Signify

Unlocking negawatts:

The role of lighting in energy security and decarbonization

Developed in collaboration with

CLIMATE GROUP

Foreword

Despite substantial progress, conventional lighting continues to account for a significant portion of the global lighting stock. This reliance on outdated technologies represents a missed opportunity to harness negawatts[1]—the energy savings unlocked through energy efficiency. Addressing this can drastically reduce energy demand, an incredibly timely issue since it was included in the COP28's pledge to double annual energy efficiency improvement rates and triple renewable energy capacity by 2030.[2]

As a business, Signify is dedicated to developing innovative technologies that deliver exceptional energy savings. Equally important is bringing together non-profit organizations, like Climate Group, politicians, and business leaders from the global sphere to accelerate the transition away from legacy lighting systems and toward smarter, more efficient solutions. This white paper seeks to show world leaders the potential of lighting as a first line of defense in solving the most pressing global challenge of our time.

Alice Steenland
Chief Strategy, Sustainability and Marketing Officer, Signify

For the past 20 years, Climate Group has built large and influential networks across business and government, focused on increasing energy efficiency, as well as climate action on the energy transition, transport and heavy industry. Climate Group holds organizations to account, turning their ambitious commitments into emissions reductions and showing what's achievable so other corporates and governments can follow their lead.

The enormous potential of energy efficiency to climate progress is underscored by Climate Group's corporate EP100 members. Signify has also been at the forefront of our energy efficiency work through Climate Group's Renovation Revolution initiative, which seeks to increase renovation rates in Europe's commercial and public buildings.

As this white paper explains, facing up to this challenge requires collective action, and with commitment and innovation, we can achieve meaningful progress for the planet and future generations.

Helen Clarkson
CEO, Climate Group

[1] 'Negawatts' in the context of energy efficiency is a term coined by Armory Lovins, physicist and co-founder of the Rocky Mountain Institute

[2] Executive summary of the COP28 pledge to triple renewable capacity from the IEA

[3] www.theclimategroup.org/energy-unleashed-doubling-down-energy-efficiencys-enormous-potential

Contents

34%

increase in global energy consumption by 2050

Switching all conventional light points in the world to energy-efficient LED by 2030, would save, annually[8]:

€606 bn

in electricity costs

186Mt

CO_2 emissions,

roughly equivalent to the annual emissions of Argentina[9]

Executive summary

In a world where energy demands due to digital infrastructure are rising, whereas some large-scale renewable energy projects are facing political and economic challenges, the imperative becomes clear: we must focus not only on generating new megawatts, but on unlocking negawatts—the energy made available through energy efficiency. Lighting, as a cornerstone of modern infrastructure, has a critical role to play in this transformation.

By 2050, we can expect a 34% increase in global energy consumption[4], which our society will struggle to meet. Unless proactive measures are taken to manage this demand responsibly, the strain on our planet's energy resources will only intensify. According to the International Energy Agency (IEA), in 2022 emissions from lighting alone accounted for over 2% of greenhouse gas (GHG) emissions. This is equivalent to the emissions produced by the aviation industry, underscoring the significant cumulative impact of lighting globally.[5]

If all homes, businesses and cities worldwide switched entirely to energy-efficient LED lighting, these emissions could be cut in half, and over €600 billion per year could be saved in electricity costs. This is equivalent to nearly one-quarter of the annual cost of the green energy transition, which is estimated at $3 billion, according to the Institute for Energy Research.[6] Additionally, 1,402 TWh of electricity could be freed up, which is roughly equivalent to the annual electricity consumption of India.[7] This shift represents not only an achievable goal but also low-hanging fruit in our efforts towards a resilient, energy secure future.

This is equivalent to the electricity:

- Required to power 300M heat pumps[10]
- Required to charge 10 times the number of electric vehicles on the road today[11]
- Generated by 285 nuclear power plants[12], which is more than half in operation today
- Generated by 233,000 onshore wind turbines, enough to power 349.5 million homes[13]
- Consumed by 14 million hyperscale data centers[14]

1,402

TWh of electricity consumption,

roughly equivalent to the annual electricity consumption of India[8]

"The world's cheapest energy is the energy that is not used."

Ursula von der Leyen,
President of the European Commission at COP28

[4] www.instituteforenergyresearch.org/international-issues/eia-expects-global-energy-consumption-to-increase-through-2050

[5] Based on estimated IEA lighting emissions and global energy-related emissions

[6] www.instituteforenergyresearch.org/regulation/global-energy-transition-will-cost-3-trillion-a-year

[7] See Figure 2 below, source: Enerdata

[8] Global data presented here is based on the latest from the International Energy Agency in simulation with the framework of the Green Switch conventional light point conversion model, which is a program run by Signify to help its customers accelerate the switch to energy-efficient lighting products, systems and services. All figures and data presented here are illustrative and based on forecasts and assumptions.

[9] www.iea.org/countries/brazil/emissions

[10] The annual operation of a heat pump requires 4,000 kWh

[11] As of 2023, there were over 40 million electric vehicle (EV) on the road globally, according to the IEA. The annual recharge of an EV is equivalent to 3,400 kWh.

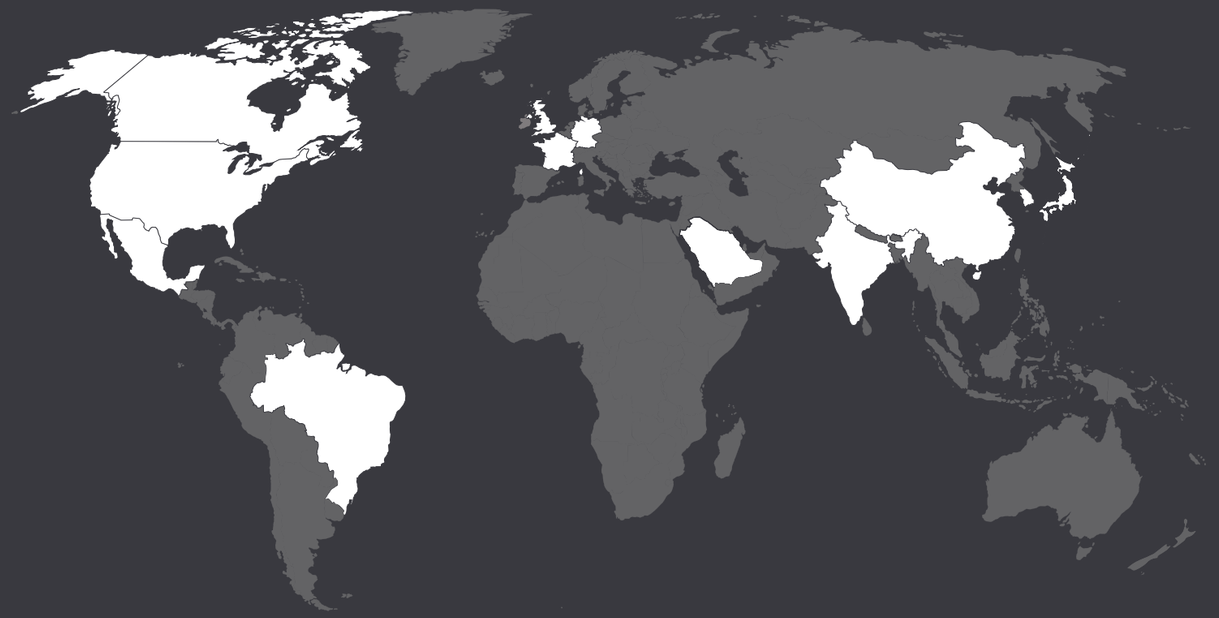
[12] One nuclear power plant produces 4,905,600,000 kWh of energy.

[13] Calculation based on one onshore wind turbine generating 6M kWh of electricity annually, enough to power 1,500 homes

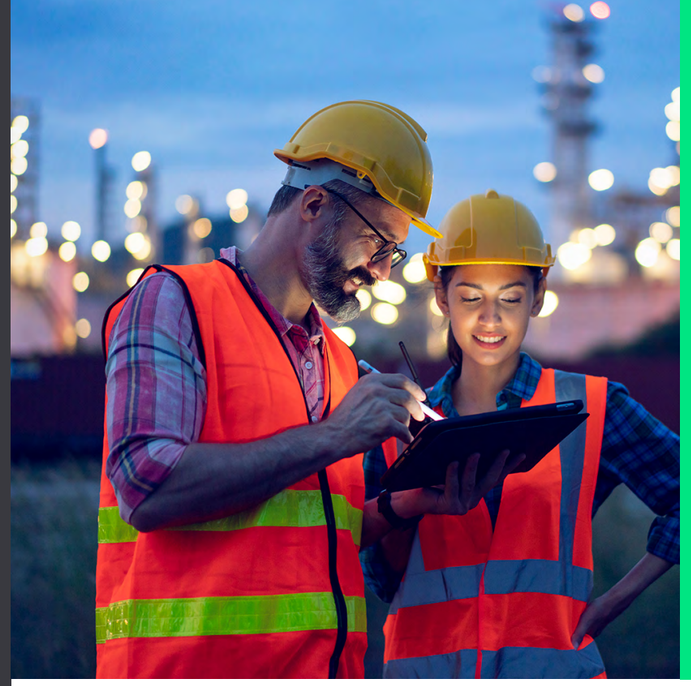
[14] www.iea.org/reports/energy-and-ai/understanding-the-energy-ai-nexus

Breakdown of electricity consumption by country (TWh)

Year 2023



China	8,392	South Korea	557
US	4,065	Germany	463
India	1,407	France	411
Japan	909	Saudi Arabia	338
Brazil	594	Mexico	324
Canada	558	UK	269



Did you know?

Global carbon emissions are around 83 times[17] the body weight of all 8 billion people on this planet.

Advancing on two global agendas

The past years have seen measurable progress in reducing GHG emissions, with the IEA reporting emissions in advanced economies fell by around 4.5% in 2023, which is now back to levels seen 50 years ago.[15] While this progress is encouraging, much more action is required.

Despite the emissions reduction in advanced economies, total energy-related emissions rose to an all-time high of 37.8 Gt[16] in 2024. To achieve the IEA's Net Zero Roadmap scenario by 2035, emissions need to decline by 80% in advanced economies and 60% in emerging markets and developing economies compared to 2022 levels.

Improvements in energy efficiency, the increased use of renewables, and decarbonization policies such as the Green Deal in the EU and China's commitment to become carbon neutral by 2060, also reflected in its nationally determined contributions (NDCs), have had a promising effect. However, much work needs to be done to meet the global climate goals agreed to in the Paris Agreement in 2016.

[15] www.iea.org/reports/co2-emissions-in-2023/executive-summary

[16] www.iea.org/reports/global-energy-review-2025/co2-emissions

[17] Global Carbon Emissions: In 2024, global carbon emissions from fossil fuels are projected to reach approximately 41.2 billion metric tons (41.2×10^{12} kg). Average Human Body Weight: The average body weight varies by region and demographic factors. For estimation purposes, let's assume an average body weight of 62 kg per person. Total Body Weight of 8 billion people: Multiplying the average body weight by the global population: 8,000,000,000 people × 62kg/person = 496,000,000,000 kg (496×10^9 kg) Comparing the two figures: Ratio of Emissions to Body Weight: 41.2×10^{12} kg (emissions) ÷ 496×10^9 kg (body weight) ≈ 83

> **Accelerating energy efficiency improvements can deliver over a third of all carbon dioxide (CO_2) emission reductions between now and 2030 in a pathway aligned with reaching net zero emissions by 2050.**
>
> IEA Energy Efficiency 2024 Report

Megawatts: Tripling renewable energy capacity

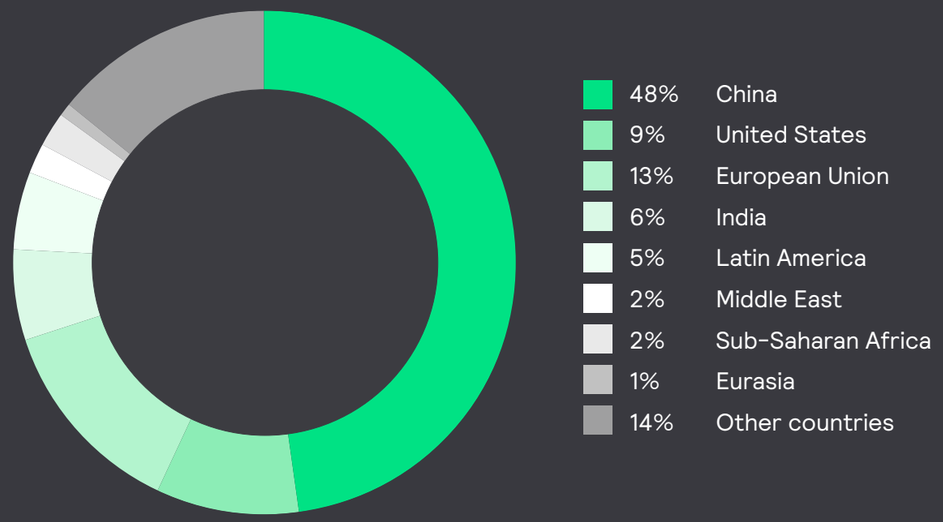
In another crucial step to limit global warming increases to 1.5°C, nearly 200 countries signed a landmark agreement at COP28 to double energy efficiency and triple renewable energy capacity by 2030. The pledge sent a clear message from governments everywhere on the direction of travel, so industries and investors could mobilize much needed private capital across the world to finance climate smart solutions.

In terms of progress on this goal, global renewable capacity is expected to grow by 2.7 times by 2030, surpassing countries' current ambitions by nearly 25%, but it still falls short of tripling, according to the IEA.[18] Today, renewable energy sources, such as wind and solar, make up about 15% of global energy consumption, the highest share in history.[18] China, an impressive powerhouse in the context of renewable energy capacity, has steadily increased its share in global annual renewable energy capacity additions and is responsible for half of this growth globally as shown in figure to the right.

Meanwhile, in the European Union, an estimated 47% of electricity now comes from solar and other renewables[19]—in part due to initiatives like the Clean Industrial Deal, which will mobilize over €100 billion to support EU-made clean manufacturing, and the Renewable Energy Directive, making it the second largest growth market in terms of renewable energy capacity.

Countries' continued investment in renewable energy capacity and infrastructure, fueling the expansion of solar, wind power and other projects, can effectively drive down costs and make green energy more accessible for large-scale deployment.

Accelerated case cumulative renewables capacity in 2030: 10,800 GW



Source: IEA (2024), Cumulative renewable capacity in the accelerated case by country or region, 2030, IEA, Paris License: CC BY 4.0

[18] www.iea.org/reports/renewables-2024/executive-summary
[19] https://ember-energy.org/latest-insights/european-electricity-review-2025/

Negawatts: Doubling the annual energy efficiency improvement rate

The push to triple renewable energy capacity by 2030 is closely linked to the parallel agenda to double the energy efficiency improvement rate. While renewables ensure that clean energy sources can meet more of the world's needs, energy efficiency reduces overall demand.

The commitment at the COP28 summit underscored the urgent need for greater national ambition and faster policy action, yet the world remains off track to meet its target to double global energy efficiency. The lag in progress reveals significant gaps between commitments and implementation.

According to the IEA's Energy Efficiency 2024 report, global energy efficiency progress, which is measured by the rate of change in primary energy intensity, is projected to have improved by only 1% in 2024. This mirrors the 1% improvement seen in 2023 and is just half of the average annual improvement rate achieved between 2010 and 2019.

Despite this, there are reasons to be hopeful, as certain countries have intensified their energy efficiency efforts in response to the global energy crisis. For instance, the European Union has implemented stricter building regulations to enhance energy efficiency. In 2024, China led the world in energy transition investment, accounting for two-thirds of the $2.1 trillion spent globally on everything from power grids to electric transport.[20] These measures aim to reduce energy consumption and GHG emissions, and they also create local jobs. According to the IEA, nearly 10 million people work in energy efficiency-related jobs today,[21] and for every $1 million spent on energy efficiency, up to 15 new jobs are created.[22]

Examples like these offer pockets of hope and potential models for broader implementation. However, without a major scale-up in policy initiatives and investments, the goal of doubling annual energy efficiency improvement rates will remain out of reach. A concerted global effort to enhance energy efficiency—alongside the rapid scaling of renewables—can drive a more sustainable and low-carbon future. Adding both megawatts and negawatts to our energy system will be essential to reach global ambitions to reduce GHG emissions and enhance energy security.

> **Doubling energy efficiency and tripling renewable capacity are not just parallel goals—they are essential partners in achieving a sustainable future. To bridge the gap between ambition and action, we need stronger policies, bold investments and a relentless commitment to innovation.**
>
> **Maurice Loosschilder,**
> Global Head of Sustainability, Signify

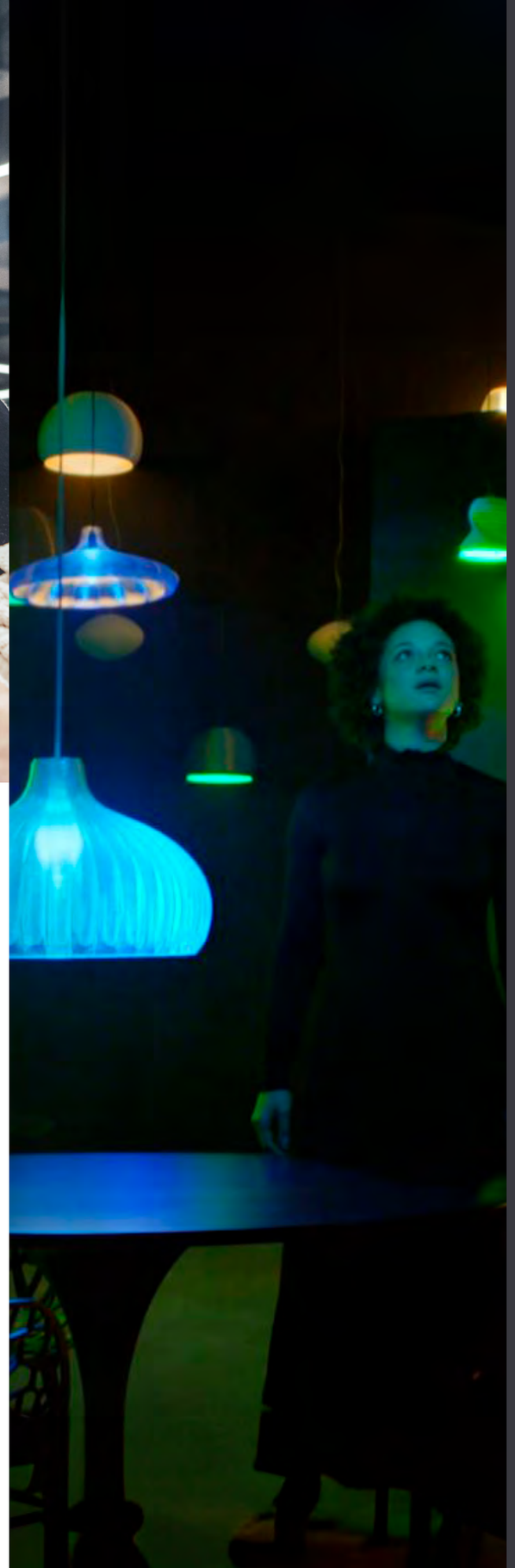
[20] www.time.com/7265783/how-china-is-boosting-renewable-energy-goals/
[21] www.iea.org/reports/energy-efficiency-2024/executive-summary
[22] www.iea.org/reports/energy-efficiency-2020/energy-efficiency-jobs-and-the-recovery

Accelerating the transition through lighting

As business leaders, decision-makers and consumers, each of us has a responsibility to consider our impact on the world around us and to take measures to protect it. Accelerating the transition to an energy secure, decarbonized future requires new ways of thinking—about how products are manufactured, distributed and used, and about how we use energy and what kind of energy that is.

Efficient lighting plays a crucial role in this transition, offering a simple yet powerful way to reduce energy consumption and thereby emissions on a global scale. By adopting energy-efficient LEDs[23] and connected lighting solutions, we can make significant strides toward a sustainable future for people and the planet.

[23] LED stands for light-emitting diode, which produces light while reducing energy consumption by around 50% compared to incandescent light bulbs, and that figure rises to 80% with connected LED. Connected LED is a system using Internet of Things (IoT) technology to connect LED lighting devices to a network: lights may be remotely controlled, monitored, and optimized through a management system.



The role of lighting

Lighting is ubiquitous in homes, businesses, cities and public spaces, so while an individual light bulb consumes a small amount of energy, the global footprint of lighting is significant. In the past decades, governments worldwide have realized the potential of LED technology, which consumes far less energy than incandescent and fluorescent light sources, and even less when managed in a connected system.

Transitioning from conventional lighting to energy-efficient LEDs and connected LEDs significantly decreases the demand for electricity, in turn reducing reliance on fossil fuels and enhancing the resilience of our energy systems. Switching all homes, businesses and cities around the globe to efficient LED lighting would eliminate 186 MMT of global CO_2 emissions annually, €606 billion in electricity costs, and would save and save 1,402 TWh of electricity[8]—enough to power 300M heat pumps[12] or charge 10x the number of electric vehicles[13] on the road today.

The cumulative effect of widespread LED adoption can ease pressure on energy grids, making the world more secure and less vulnerable to energy supply disruptions.

From efficient LED to connected and solar

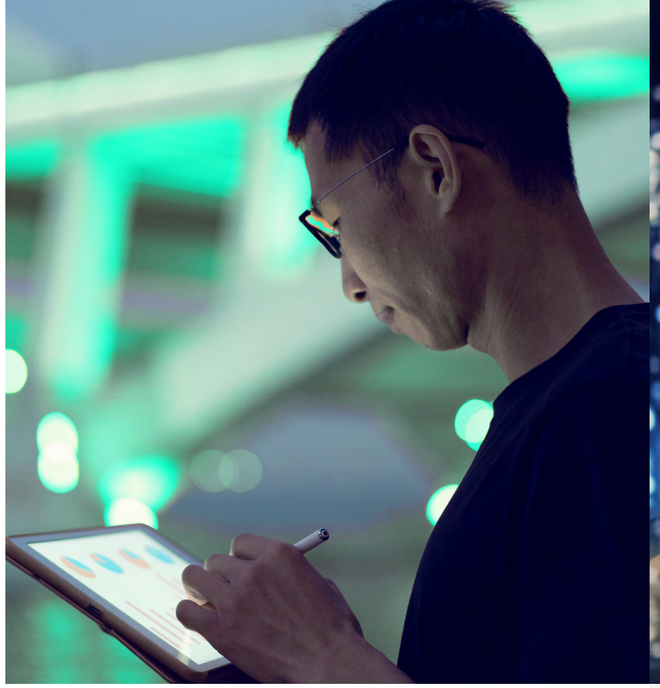
The transition to LED lighting is one of the fastest and least disruptive interventions available in energy security and decarbonization, serving as a frontrunner for deeper, more complex energy-efficiency renovations. According to the latest data from the IEA, in 2022 LEDs made up about 50% of global residential lighting sales,[24] a significant uptick from a few years prior where they made up for only a quarter of total sales.

Compared to conventional lighting, LEDs reduce energy consumption by around 50%.[25] When LEDs are integrated into connected lighting systems that incorporate sensors, networks, and smart controls, energy reductions can reach as high as 80%.[25] This combination not only maximizes efficiency but also introduces smart functionalities that enhance the well-being of building occupants, supporting digital building and smart city infrastructures.

Alongside this idea of investing in cleaner and more resilient technologies for the future, solar-powered street lighting allows for additional illumination, without taking electricity from the grid. In fact, one of the fastest-growing solar technology applications is street lighting. Solar street lighting uses sunlight to charge its batteries and on cloudy days seamlessly switches to electricity from the grid. This presents an energy-efficient way of lighting streets, roads and parks, optimizing negawatts whilst leveraging renewable megawatts.

Solar-powered lighting also balances electricity loads, for example, battery power can be used during peak hours, so that fewer power stations are required. This is especially relevant in remote areas where existing infrastructure is minimal. By harnessing technologies like connected LEDs and renewable energy sources like solar, cities and businesses can further reduce global dependence on fossil fuels, enhance grid resilience and bolster energy security.

[24] www.iea.org/data-and-statistics/charts/global-residential-lighting-sales-share-by-technology-in-the-net-zero-scenario-2010-2030
[25] www.signify.com/global/our-company/blog/sustainability/green-switch-energy-efficiency-is-a-cant-do-without



Getting it done in practice

Lighting is one of the most straightforward solutions to generate negawatts and build energy resilience. Globally, we are witnessing an increase in regulations that push for smarter, more energy-efficient lighting solutions, from stricter energy codes for buildings to the implementation of LED technology in public spaces. However, there is more that can be done to enhance energy security and accelerate decarbonization.

There are a few key sectors that both consume a significant amount of energy and present unique opportunities for innovation in lighting design and forthcoming regulation: buildings, public infrastructure and sports arenas.

The luminous efficacy of LED light sources will continue to improve as technology continues to approach the theoretical limit.

This is great news for cities, businesses, and consumers who want a quick and effective way to cut energy consumption and related greenhouse gas emissions, but there's still much work to be done. The figures cited on page 8 are robust, but in reality a third of all light points globally are still conventional. That number is closer to 50% in the US and the EU.

Residential and non-residential buildings

Much of the work that needs to be done now lies on the demand side of the energy consumption equation—and one of the largest drivers of energy demand worldwide is the inefficiency of the existing building stock. Connected LED lighting systems can accelerate the transition to green and net-zero buildings, while lowering maintenance and operational costs. Add-on benefits include improved light quality and reliability, creating flexible spaces that allow people to work comfortably and productively.

Segment consumption and emissions

30%

of global energy is consumed by buildings, 40% in the US (IEA / NREL)

26%

of global energy-related emissions are accounted for by buildings, 18% of which are indirect (IEA)

85%

of EU buildings were built before 2000 and amongst those, 75% have a poor energy performance or a poor energy performance rating (EC)

50%

of global residential lighting sales are accounted for by LEDs, steadily increasing in the last years (IEA)

50%

of buildings that will exist by 2050 have not yet been built (UNEP)

Reduction opportunities

In the past decade, energy demand in buildings has risen each year by an average of 1%, so improvements in efficiency are key in the years to come. The IEA's Net-Zero Energy (NZE) scenario, which outlines a pathway to achieving net zero emissions by 2050, highlights that energy consumption in buildings must drop by around 25% as well as achieve a 40% reduction in fossil fuel use by 2030 to reach net zero goals.[26]

In the US, lighting in residential and commercial buildings is estimated to consume as much as 27% of total end energy consumption.[27] Transitioning to the latest innovations in energy-efficient LEDs and connected LEDs presents an immediate opportunity to reduce lighting-related energy consumption. With half of buildings still using conventional lighting, the switch to LEDs alone could reduce energy consumption substantially. This requires policy action to ensure that technological advances in more efficient lighting solutions are given the opportunity to be widely implemented.

[26] www.iea.org/energy-system/buildings
[27] www.eia.gov/tools/faqs/faq.php?id=86&t=1

Phasing in more energy-efficient lighting through renovation projects presents an immediate method to reduce carbon emissions, lessen the reliance on costly and volatile fossil fuels and lower costs for households and companies. This is especially true in places like the EU, where 85% of buildings were constructed before 2000 and three-quarters of all buildings have a poor energy performance.[28] In reaction, the EU made a significant push to lower energy consumption in the built environment with the publication of the revised Energy Performance of Buildings Directive (EPBD) in May 2024.

The timing has never been more urgent. For this transition to occur, energy efficiency must become the standard for green and healthy building certifications. Reflecting this in forthcoming legislation and initiatives can be a powerful accelerant to achieving net zero.

Lighting is everywhere — in our homes, workplaces, cities and streets — which means its collective energy use adds up quickly. By accelerating the transition to energy-efficient and connected LED systems, we can dramatically reduce electricity demand, lower emissions, and build more resilient, future-ready energy systems.

Mario Giordano,
Global Head of Public & Government Affairs

[28] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

Regulations and programs around the world

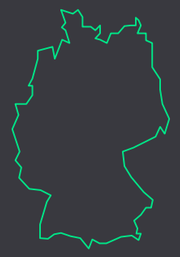
Global

The WELL Standard v2 and WELL Certification are among the world's leading healthy buildings programs. Light is one of the concepts in WELL v2 and promotes exposure to light, while it aims to create healthy lighting environments with an emphasis on visual comfort.

US

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) published in 2023 net-zero energy and net-zero carbon standards for building operations. The standard is intended "to address energy and carbon flows across a site boundary, their measurement and their balance."

In June 2024, the US Department of Energy developed a National Definition of a Zero Emissions Building, setting forth standardized, consistent and measurable minimum criteria to support net-zero initiatives in the buildings sector and advance climate goals in the public and private sectors.

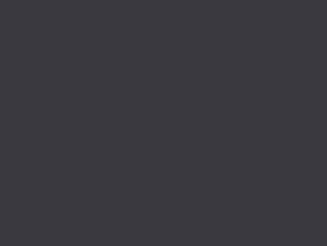


Germany

The Federal Subsidy for Efficient Buildings (BEG), operated by the German development bank KfW, is a program based on the Climate Action Programme 2030 with the goal of promoting building renovation across the country. The BEG supports the use of optimized system technology, such as connected lighting.

Japan

The revised Building Energy Conservation Act of 2022 requires zero-energy performance for all new buildings by 2030, and for all existing buildings by 2050.



Spain

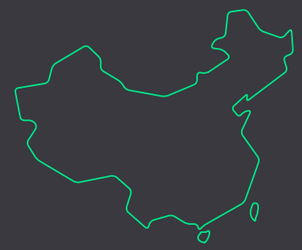
The Public Buildings Rehabilitation Programme (PIREP) promotes the sustainable rehabilitation of public buildings, including schools, hospitals, and health and sports centers. Financing is available for improving energy efficiency, sustainability and aesthetics, with provisions that specifically address energy innovation and building digitalization.

Europe

In line with 2050 goals, the 2023 revision of the Energy Performance of Buildings Directive (EPBD) requires zero emissions for all new public buildings beginning in 2026 and all new buildings beginning in 2028, with higher energy performance standards for existing buildings over time. Energy-efficient lighting is a crucial element of the EPBD mandates.

The RoHS directive restricts the use of mercury in lighting products, with great impact on fluorescent lighting products. This includes a ban on CFLni lamps as of February 2023 and a ban on T5 and T8 fluorescent lamps as of August 2023.

The Eco-design for Sustainable Products Regulation, effective July 2024, strengthens previous regulations for phasing out products that fail to meet efficiency requirements, such as halogen capsules, and aims to significantly improve the circularity of products in the market.



China

In April 2022, the Ministry of Housing and Urban Rural Development published the General Code for Energy Efficiency and Renewable Energy Application in Buildings, requiring all new, expanded or renovated buildings to be designed for energy efficiency.

Roads, streets and public buildings

Roadways, public outdoor spaces, and municipal buildings could reap huge benefits from a switch to more energy-efficient lighting. Connected LEDs and solar lighting offer some of the fastest ways for cities and rural areas to cut electricity consumption, costs and thereby carbon emissions.

What's more, with connected, IoT-enabled lighting platforms, municipal leaders can use lighting to create a flexible foundation on which to build smart city ecosystems, leveraging smart controls to dim light output based on time of day and via motion detection, as well as optimize for biodiversity and safety with light at night.

Segment consumption and emissions

2%

of Earth's surface is represented by cities, which use 78% of its energy (UN)

60%

of global CO_2 emissions are produced by cities (UN)

25%

of electricity consumed by municipalities is accounted for by public street and area lighting[29] (CEM)

1%

of total electricity demand worldwide is accounted for by public street and area lighting[17] (CEM)

6%

of building GHG emissions in the US would be eliminated by decarbonizing state and local government buildings (RMI)

[29] Claimed 40% (based on 2012 context) is updated by Signify model to 25% considering the 2024 context

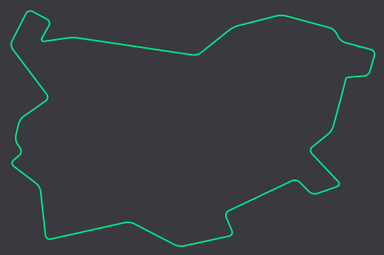
Reduction opportunities

As specified, LED street lighting offers energy savings of up to 50% compared to traditional lighting technologies. Energy savings can reach 80% with connected LED street lighting that can be managed manually or automatically adjusted based on schedules, ambient light levels, motion detection or incidents.[25]

According to Signify's own estimates, for a city of 1.5 million people, the switch to LED could save 80 GWh in public outdoor lighting, 140 GWh in lighting for public buildings, and 51 tons of CO_2 emissions annually.[9] Additional GHG emissions can be avoided via remote, centralized lighting management systems with data-rich alerts, eliminating the need for scouting crews to drive the streets at night. For instance, street lights with embedded sensors can monitor ambient temperature and noise, air quality, traffic density and more, offering actionable insights that city officials can then use to make their cities safer, cleaner and more efficient.

Looking particularly at the US, the federal government is the single largest energy consumer, in part due to its 350,000 municipal buildings. Mandating performance standards for these buildings, as seen under the Energy Efficiency Directive in the EU, could save taxpayer money, cut millions of tons of GHG emissions, while demonstrating the leadership needed to encourage businesses and local governments to follow suit.

Regulations and programs around the world



Bulgaria

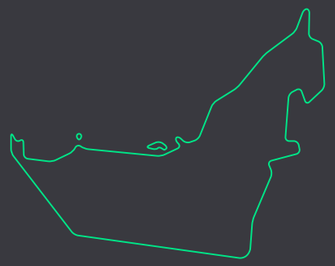
The EU's Recovery and Resilience Facility provided €76 million to modernize outdoor lighting in 68 municipalities, with implementation already underway.

Europe

The revised Energy Efficiency Directive defines energy savings requirements for central government buildings. Under the directive, all EU countries must renovate at least 3% of the total floor area of buildings owned and occupied by central government annually.

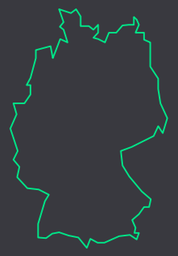
US

Street lighting modernization initiatives are in progress in many major cities and regions, including Washington, D.C., Chicago and Seattle.



UAE

The.Dubai Demand Side Management (DSM) Retrofit Program aims to retrofit 30,000 buildings by 2030.



Germany

The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) funds industrial-scale pilot projects in key environmental sectors such as climate protection and resource efficiency.

Global

Northeast Group estimates that over €40 billion will be invested globally in LED street lighting, networked lighting controls, embedded sensors and lighting management software between now and 2033.

Sports stadiums and arenas

Sports buildings alone account for 10% of the annual energy consumption in Europe.[30] With a switchover to centrally-managed LED and connected lighting systems, professional sports organizations can make progress toward their energy-efficiency goals while enhancing the game day experience for participants, fans in the stands and broadcast viewers.

[30] https://www.sciencedirect.com/science/article/pii/S2210670723006303

[31] The calculation is based on an average of 600 LED lights at 1,500 watts per fixture with an average game length of 6 hours

Segment consumption and emissions

0.6%

of total emissions in 2020 were accounted for by the global sports industry, or between 300 and 350 million tons of CO_2 emissions, roughly equivalent to the emissions of Spain or Poland (RTA)

30 million

tons of CO_2 emissions are emitted by the global American football industry annually, roughly equivalent to the emissions of Denmark (DGB Group)

3.6 million

tons of CO_2 emissions would be generated by the 2022 World Cup in Qatar according to FIFA, but investigators believe that the actual footprint was closer to 10million tons of CO_2 emissions (BBC)

10k - 20k kWh

is consumed by a 70,000-seat stadium on gameday — depending on the features of the venue and the type of event — of which 5,400 kWh[31] can come from lighting. LED luminaires can last five times longer and use around 50% less energy compared to conventional lighting, leading to substantial energy and cost savings (Power Integrations)

Reduction opportunities

Many arenas, stadiums, teams and organizations have recognized the climate impact of sports and have made energy efficiency and sustainability an ambition. London's Emirates Stadium recycles 80% of matchday waste.[32] The Mercedes-AMG PETRONAS F1 Team reduced its air travel emissions by over 2,628 tons of CO_2 following an investment in sustainable aviation fuel.[33]

Alongside cooling, broadcasting and other operations in a sports stadium or arena, lighting can consume 1,000 and 2,000 kWh per hour during an event;[34] however, a switchover to centrally-managed, connected LED lighting can reduce electricity usage by as much as 80%.

By replacing fluorescent and incandescent lighting with LED lighting, for example, Germany's Allianz Arena has saved more than 60% on electricity and approximately 362 tons of CO_2 emissions per year, compared to its previous system.[35] In the US, the NFL Denver Broncos team has saved an estimated 1.34 million kWh per year at Mile High Stadium by switching to LED lighting.[36]

[32] www.nlwa.gov.uk/blog/how-green-your-team

[33] www.mercedesamgf1.com/news/2023-sustainability-report-key-facts-and-highlights

[34] www.ledsuniverse.com/sports/stadium/expenses/the-hidden-costs-of-stadium-lighting-a-closer-look/

[35] www.colorkinetics.com/global/showcase/allianz-arena

[36] www.electricchoice.com/blog/nfl-stadiums-attempt-to-lower-energy-costs/

Regulations and programs around the world

EU

The Union of European Football Associations (UEFA), the governing body for European football made up of over 55 national football associations, unveiled its Sustainable Infrastructure Guidelines and Football Sustainability Strategy 2030 in 2022, with a mission “to inspire, activate, and accelerate collective action to respect human rights and the environment within the context of European football.”

US

The NFL Green program, which has been in place since 1993, “works to mitigate the environmental impact of the NFL's major events and create a green legacy in each community that hosts the Super Bowl, Pro Bowl, and NFL Draft.” NFL stadiums around the US are contributing to this effort by achieving LEED certification, switching to renewables like solar and installing LED lighting systems.

Global

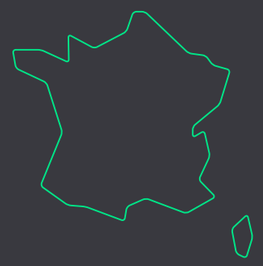
The UN announced Sports for Climate Action in 2021, with the objective to measure, reduce and report on GHG emissions to achieve net-zero by 2040 and use sports to help rally the global community around climate change mitigation.

At COP26 in Glasgow in 2021, the International Federation of Association Football (FIFA) introduced the FIFA Climate Strategy, which confirmed its commitment to the UN’s Sports for Climate Action framework and pledged to achieve a 50% reduction in carbon emissions by 2030 and reach net-zero by 2040.

In 2019, Formula 1 announced its plan to achieve a net-zero carbon footprint by 2030. Among other ambitions, Formula 1 has since modified its operations to cut absolute carbon emissions in half compared to a 2018 baseline and has committed to running its race cars on 100% sustainable fuel by 2026. Formula 1 is also looking for ways to reduce its travel and logistics sector emissions.

Italy

The Progetto Sport e inclusione sociale project funds projects to build, renovate and equip sports facilities in disadvantaged areas with a focus on energy efficiency.



France

In 2021, the Ministère de l'Economie et des Finances (MEF) introduced a measure to improve energy efficiency for local sports authorities by subsidizing renovation projects for gyms, swimming pools and other structural sports equipment.

Recommendations

Progressing on climate action requires active collaboration from private and public sector leaders to influence business innovation and policy. Below are several ways to ensure we are held accountable for progress on sustainability goals, while we benefit from energy efficiency gains of the latest innovations in energy-efficient LEDs, ensuring future energy security today and for generations to come.

1. Make an integrated plan

A climate transition plan is an important step for business leaders to commit to transform their own operations to make the net zero by 2050 goal a reality. With an integrated plan, in which negawatts (energy efficiency improvements) and megawatts (renewable energy uptake) are central components, companies can hold themselves to the rigor, standards and transparency needed to take effective climate action.

With the switch to energy-efficient LED lighting as a first step, imagine the impact that each sector could have through their own decarbonization efforts, encouraging collective action on a wider scale.

2. Partner up on advocacy

No single party, company or government can achieve global climate ambitions in a silo: a collaborative approach is required. Companies must continue to develop innovative solutions that support energy efficiency gains, and policymakers can do their part to encourage their widespread adoption.

Non-profit organizations like Climate Group are pushing companies toward commitments and action, providing a platform to celebrate successful initiatives, advocating for policy action in support of their members, and acting as a strong resource for companies just getting started on in their own sustainability journeys.

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3. Increase building renovation rates

According to IEA estimates, renovation rates globally must increase from the current 1% annually to 2.5% to reach net zero by 2050. There are several policies and initiatives aiming to make this goal a reality, including the Energy Performance of Buildings Directive in which the EU aims to achieve a fully decarbonized building stock by 2050 and the Renovation Revolution from Climate Group, of which Signify is a project partner. The latter calls on companies, sub-national governments, and environmental sector NGOs to work together to increase renovation rates in Europe's commercial and public buildings.

While decarbonization in buildings might look like replacing old gas boilers with heat pumps or installing rooftop solar panels, one of the least invasive projects a city official can undertake is upgrading to energy-efficient LED lighting.

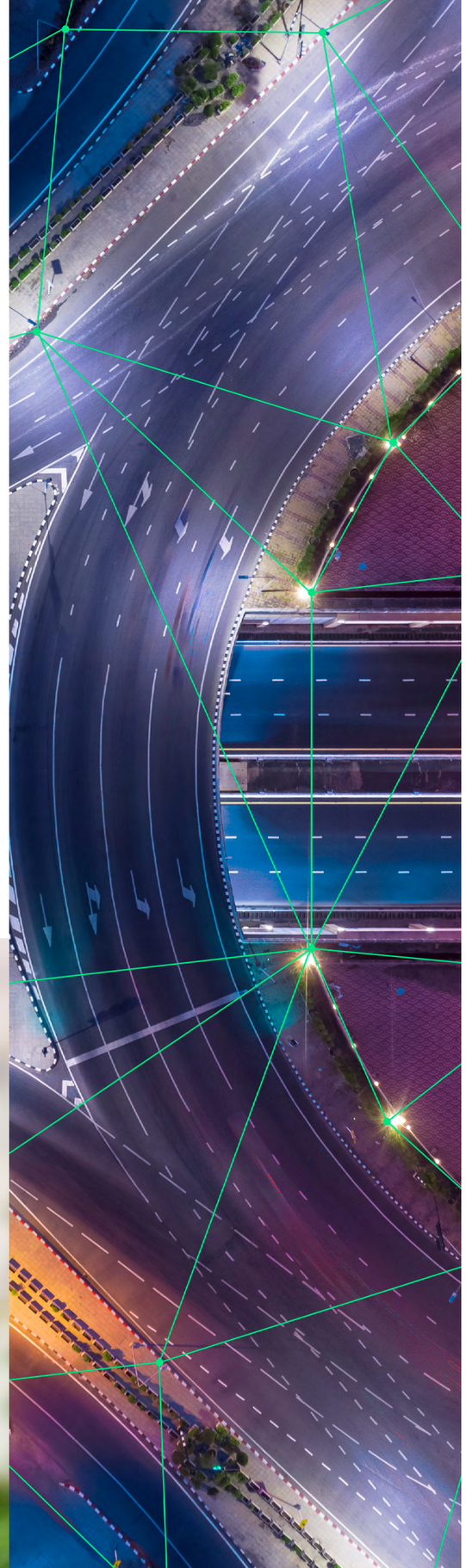
4. Ensure supportive, stable policy

Companies shoulder a large part of the responsibility to decarbonize; however, legislators play a vital role in passing policies to encourage action around energy efficiency gains and the use of renewables across our economy.

In many jurisdictions, governments are or are considering weakening or even eliminating environmental and social policies that have been agreed after extensive consultation with the private sector and civil society. This kind of policy whiplash risks undermining the stability that the private sector needs to be able to invest and innovate. By engaging leading companies in a consultation process, policymakers can avoid fundamental changes in direction and instability that may stifle investment and innovation.

5. Highlight energy efficiency in the NDCs

With governments currently focused on preparing new Nationally Determined Contributors (NDCs), there is a window of opportunity to make energy efficiency a key focal point in long-term national plans. To date, only 16 of the 195 parties have submitted their Nationally Determined Contributors (NDCs), of which 13 parties include energy efficiency as part of their plans. As we near COP30 in Belém, it is paramount that, for all countries, energy efficiency is cited as a 'first fuel' or the first line of defense on climate action.



Conclusion

Signify has engaged world leaders from both the public and private sectors for the better part of the last century on the topic of energy efficiency, spurring collective action to reduce global lighting-related emissions. The aim has been to highlight the immense energy-saving potential of efficient LED-based lighting technologies and to actively promote their widespread adoption.

However, now there is a very different level of urgency as we have already reached tipping points for global warming, while energy demand continues to increase exponentially. In the face of geopolitical and economic challenges, we require urgent and innovative solutions to manage this demand sustainably. First, we must reduce our energy consumption and harness the power of negawatts—the energy savings unlocked through energy efficiency. From there, we must prioritize bringing enough new, clean megawatts to the grid, without which we cannot hope to meet the ambitions of the Paris Agreement to ensure temperature rises in this century stay well below 2°C compared to pre-industrial levels.

By working together, we can unlock the potential of lighting as a powerful tool and accelerant in the pursuit of a decarbonized, energy-secure future.