Climate and Energy

Climate change is a serious environmental, economic, and social challenge. We focus on reducing our own climate impact—the emissions resulting from our own operations, our supply chain, and the marketing and use of our products. We also work to identify ways that Intel technology can help others reduce their climate impacts. Our Climate Change Policy outlines our formal position on climate change and our policy advocacy principles.

Reducing Our Operational Carbon Footprint

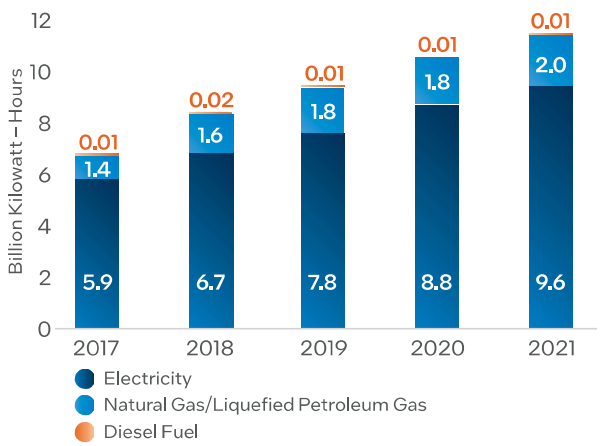
For over two decades, Intel has set aggressive greenhouse gas (GHG) reduction goals to conserve energy and minimize GHG emissions. We have invested in GHG reductions, including chemical substitution, abatement, energy conservation, process optimization, and renewable and alternative electricity. As a result of these actions, we have avoided nearly 75% of our cumulative Scope 1 and 2 emissions over the last decade. We collaborate with others in the semiconductor and other manufacturing industries to identify new and innovative approaches to reduce emissions. For more information, see "Sustainable Manufacturing and Chemistry Initiatives" later in this section.

Energy Conservation

Reducing operational energy use is core to Intel's overall climate strategy and our 2030 goals. Cumulatively we conserved approximately 486 million kWh of electricity from the 2020 baseline through the end of 2021 toward our 4 billion kWh goal, resulting in cumulative savings of more than $30 million.

Our energy management systems follow the international ISO 50001 Energy Management System standard. Although energy conservation opportunities are present across the spectrum of Intel's manufacturing operations, we have identified strategic investment areas in efficient lighting, chilled water cooling, compressed air, and heat recovery and electrification. Read the blog.

Energy Use



Our 2021 absolute energy use increased 9% compared to 2020 due to bringing new tools online and the additional complexity of newer technologies. In 2021, approximately 83% of our global energy use was electricity.

2030 Goal: Energy Conservation

Description. Achieve cumulative electricity savings of 4 billion kWh from 2020 to 2030.

Baseline. Progress measured from baseline of Jan. 1, 2020.

Progress in 2021. In 2021, we invested in projects that enabled us to conserve approximately 162 million kWh of electricity. We have conserved a cumulative total of 486 million kWh of electricity since the baseline date.

Looking Ahead. In 2022, we plan to continue to invest in new and innovative projects that will conserve an additional 100 million kWh of electricity.

Alignment with TCFD

We are committed to transparency around our carbon footprint and climate risk and use the framework developed by the Task Force on Climate-Related Financial Disclosures (TCFD) to inform our disclosure on climate governance, strategy, risk management, and metrics and targets. For governance and strategy, we follow an integrated approach to addressing climate change, with multiple teams responsible for managing climate-related activities, initiatives, and policies, including manufacturing and operations, government and public affairs, supply chain, and product teams. Senior executives and the Board's Corporate Governance and Nominating Committee review strategies and progress toward goals.

We describe our overall risk management processes in our 2022 Proxy Statement, and we describe our climate-related risks and opportunities in this report; our Climate Change Policy; "Risk Factors" within of our 2021 Annual Report on Form 10-K; and in our most recent CDP Climate Change survey, which is available on our Report Builder website. We employ a variety of climate-related assessments and scenarios across multiple aspects of our business. In 2021, subject matter experts from multiple business groups partnered to further drive the integration of climate change considerations into our processes for assessing risks and opportunities and to conduct a climate change scenario analysis.

A more detailed mapping of our climate disclosures aligned with the TCFD and Sustainability Accounting Standards Board (SASB) framework is included in the Appendix.

2030 Goal: Scope 1 and 2 GHG Emissions

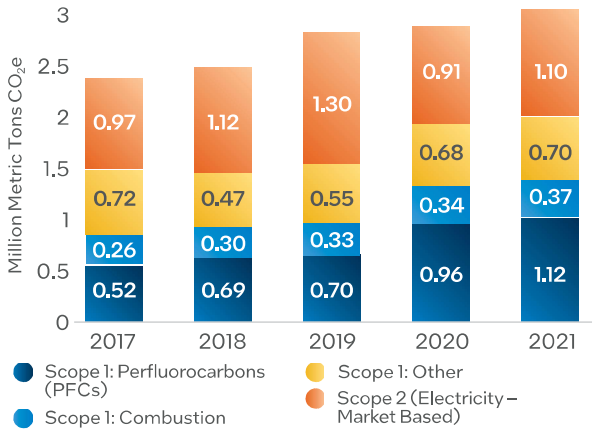
Description. Drive a 10% reduction in our absolute Scope 1 and 2 GHG emissions from 2020 to 2030.

Baseline. Progress measured as percent reduction from our calendar year 2019 emissions. Our combined Scope 1 and Scope 2 GHG emissions in 2019 were 2.88 million metric tons of CO_2e.

Progress in 2021. During 2021, our Scope 1 and 2 emissions increased by approximately 14% from the 2019 baseline.

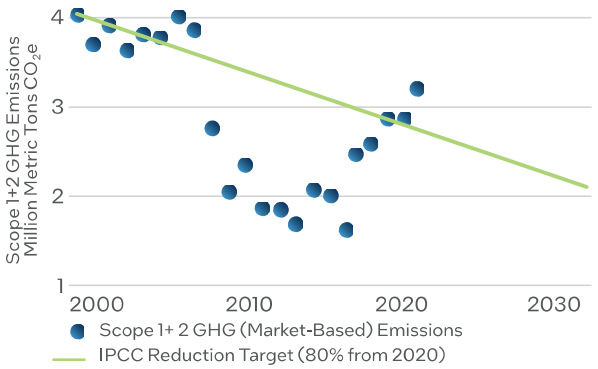
Looking Ahead. In 2022, we will continue to take action to reduce emissions through abatement, investments in renewable electricity, process and equipment optimization, and energy conservation. In addition to this 2030 goal, in April 2022 we announced a new commitment to reach net zero Scope 1 and 2 GHG emissions by 2040. Next year we will begin reporting progress toward both the 2030 and 2040 commitments.

Scope 1 + 2 GHG Emissions



Our combined Scope 1 (direct) and Scope 2 (indirect) GHG emissions increased by approximately 14% on an absolute basis in 2021 from the 2019 baseline, driven by the complexity of current manufacturing process technologies.

Intel's GHG Emissions—Where Are We Headed?



For over two decades, we have tracked our Scope 1 and Scope 2 emissions against a science-based reduction target of 80% from 2000 levels by 2050. In recent years, our absolute GHG emissions have increased due to significant growth and complexity of our current manufacturing process technologies. Since 2000, our Scope 1 and 2 emissions have decreased by about 19% on an absolute basis, even as we expanded our manufacturing capacity significantly. We are committed to driving reductions through our 2030 RISE goals and our recently announced commitment to reach net zero GHGs for Scope 1 and 2 by 2040, as well as through collaboration with others in the semiconductor and other manufacturing industries. For more information, see "Sustainable Manufacturing and Chemistry Initiatives" later in this section.

Our emissions calculations are based on Global Reporting Initiative Standards, the World Resources Institute/World Business Council for Sustainable Development's The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, and internal criteria defined by Intel management. Additional GHG emissions reporting is publicly available in our CDP questionnaire response on our Report Builder website.

Cooling system at Intel's Mission Campus in Santa Clara, California.

2021 GHG Emissions Reported by Category (metric tons of CO_2e)

Scope	Emissions	Notes
Scope 1 (Direct) Emissions	2,181,000	Manufacturing process, onsite fuel combustion, refrigerants, onsite fleet/ air travel.
Scope 2 (Indirect, Electricity)	1,093,000	Market-based method;[2] includes renewable electricity purchases.
Scope 1 and 2 Total	**3,274,000**	
Scope 3 Total	**28,863,000**	Indirect/value chain.
Leased Vehicles and Commuting	289,000	Employee leased vehicles and commuting.
Logistics and Distribution	207,000	Upstream and downstream transport and distribution.[3]
Employee Business Travel	12,000	Air travel, car rentals, and hotel stays.
Supply Chain	4,924,000	Represents the 2022 estimate based on key suppliers' 2021 CDP Climate Change Questionnaire information.
Capital Goods	141,000	Extraction, production, and transport of capital goods purchased.
Fuel and Energy Related Activities	121,000	Impacts related to extraction, production, and transportation of fuels and energy purchased, not already included in Scope 1 or 2. Market-based method.[4]
Waste Generated in Operations	60,000	Disposal and treatment of waste generated in our operations.
Product Energy Usage	22,903,000	Represents the GHG emissions of the product lifetime (5,264,000 metric tons of CO_2e annualized). Includes consideration of cloud service provider publicly reported use of renewable electricity in data centers.[5]
Processing of Sold Products	206,000	Processing of intermediate products sold to down-stream manufacturers.

[2] Location-based method Scope 2 emissions (does not account for any renewable electricity purchases) = 3,820,000 metric tons CO_2e/year.

[3] Upstream portion = 85,000 metric tons; downstream portion = 122,000.

[4] Market-based method includes renewable purchases. Location-based method emissions (does not account for any renewable electricity purchases) = 298,000 metric tons of CO_2e/year.

[5] Lifetime and annual product energy usage emissions without consideration of customer renewable electricity are 32,632,000 and 7,475,000 metric tons CO_2e, respectively.

Renewable and Alternative Electricity

In addition to conserving energy, we purchase green power and operate on-site alternative electricity projects that provide power directly to Intel buildings. Over the last five years, Intel's renewable electricity supply and renewable electricity attribute purchases have totaled more than 30 billion kWh, enough to power more than 2.8 million US households for one year.[6]

Over the last decade, Intel's on-site alternative and renewable electricity installations and our installed capacity have grown exponentially. We now have more than 100 alternative and renewable electricity installations with capacity of more than 50,000 kW across 23 Intel campuses, with an additional 15 installations under construction. These installations use 22 different technology applications, such as solar hot and cooling water systems, solar electric photovoltaic-covered parking lots, and mini bio-energy, geothermal energy, and micro wind turbine array systems.

These on-site projects, which include pilots of innovative technology applications, help us displace grid-supplied, carbon-intensive electricity sources and identify future installation and technology opportunities for both Intel and the broader alternative and renewable electricity market. When installed, our projects are often the largest corporate on-site projects of their type in a country or region.

[6] Based on average US household energy usage figures published by the US Energy Information Administration.

2030 Goal: Renewable Electricity

Description. Achieve 100% renewable electricity across our global operations, including manufacturing.

Baseline. During 2020, we had reached 100% renewable electricity in our US and European operations, 50% for our Israel operations, and 71% globally.

Progress in 2021. We continued our 100% renewable electricity commitment for our US, Europe, Israel and Malaysia operations, and achieved 80% globally by the end of 2021.

Looking Ahead. We will continue to explore additional locations to increase renewable electricity.

For more than a decade, Intel has been one of the top voluntary corporate purchasers of green power in the US EPA's Green Power Partnership (GPP) program. In addition to generating on-site and off-site renewable electricity and purchasing renewable electricity from our utility suppliers, we purchase green attributes from multiple sources of generation. These include wind, solar, hydroelectric, and geothermal, which are certified and verified by nonprofit validation accreditors such as the Center for Resource Solutions' Green-e program to meet GPP program requirements.

Our approach to renewable and alternative electricity investments has been to reduce our own carbon footprint while encouraging others to take similar actions. We are encouraged by actions we have seen over the past decade—by companies, investors, utilities, and governments—to increase commitments and investments in renewable energy supplies and apply new technologies.

Product Energy Efficiency

Each new generation of products offers higher performance and improved energy efficiency compared to previous generations. Building energy efficiency into our products not only reduces our Scope 3 GHG emissions, but also presents an opportunity to create value for our customers by helping them lower their Scope 2 GHG emissions, energy use, and overall environmental impact.

In 2021, we launched 12th Generation Intel® Core™ processors for desktop and notebook computers, with hybrid architecture comprising performance cores and efficient cores. Performance boost[1] with hybrid technology will lead to higher performance per watt in client products, helping us meet our 2030 10X product efficiency goals.

During 2021, we continued our work on energy-efficiency initiatives and have made substantial progress in replacing traditional system sleep and idle states with Modern Standby. Intel maintained 100% adoption of Modern Standby on notebook PC designs using 12th Generation Intel Core processors (ADL-P and ADL-U). The transition of desktop PCs to Modern Standby ramped in 2021 with a doubling of design wins through ecosystem partnerships.

Intel collaborated with the technology industry to enable customers to successfully transition to Tier-2 specifications of California Energy Commission (CEC) computers standard (approximately 15% annual PC energy use reduction). We also worked with industry partners and the Consumer Technology Association to influence US computer and display standards to align with the existing CEC standards and future CEC revisions. This alignment is critical to prevent a patchwork of state-level certification requirements. Working with the European Commission and other stakeholders on EU Lot 3 Computers regulation revision, Intel continued to make progress with DIGITALEUROPE on new software tools for PC active mode energy-efficiency labeling recommendations. We also worked with government policy makers In South Korea to influence the direction of the new version of computer standard.

[1] https://download.intel.com/newsroom/2021/manufacturing/12th-Gen-Blueprint-Series-Presentation.pdf

For server energy efficiency, Intel collaborated with technology industry consortia and European Standardization Organizations to support development of new harmonized standards in support of EU Lot 9 server regulation already in effect. We also contributed to server energy-efficiency standards initiatives in the UK and India. In China, as part of industry consortia we are working with China National Institute of Standardization to agree on a workable solution for SPEC® SERT® suite and China's indigenous benchmark tool (BenchSEE) to co-exist, in order to comply with China's upcoming server energy-efficiency standard.

We have estimated the GHG emissions due to energy consumption by Intel® processors sold in 2021. The annual and lifetime emissions of Intel processors when used in customers' compute applications (i.e., server, desktop, notebook, and workstation) equate to approximately 5,264,000 and 22,903,000 metric tons of CO_2e, respectively.

The decrease in annual and lifetime emissions compared with 2020 is driven primarily by significant improvements in our server CPU calculation methodology for product energy usage and associated GHG emissions. Refinements for 2021 included incorporating both enterprise and cloud data center models. While there was no change to traditional enterprise data center methodology, the cloud data center model required significant refinement to CPU percent average active power in line with CPU usages in today's data centers. Further refinements for 2021 included accounting for the emissions reduction impacts of the use of renewable electricity by our customers. Specifically, calculations included consideration of cloud service provider publicly reported use of renewable electricity in data centers. Yearly emissions due to energy consumption of Intel processors are expected to trend downwards as our customers further adopt renewable electricity initiatives and goals. Net lifetime emissions after accounting for renewable electricity is going down, even with higher percent average active power in cloud data centers.

For more information, see "Achieving Carbon Neutral Computing" later in this section.

2030 Goal: Product Energy Efficiency

Description. Increase product energy efficiency 10X for Intel client and server microprocessors to reduce our Scope 3 emissions.

Baseline. Progress on the client component of our product energy efficiency goal is measured using SPEC® CPU2017 Integer Rate benchmark and Display On Idle Power using an end of 2019 baseline. Desktop and notebook product efficiencies will be reported together as a single number through a weighted average of desktop and notebook processor sales volumes. Progress on the data center component of our product energy efficiency goal is measured using SPEC® Server Efficiency Rating Tool (SERT®) suite[2] on Intel and/or OEM commercial systems, using an end of 2019 baseline.

Progress in 2021. **Client product energy efficiency** is slightly behind goal. In 2021, we released our 12th Generation Intel® Core™ processors, which achieved 2X improvement in product energy efficiency vs. 2019 baseline but fell slightly short of our aggressive internal goal of 2.3X. **Server product energy efficiency** is slightly behind goal. In 2021, we released our 3rd Generation Intel® Xeon® Scalable processors, which achieved 1.48X improvement in product energy efficiency vs. 2019 baseline but fell slightly short of the 1.53X internal goal that provides a linear path to 10X by 2030.

Looking Ahead. For 2022, we plan to report on server progress toward the 2030 goals based on soon-to-be released 4th Generation Intel® Xeon® Scalable processors (code-named "Sapphire Rapids") and client progress based on our next-generation processor code-named "Raptor Lake."

[2] SPEC and SERT are registered trademarks of the Standard Performance Evaluation Corporation (SPEC).