
LEED FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS



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United States Green Building Council (USGBC)



USGBC

- USGBC: United States Green Building Council.
- The USGBC was founded in 1993.
- Non-profit organization based in Washington, DC.
- Consensus driven.
- The council's vision is that all buildings will achieve sustainability within a generation.
- To realize this vision, USGBC developed the LEED rating system, which has proven to be a primary driver of the green building movement.



LEED Green Building Rating System™



LEED Green Building Rating System™

- The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™



- is the nationally and internationally accepted benchmark for the design, construction, and operation of high performance green buildings in the US.
- Was introduced in 2000.
 - LEED is a voluntary standards and certification program, and was developed to promote leadership in the building industry by providing an objective, verifiable definition of “green.”

LEED Green Building Rating System™

LEED promotes a whole-building approach to sustainability by recognizing performance in six key areas of human and environmental health:

- Location & Transportation
- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality



LEED Green Building Rating System™



Certification Levels for LEED-NC (New Construction)



Platinum (80-110 points)



Gold (60-79 points)



Silver (50-59 points)



Certified (40- 49 points)



Total Points Possible = 110

LEED NC Credit Categories

Document prerequisites & points for the facility in 6 categories:

LEED Version 4 for Building Design & Construction and Major Renovation

Credit Structure

Intent:

A descriptive goal of the credit.

Requirements:

An interpretation of the goals in steps that can be followed to fulfill the requirement.

Technologies and Strategies:

The method(s) of achieving the stated requirement(s).

Enhanced Refrigerant Management

Intent

Reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to global warming.

Requirements

OPTION 1

Do not use refrigerants.

OR

OPTION 2

Select refrigerants and HVAC&R that minimize or eliminate the emission of compounds that contribute to ozone depletion and global warming. The base building HVAC&R equipment shall comply with the following formula, which sets a maximum threshold for the combined contributions to ozone depletion and global warming potential:

$$LCGWP + LCODP \times 10^5 \leq 100$$

Where:

$$LCODP = [ODPr \times (Lr \times Life + Mr) \times Rc] / Life$$

$$LCGWP = [GWPr \times (Lr \times Life + Mr) \times Rc] / Life$$

LCODP: Lifecycle Ozone Depletion Potential (lbCFC11/Ton-Year)

LCGWP: Lifecycle Direct Global Warming Potential (lbCO₂/Ton-Year)

GWPr: Global Warming Potential of Refrigerant (0 to 12,000 lbCO₂/lbr)

ODPr: Ozone Depletion Potential of Refrigerant (0 to 0.2 lbCFC11/lbr)

Lr: Refrigerant Leakage Rate (0.5% to 2.0%; default of 2% unless otherwise

| SS | WE | EA | MR | EQ | ID |
|----------|----|----|----|----|----|
| | | | | | |
| Credit 4 | | | | | |

1 point

Credits and Points

Credits

For Each Credit, the rating system identifies the intent, requirements, technologies or strategies to achieve each credit

Points:

The number of possible points for each credit which are granted based on the achieved requirement(s)

On-Site Renewable Energy

Intent

Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental and economic impacts associated with fossil fuel energy use.

Requirements

Use on-site renewable energy systems to offset building energy cost. Calculate project performance by expressing the energy produced by the renewable systems as a percentage of the building annual energy cost and using the table below to determine the number of points achieved.

Use the building annual energy cost calculated in EA Credit 1 or use the Department of Energy (DOE) Commercial Buildings Energy Consumption Survey (CBECS) database to determine the estimated electricity use. (Table of use for different building types is provided in this Reference Guide.)

| % Renewable Energy | Points |
|--------------------|--------|
| 2.5% | 1 |
| 7.5% | 2 |
| 12.5% | 3 |

Potential Technologies & Strategies

Assess the project for non-polluting and renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

| SS | WE | EA | MR | EQ | ID |
|----------|----|----|----|----|----|
| | | | | | |
| Credit 2 | | | | | |

1–3 points



Certification under LEED-NC

LEED NC: Location & Transportation

To avoid development on inappropriate sites. To reduce vehicles miles traveled. To enhance livability and improve human health by encouraging daily physical activity.

LEED NC: Location & Transportation

Credits

Credit 1: LEED for Neighborhood Development Location

To avoid development on inappropriate sites. To reduce vehicles miles traveled. To enhance livability and improve human health by encouraging daily physical activity.

Credit 2: Sensitive Land Protection

To avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site.

Credit 3: High Priority Site

To encourage project location in areas with development constraints and promote the health of the surrounding area.

LEED NC: Location & Transportation (contd.)

Credits

Credit 4: Surrounding Density and Diverse Uses

To conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. To promote walkability, and transportation efficiency and reduce vehicle distance traveled. To improve public health by encouraging daily physical activity.

Credit 5: Access to Quality Transit

To encourage development in locations shown to have multimodal transportation choices or otherwise reduced motor vehicle use, thereby reducing greenhouse gas emissions, air pollution, and other environmental and public health harms associated with motor vehicle use.

LEED NC: Location & Transportation (contd.)

Credits

Credit 6: Bicycle Facilities

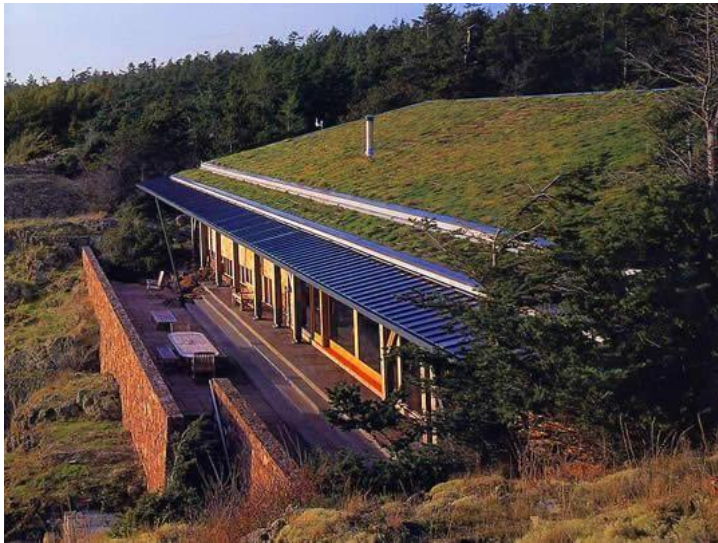
To promote bicycling and transportation efficiency and reduce vehicle distance traveled. To improve public health by encouraging utilitarian and recreational physical activity.

Credit 7: Reduced Parking Footprint

To minimize the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff.

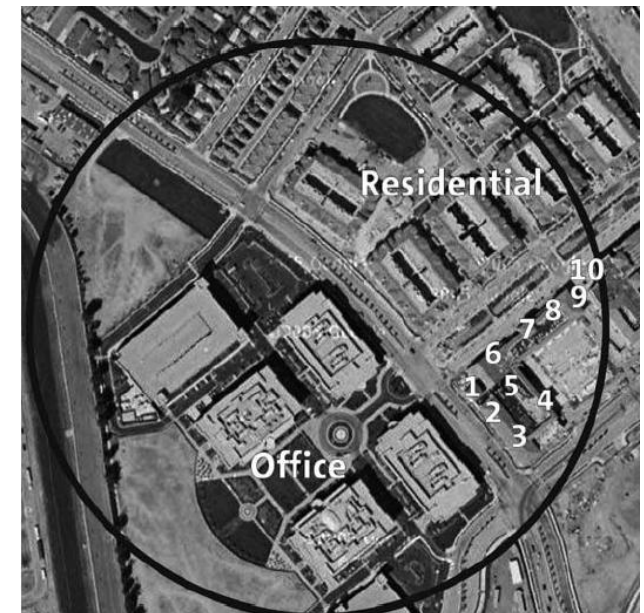
Credit 8: Green Vehicles

To reduce pollution by promoting alternatives to conventionally fueled automobiles.



Certification under LEED-NC

LEED NC: Sustainable Sites



LEED NC: Sustainable Sites

Credits

Prerequisite: Construction Activity Pollution Prevention

To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust.

Credit 1: Site Assessment

To assess site conditions before design to evaluate sustainable options and inform related decisions about site design.

Credit 2: Site Development - Protect or Restore Habitat

To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

LEED NC: Sustainable Sites (contd.)

Credits

Credit 3: Open Space

To create exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities.

Credit 4: Rainwater Management

To reduce runoff volume and improve water quality by replicating the natural hydrology and water balance of the site, based on historical conditions and undeveloped ecosystems in the region.

Credit 5: Heat Island Reduction

To minimize effects on microclimates and human and wildlife habitats by reducing heat islands.

LEED NC: Sustainable Sites (contd.)

Credits

Credit 6: Light Pollution Reduction

To increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people.



Certification under LEED-NC

LEED NC: Water Efficiency



LEED NC: Water Efficiency

Credits

Prerequisite: Outdoor Water Use Reduction

To reduce outdoor water consumption through one of the following options: Non-vegetated surfaces, such as permeable or impermeable pavement, should be excluded from the landscape area calculations. Athletic fields and playgrounds (if vegetated) and food gardens may be included or excluded at the project team's discretion.

Prerequisite: Indoor Water Use Reduction

To reduce indoor water consumption. For the fixtures and fittings listed in Table 1, as applicable to the project scope, reduce aggregate water consumption by 20% from the baseline. All newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling must be [WaterSense labeled](#) (or a local equivalent for projects outside the U.S.).

Prerequisite: Building-Level Water Metering

To support water management and identify opportunities for additional water savings by tracking water consumption.

LEED NC: Water Efficiency (contd.)

Credits

Credit 1: Outdoor Water Use Reduction

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period - or - reduce the project's landscape water requirement (LWR) by at least 50% from the calculated baseline for the site's peak watering month. Reductions must first be achieved through plant species selection and irrigation system efficiency as calculated in the [Environmental Protection Agency \(EPA\) WaterSense Water Budget Tool](#).

Credit 2: Indoor Water Use Reduction

Further reduce fixture and fitting water use from the calculated baseline in WE Prerequisite Indoor Water Use Reduction. Additional potable water savings can be earned above the prerequisite level using alternative water sources. Include fixtures and fittings necessary to meet the needs of the occupants.

LEED NC: Water Efficiency (contd.)

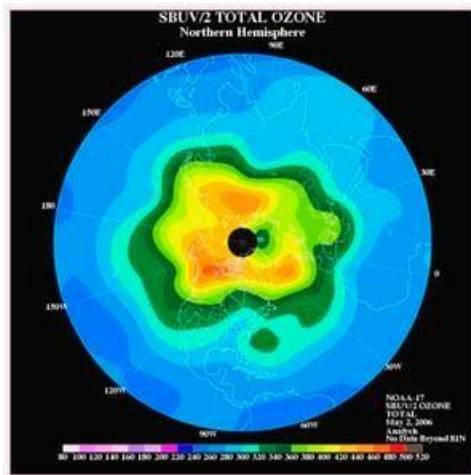
Credits

Credit 3: Cooling Tower Water Use

To conserve water used for cooling tower makeup while controlling microbes, corrosion, and scale in the condenser water system.

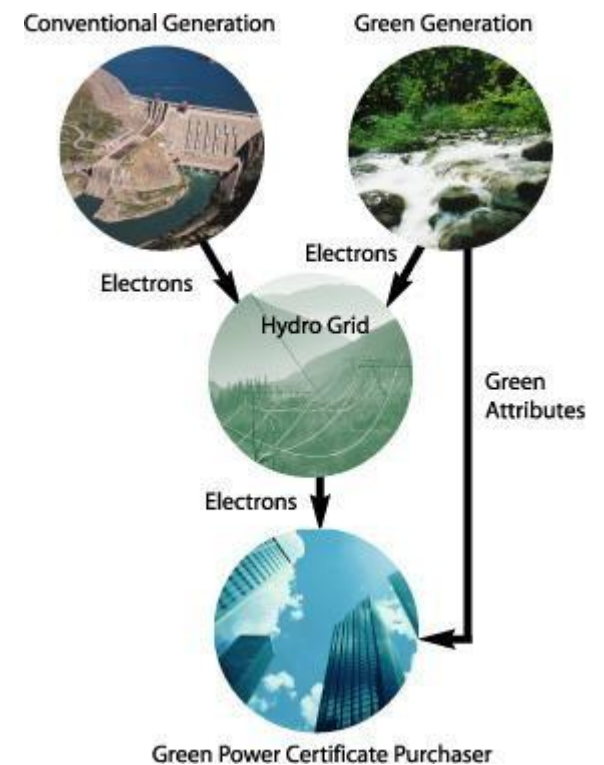
Credit 4: Water Metering

To support water management and identify opportunities for additional water savings by tracking water consumption.



Certification under LEED-NC

LEED NC: Energy & Atmosphere



LEED NC: Energy & Atmosphere

Credits

Prerequisite: Fundamental Commissioning & Verification

To support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

Prerequisite: Minimum Energy Performance

To reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

Prerequisite: Building-Level Energy Metering

To support energy management and identify opportunities for additional energy savings by tracking building-level energy use.

Prerequisite: Fundamental Refrigerant Management

To support energy management and identify opportunities for additional energy savings by tracking building-level energy use.

LEED NC: Energy & Atmosphere (contd.)

Credits

Credit 1: Enhanced Commissioning

To further support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

Credit 2: Optimize Energy Performance

To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use.

Credit 3: Advanced Energy Metering

To support energy management and identify opportunities for additional energy savings by tracking building-level and system-level energy use.

LEED NC: Energy & Atmosphere (contd.)

Credits

Credit 4: Demand Response

To increase participation in demand response technologies and programs that make energy generation and distribution systems more efficient, increase grid reliability, and reduce greenhouse gas emissions.

Credit 5: Renewable Energy Production

To reduce the environmental and economic harms associated with fossil fuel energy by increasing self-supply of renewable energy.

Credit 6: Enhanced Refrigerant Management

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to climate change.

LEED NC: Energy & Atmosphere (contd.)

Credits

Credit 7: Green Power & Carbon Offsets

To encourage the reduction of greenhouse gas emissions through the use of grid-source, renewable energy technologies and carbon mitigation projects.



Certification under LEED-NC

LEED NC: Materials and Resources



LEED NC: Materials and Resources

Credits

Prerequisite: Storage & Collection of Recyclables

To reduce the waste that is generated by building occupants and hauled to and disposed of in landfills.

Prerequisite: Construction & Demolition Waste Management Planning

To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

LEED NC: Materials and Resources (contd.)

Credits

Credit 1: Building Lifecycle Impact Reduction

To encourage adaptive reuse and optimize the environmental performance of products and materials. Historic Building Reuse - or - Renovation of Abandoned or Blighted Building - or - Building and Material Reuse - or - Whole-Building Life-Cycle Assessment.

Credit 2: Building Product Disclosure & Optimization – Environmental Product Declarations

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

LEED NC: Materials and Resources (contd.)

Credits

Credit 3: Building Product Disclosure & Optimization – Sourcing of Raw Materials

To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

LEED NC: Materials and Resources (contd.)

Credits

Credit 4: Building Product Disclosure & Optimization – Material Ingredients

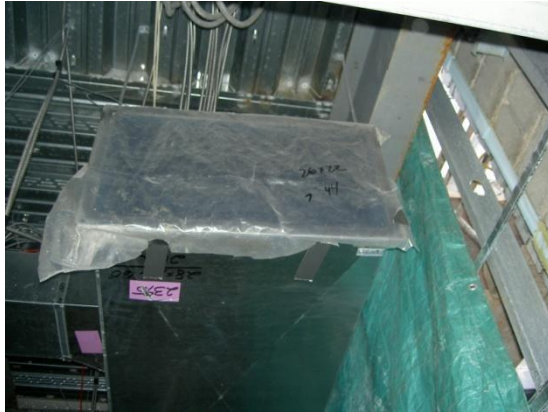
To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

LEED NC: Materials and Resources (contd.)

Credits

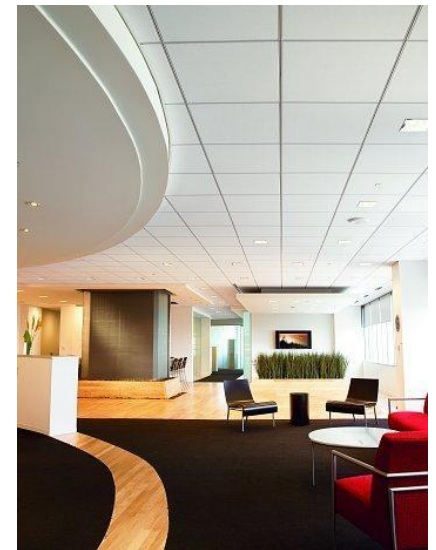
Credit 5: Construction & Demolition Waste Management

To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.



Certification under LEED-NC

LEED NC: Indoor Environmental Quality



LEED NC: Indoor Environmental Quality

Credits

Prerequisite: Minimum Indoor Air Quality Performance

To contribute to the comfort and well-being of building occupants by establishing minimum standards for indoor air quality (IAQ).

Prerequisite: Environmental Tobacco Smoke Control

To prevent or minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke.

LEED NC: Indoor Environmental Quality (contd.)

Credits

Credit 1: Enhanced Indoor Air Quality Strategies

To promote occupants' comfort, well-being, and productivity by improving indoor air quality.

Credit 2: Low-Emitting Materials

To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Credit 3: Construction Indoor Air Quality Management Plan

To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.

LEED NC: Indoor Environmental Quality (contd.)

Credits

Credit 4: Indoor Air Quality Assessment

To establish better quality indoor air in the building after construction and during occupancy.

Credit 5: Thermal Comfort

To promote occupants' productivity, comfort, and well-being by providing quality thermal comfort.

Credit 6: Interior Lighting

To promote occupants' productivity, comfort, and well-being by providing high-quality lighting.

LEED NC: Indoor Environmental Quality (contd.)

Credits

Credit 7: Daylight

To connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space.

Credit 8: Quality Views

To give building occupants a connection to the natural outdoor environment by providing quality views.

Credit 9: Acoustic Performance

To provide workspaces and classrooms that promote occupants' well-being, productivity, and communications through effective acoustic design.



Certification under LEED-NC

LEED NC: Innovation & Design Process



LEED NC: Innovation & Design Process

Credit

Credit 1: Innovation

To encourage projects to achieve exceptional or innovative performance

Credit 2: LEED Accredited Professional

To encourage the team integration required by a LEED project and to streamline the application and certification process.



Certification under LEED-NC

LEED NC: Regional Priority



LEED NC: Regional Priority

Credit

Credit 1: Regional Priority

To provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities.

Sample Projects





Bronx Library Center New York, NY

90% of demolition
debris recycled

20% energy cost
savings

80% of wood is FSC
certified



**Boulder Associates,
Inc. Office
Boulder, CO**

39%

of materials and
furniture have
recycled content

43%

less water use

55%

of demolition/
construction
waste diverted
from landfill



Photography courtesy of Ed LaCasse



Sidwell Friends Middle School Washington, DC

90% reduced municipal
water use

60% less energy
demand than a
conventional school

80% native plant species
planted on site



Photograph Courtesy of Peter Aaron/ESTO



Tepeyac Haven Pasco, WA

15 units per acre

29% improvement of
attic insulation heat
resistance over
state code energy

44 homes available for
low-income families





Orchard Garden Hotel San Francisco, CA

22% of building materials
manufactured
within 500 miles

77% of construction
waste diverted from
the landfill

100% of interior
spaces
designated
tobacco-free

Photograph Courtesy of
Orchard Garden

Leading with LEED



Architects

**Building
Owners**

**Federal,
Local,
and State
Governments**

**Product
Manufacturers**

Nonprofit Leaders

Planners

Engineers

**Financial
Planners**

**Utility
Managers**

**Interior
Designers**

**Landscape
Architects**

**Building
Tenants**

**Property
Managers**

**Code
Officials**



High Performance Building Benefits

Bottom line for owner and/or tenant

- Improve Occupant Productivity
- Improve Occupant Health
- Reduce Operating Costs
- Improve Resale/Occupancy
- Attract Employees

Community

- Use Existing Infrastructure
- Preserve Green Space



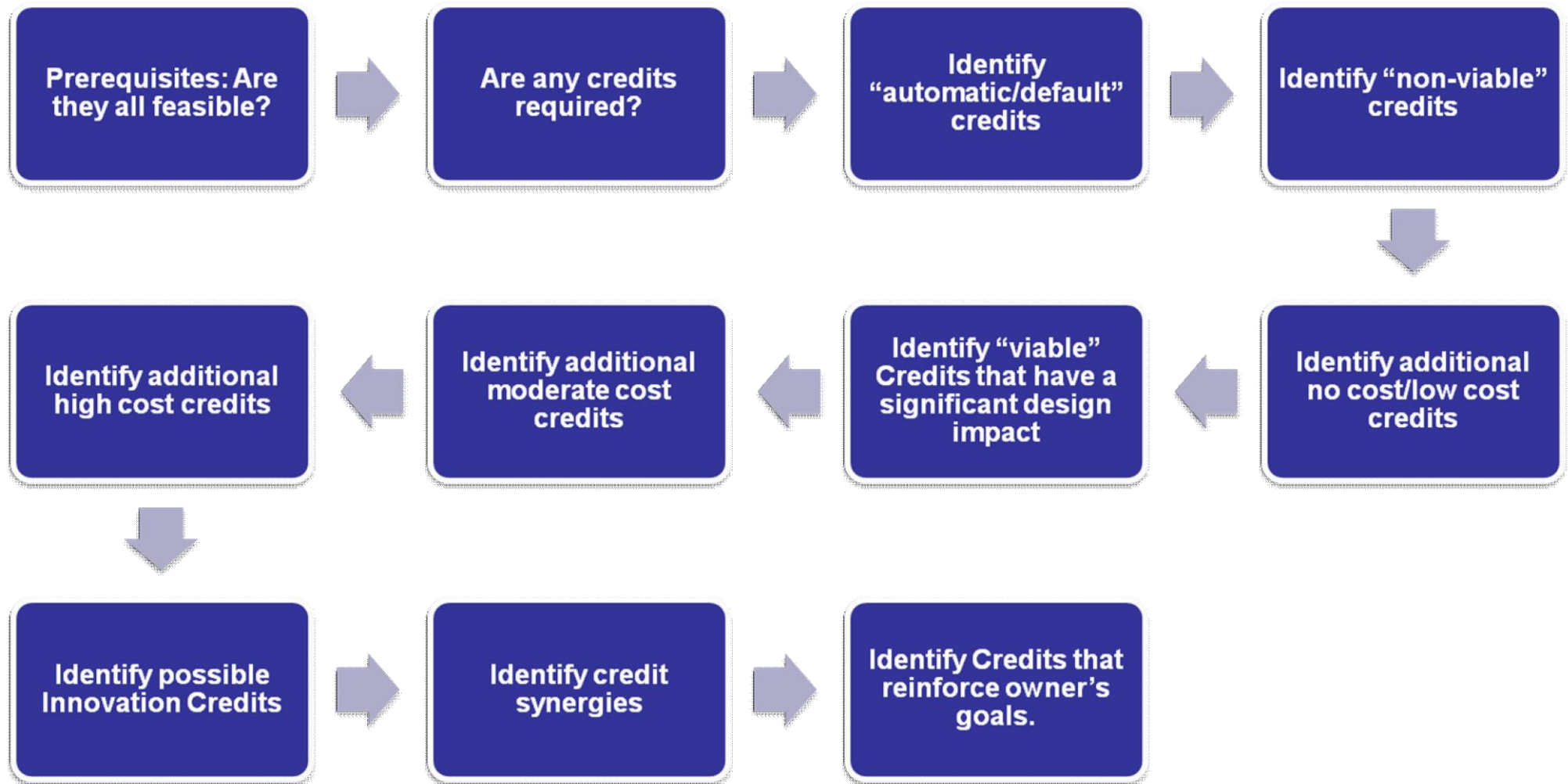
High Performance Building Benefits (contd.)

Environmental

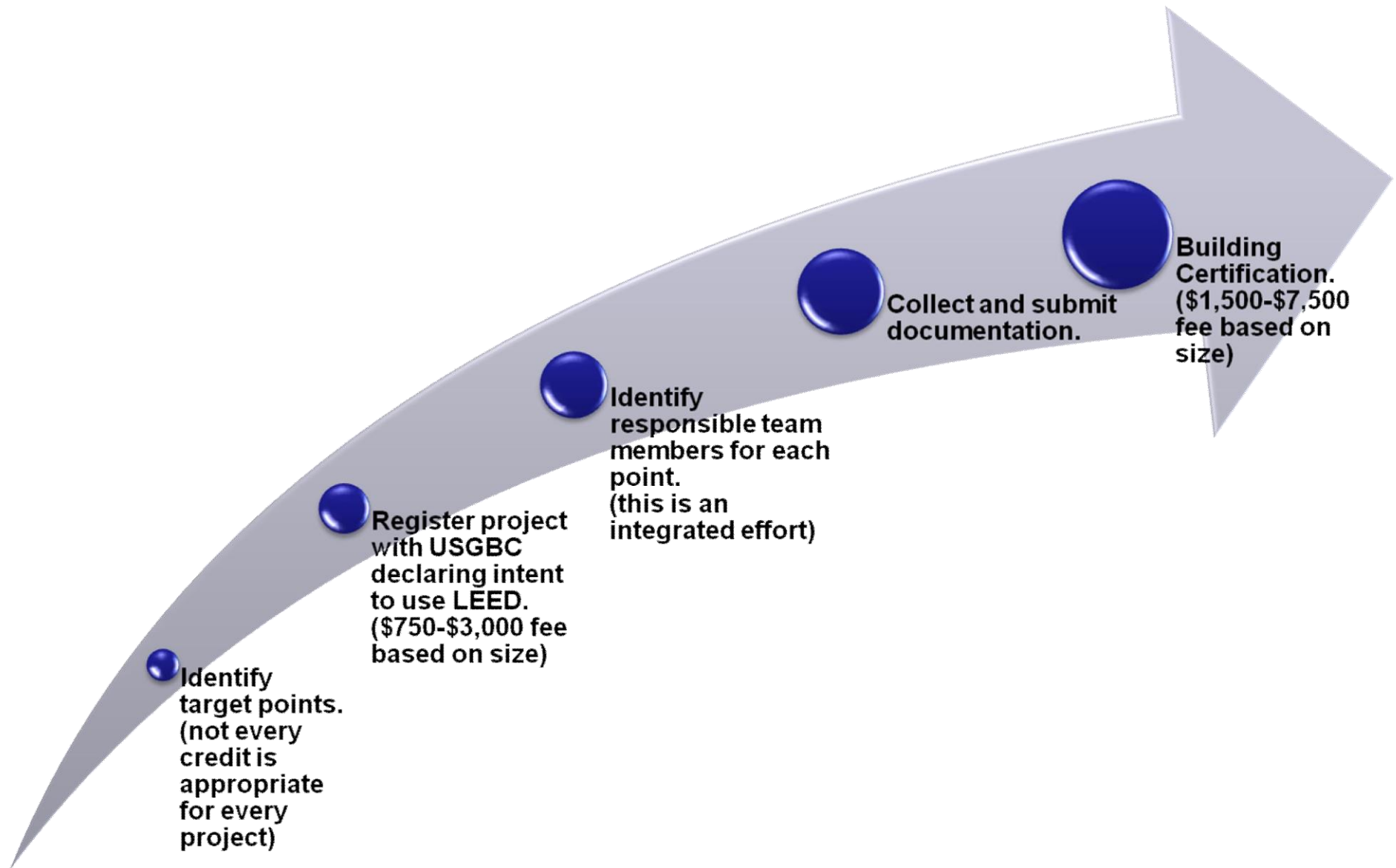
- Enhance/protect ecosystems and biodiversity
- Reduce greenhouse gas emissions
- Improve air & water quality
- Reduce solid waste
- Conserve natural resources/promote use of renewable resources



Planning for a LEED project



LEED Certification Process



Tools and Resources



Tools and Resources

- U.S. Green Building Council Website <http://www.usgbc.org>
- Whole Building Design Guide <http://www.wbdg.org>
- Environmental Protection Agency (EPA) WaterSense Water Budget Tool <https://www.epa.gov/watersense/water-budget-tool>
- Energy Design Resources <https://energydesignresources.com>

Questions



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