



# TECHNOLOGY

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## Green Building Blocks Small changes can make big differences in spurring sustainability

The LED revolution has been growing for 10-plus years, with lighting professionals extolling the virtues of energy savings and less reliance on traditional sources that contain mercury, such as fluorescent or high intensity discharge (HID) lighting. But as the effects of climate change increase exponentially, so does the need for true sustainability in lighting and *we can't mitigate what we can't measure.*

It's no longer sufficient to rest on the knowledge that LEDs save energy; we need to uncover the impacts from material extraction to the end-of-life of the product in order to avoid unintended consequences and to discover small changes that can make big differences. While the lighting industry may be behind many other building construction industries in its adoption of life cycle assessment (LCA) methodologies, we're actually coming out ahead of the curve in relation to other electrical products. Let's step up our game as an industry and lead the way.

The need is pressing. According to a 2022 United Nations report, "The buildings and construction sector is not on track to achieve decarbonization by 2050. And the gap between the actual climate performance of the sector and the decarbonization pathway

is widening." The report estimates 2.5 trillion sq ft of new construction by 2060, which means increased demand for luminaires and lighting systems. While there is a wealth of high-quality carbon and sustainability reporting for building materials like asphalt or concrete, there's a *lack* of high-quality reporting on carbon and sustainability for lighting and other electrical products in buildings due to a set of complex barriers that remain in place, including lack of understanding of the process or concerns about cost or resources required.

**EVERYTHING HAS A LIFE CYCLE,** including lighting products, and LCAs are the "gold standard"



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third-party verified and standardized tool that measures and reports results on all the details of the materials and processes that go into the production, use and disposal of lighting products. With an LCA, we can measure what the production of a product does to the air we breathe, the water we drink, and our exposure to environmental health burdens like carcinogens. We can also use the LCA to identify "hot spots" in the life cycle that need to be addressed. LCAs can be used to create summary reports called Environmental Product Declarations (EPDs), which are increasingly being required or specified by architects and engineers for LEED or WELL credits, for meeting internal sustainability goals, or to meet new state or federal sustainability reporting requirements.

So, with the need for sustainability in lighting staring us in the face, what are we doing about it? In crafting its new L-Prize competition in 2021, the DOE sought to expand the definition of exceptional LED lighting performance to include material sustainability, diversity in organizations, transparency reporting, equity and inclusion, and product design principles for a circular economy. All entrants to the competition must rate at least 1 on CIBCE's Circular Economy Assessment Method or TM66, which is a

comprehensive tool allowing manufacturers to engage with the depth of detail required to create a fully circular-economy-capable lighting product.

The goals and rules in the current L-Prize also acknowledge that sustainability means taking into consideration the social impacts of lighting. In any lighting project, product or team, sustainability goals and DEI goals need to be included holistically, from the early stages. We will not reach our national and global decarbonization and resiliency goals without the equitable participation of all communities, including historically disinvested or disadvantaged communities.

**AT LIGHTFAIR INTERNATIONAL** in New York City this past May, my colleagues and I led a fun, interactive and thought-provoking session that used the framework of Life Cycle Thinking (LCT) to engage attendees, help bring them to a common understanding and build upon the existing LCA knowledge base. Our goal was to demonstrate a pathway to achieving improved environmental and social outcomes by simply applying LCT from a holistic sustainability perspective. We hoped to inspire participants to become advocates for LCA and its expansion of methods, impact categories and reporting frameworks (such as EPDs) to include social impacts to improve equity and justice outcomes and benefits across the nation and globe.

LCT is a distinct mindset that challenges and allows shareholders to think across the entire system life cycle, as well as across sustainability pillars and impacts, considering causes and effects, tradeoffs, burden shifts and unintended consequences before any work has been produced. This type of thinking allows interested parties to consider end-of-life outcomes so that decisions made in very early stages won't have unintended consequences.

Earlier, in 2022, Pacific Northwest National Laboratory (PNNL) began a collaboration with a diverse team that includes LCA experts and several lighting manufacturers to develop strategies and tools that will help to address the existing barriers for lighting manufacturers to access high-quality sustainability and life cycle assessment data. The goal of this project is to support lighting manufacturers and specifiers who want to reduce greenhouse gas emissions (embodied carbon), and other negative effects by removing the barriers for the lighting industry (and other electrical industries) to participate in data-driven sustainability.

The goal of the project is to create a transparent, comparable template that supports standardized data collection for LCAs and can give assessments of hot spots across the full life cycle of the product. The template is currently in beta testing, with an anticipated public release in early 2024.

**AS THE LIGHTING INDUSTRY** continues to set new goals to reduce climate change impacts and to promote social equity and justice in manufacturing and in the supply chain, we must continue to consider holistic approaches and ensure that we're gathering consistent and comparable high-quality data for decision-making. When designing or specifying a material, product or project, circular approaches must be used and sustainability (including environmental, social, economic, and equity and justice impacts) must be kept at the forefront.

There are many opportunities to get involved or to learn more, through the IES, the GreenLight Alliance LCA Incubator<sup>1</sup>, and PNNL's sustainability work or at upcoming conferences. Understanding and setting sustainability goals and priorities helps identify priorities for research, design and development of products and projects. Let's work together to discover small changes that can make big differences.

Kate Hickcox joined PNNL in 2020. She is a creative thinker with over 20 years of experience in lighting, research and design. Her work focuses on sustainability, which means considering the complex aesthetic, technical, visual and non-visual needs of people while at the same time equitably benefiting the economy, society and the environment.



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