFC).

Level 1 Charging

Image source: cleantechnica.com

L1 charging equipment is the slowest. L1 chargers plug directly into a standard 120-volt (V) alternating current (AC) outlet, providing an average power output of 1.3 kW to 2.4 kW. This power output equals 3-5 miles per hour of EV range.

An overnight charge will increase the range by 30-50 miles, sufficient for many commuters. It can take up to 24 hours to fully charge an empty EV battery.

L1 charging is most common in residential settings. There are only a few L1 chargers designed for public use. Most L1 chargers are the "emergency" cables that come standard when purchasing an electric vehicle. Some parking garages provide 120 V charging outlets if EV drivers supply their cable.

Please note that EVSE charging times are approximate values only provided to give you an idea of what to expect from different levels of charging equipment. The actual charging times will depend on the equipment's make and model.

Charging Type	Charge Time	Volt/Amps	Power Equivalent	Installation
AC Level 1	Up to 20 hours	120/15	Toaster	Self
AC Level 2	Up to 7 hours	240/40	Clothes Dryer	Professional
DC Fast Charge	Up to 30 mins	480/125	15 Central AC	Professional

Image source: netscribes.com

Level 2 Charging

Image source: forbes.com

L2 chargers operate at 208-240 V and produce between 3 and 19 kW of AC power. This power output translates to 18-28 miles per hour. An EV can be fully charged in 8 hours or less on average. Because some L2 chargers can deliver more power than EVs can handle, results will vary depending on the charger and EV combination.

In the United States, the most common type of charger is L2. L2 chargers have been installed in every state and can be found in various public places such as parking garages, grocery stores, malls, and hotels. They are popular in workplaces where employees can leave EVs charging for extended periods of time. Many EV drivers buy an L2 charger for home use because it allows them to charge their EV completely overnight.

Direct Current Fast Chargers

Image source: freightwaves.com

With a maximum output of 350 kW, DCFCs are the fastest chargers available. DCFCs is designed to charge an EV battery to 80 percent capacity in 20-40 minutes and to 100 percent capacity in 60 minutes. The maximum charge rate is frequently constrained by the EV acceptance rate.

While many EVs on the market today can only charge at a maximum of 50 kW, newer EV models can charge at over 200 kW. Very few public charging stations are capable of delivering the maximum power accepted by today's top-of-the-line EVs.

Due to their high cost and power draw, DCFCs are designed for commercial or industrial applications. They are typically located near major interstate highways to facilitate EV road trips. There are currently over 15,000 DCFC plugs in the United States, but forecasts show that the number will increase significantly in the coming years.

HOW CAN PROJECTS EARN THE LEED GREEN VEHICLES CREDIT POINT?

LEED v4 BD+C: New Construction; Location and Transportation - Green vehicles credit awards projects with a maximum of one point for utilizing green vehicles rather than conventionally fueled ones.

To achieve this goal, credit requires designating 5% of all parking spaces the project uses as preferred parking for green vehicles. Credit requires communicating with the building occupants that the green cars can only use designated locations.

Here are some strategies building owners may want to follow to communicate a designated "green vehicle only" parking policy.

- Create signage for green vehicles that is visible to all occupants.
- Create a map of the building showing where designated parking areas are located.
- Create an email or other communication including pictures and descriptions of what these spaces look like so occupants know which type they should be looking for when arriving at their destination.
- Invite occupants for a tour of the green parking areas.
- Offer incentives for choosing to park in designated spaces and/or creating a green vehicle carpooling plan (e.g., giving drivers who arrive with at least one other occupant who is also driving a free coffee).

Distribute green vehicle parking evenly.

Projects are expected to distribute preferred parking spaces among various parking sections proportionally (e.g., between short-term and long-term spaces). This will provide a balance and ensure that green vehicles are not concentrated in one area.

Incentives for sustainable transportation options should be offered to encourage drivers to reduce their carbon footprints, such as free coffee or other deals for those who carpool with at least one passenger driving a green vehicle. Promote these incentives on the company website, through social media outlets, and other avenues.

Offer discounted parking rates.

The green vehicles credit requires applying at least a 20% discounted parking rate to green vehicles substituted for preferred parking spaces.

Again, the discounted rate must be announced at the parking area's entrance and permanently available to all qualifying vehicles.

In addition to preferred parking for green vehicles, projects should consider one of the two alternative-fuel fueling stations listed below:

1. **Electric vehicle charging**

Green vehicles credit requires providing electrical vehicle supply equipment (EVSE) in 2% of all parking spaces used by the project. Also, parking spaces reserved for EVSE are expected to be in addition to preferred parking spaces for green vehicles.

Credit requires all EVSEs to have a level 2 charging capacity (208 – 240 volts) or greater. This allows the EVSE to fully charge an electric vehicle in a significantly shorter time than level one (120 volts) equipment.

Also, EVSE is required to meet all regional or local standards for electrical connectors, such as **SAE Surface Vehicle Recommended Practice J1772, SAE Electric Vehicle Conductive Charge Coupler, or IEC 62196 of the International Electrotechnical Commission for projects outside the U.S.**

To incentivize off-peak charging, all EVSE devices must also be able to participate in demand-response programs or time-of-use pricing.

2. Liquid, gas, or battery facilities

Image source: oilmanmagazine.com

If projects cannot install EVSE due to certain restrictions, they can install liquid, gas, or battery facilities that refuel a number of vehicles per day equal to at least 2% of all parking spaces.

HOW CAN PROJECTS DOCUMENT COMPLIANCE WITH THE CREDIT REQUIREMENTS?

Image source: g2.com

The first step in documenting a green vehicle credit project is calculating the total number of parking spots on site. All off-street parking spaces leased or owned by the project, within and/or outside the project boundary, must be included in the calculation.

However, simply calculating the number of parking spaces is insufficient. All parking spaces should be depicted on the project site plan, and the number of parking spaces should be labeled separately for each zone.

The goal is to provide a visual representation of where parking spots are located and to be able to easily reference the number of off-street parking spaces within a given zone.

The next thing to do is calculate the number of preferred parking spaces and alternative-fuel fueling stations. As we mentioned earlier, the number of preferred spaces is 5% of the total parking spaces, and the number of fueling stations is 2% of the total parking spaces.

Projects are expected to provide discount parking for preferred spaces. Building management should provide regular parking rates and discounted rates for preferred parking spaces to document discount parking.

Pictures showing parking rates (regular and discounted) shown on the building entrance, as well as a signed Site Management Document specifically referencing parking rates should help to document discount parking.

Essential to note that preferred parking should be incorporated in the design documentation rather than creating an isolated drawing for credit purposes.

Next, select EVSE or other alternative-fuel fueling stations for the project. In doing that, teams should consider legal, technical, and safety issues associated with each fuel type.

Building owners can survey the occupants to determine what alternative fuel they use. Availability of fuels in a given location may be a factor in your choice.

Compare the equipment that is necessary for the different types of fuel. Depending on which fuel type is chosen, this will range in cost and complexity.

Learn about the safety and maintenance issues associated with alternative fuels. Building personnel must be trained to operate and maintain the fueling stations.

Review your local codes to determine if other requirements must be met besides those listed above.

The project should choose an EVSE that meets the credit requirements for charge capability, standard compliance, and network features; all three must be documented to be credit compliant. You should be able to find features of charging equipment usually on the manufacturer's website.

The team should provide proof of selected EVSE

- Uses Level 2 and 3 chargers
- Aligned with the **SAE J1772** standard is common among U.S.-based EVSE manufacturers. **IEC 62196** of the International Electrotechnical Commission is an equivalent standard common outside the U.S.
- Equipped with Wi-Fi, Ethernet, cellular modem, or other Internet communication mechanisms, it can send usage data to a server. This allows you to participate in demand response programs (such as SmartGrid) or time-of-use pricing. At the very least, specifications must demonstrate that the product is IP-addressable.
- Has a direct connection with on-site renewable energy that is acceptable in place of network capability if the EVSE will draw solely from that energy source.

Identify where each fueling station for alternative fuel vehicles is located on the site plan. Plug-in electric vehicles or battery switching stations for EVSE can be located anywhere in the parking facility. Parking spaces reserved for EVSE are not eligible for preferred parking spaces for green vehicles.

Liquid or gas fueling stations should be located outside if possible. If one cannot be located outside, provide a dedicated exhaust that is directly connected to the outside. Parking for green vehicles should be designated by signage and pavement markings.

In addition, specify the type of fueling station provided. In projects that use EVSE, provide signage indicating that the parking space is only for plug-in electric vehicles. If a project offers discounted parking instead of preferred parking, users must be informed of the discounted rate.

Image source: thedriven.io

Review the policy for green vehicle parking and alternative fuel facilities with the property manager or parking management to ensure that the appropriate vehicles use these spaces. The enforcement strategy will vary depending on the project, but it should include consequences for violations by building users.

Encouraging green vehicle use is as much about fostering a sense of environmental responsibility and community involvement among tenants, workers, visitors, residents, and property owners.

HOW CAN LEED PROJECTS OUTSIDE OF THE US PURSUE GREEN VEHICLES CREDIT?

Image source: nordicapis.com

Projects in Europe can pursue the ACP (Alternative Compliance Path) by meeting the requirements of the **Euro 6 maximum emission limit values of Regulation (EC) No. 715/2007.**

“Euro 5” and “Euro 6” are the norms set by the EC (European Parliament and the Council) to regulate maximum emission limit values for light passenger and commercial vehicles in Europe.

Projects in South America can pursue green vehicle credit if the vehicles meet both of the following criteria:

1. A Nota Verde Program score of four stars or higher from **IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - Brazilian Institute of Environment and Renewable Natural Resources).**

Image source:
alertaconcursos.com.br

2. An A from **INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia - National Institute of Metrology, Quality, and Technology) for the Brazilian Vehicle Labeling Program.**

Image source: revistadeacuerdo.org

REFERENCES

1 – LEED v4 BD+C Location and Transportation Green vehicles

2 - What's the Difference Between EV Charging Levels?

3 - Euro 6 emissions standards: what do they mean for you?