Google Cloud

Fraport & Google Cloud

A partnership on sustainability

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Google Cloud

Dear Mr. Kleiner,

Companies have seen massive amounts of change in the past few months. As the future holds exciting opportunities for collaborative ventures, we see major potential in working together with Fraport. In this personalized document, we'd like to dive into the possibilities of accelerating your sustainability strategy in collaboration with Google Cloud, especially given Google's expertise in greening *of* IT and greening *by* IT in the financial services industry using our analytics capabilities and CO2-neutral Cloud solutions.

Keeping the sustainability ambitions of both our organizations in mind, I thought it would be a good idea to connect and explore ways we could partner together. Please let me know if you are open to setting up a meeting.

Warm regards,
Lisa Kern

How carbon-free is your cloud? New data lets you know

Google first achieved carbon neutrality in 2007, and since 2017 we've purchased enough solar and wind energy to match 100% of our global electricity consumption. Now we're building on that progress to target a new sustainability goal running our business on carbon-free energy 24/7, everywhere, by 2030. Today, we're sharing data about how we are performing against that objective, so our customers can select Google Cloud regions based on the carbon-free energy supplying them.

Completely decarbonizing our data center electricity supply is the critical next step in realizing a carbon-free future and supporting Google Cloud customers with the cleanest cloud in the industry. On the way to achieving this goal, each Google Cloud region will be supplied by a mix of more and more carbon-free energy and less and less fossil-based energy. We measure our progress along this path with our Carbon Free Energy Percentage (CFE%). Today we're sharing the average hourly CFE% for the majority of our Google Cloud regions here and on GitHub.

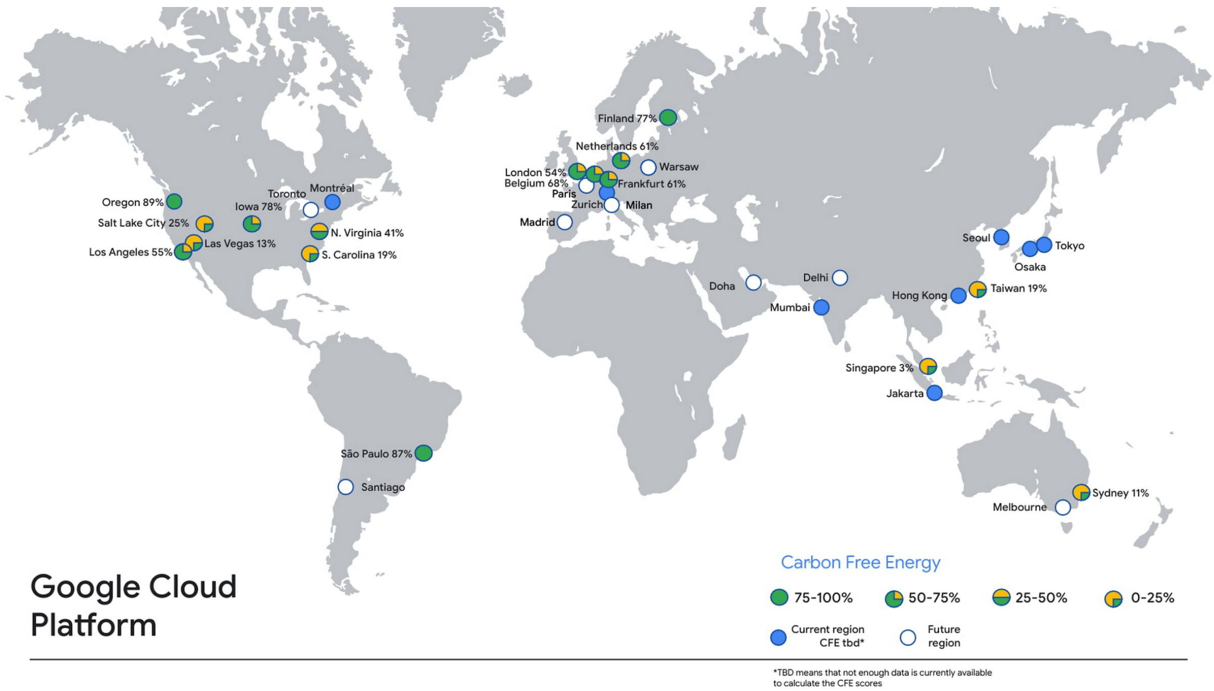
Customers like Salesforce are already integrating environmental impact into their IT strategy as they work to decarbonize the services they provide to their customers. Patrick Flynn, VP of Sustainability at Salesforce, is committed to harnessing their culture of innovation to tackle climate change.

"At Salesforce we believe we must harness the power of innovation and technology across the customer relationship to address the challenge of climate change. With Google's new Carbon Free Energy Percentage, Salesforce can prioritize locations that maximize carbon free energy, reducing our footprint as we continue to deliver all our customers a carbon neutral cloud every day."

—Patrick Flynn, VP of Sustainability at Salesforce.

We're sharing this data so you – like Salesforce – can incorporate carbon emissions into decisions on where to locate your services across our infrastructure. Just like the potential differences in a region's price or latency, there are differences in the carbon emissions associated with the production of electricity that is sourced in each Google Cloud region.

The CFE% will tell you on average, how often that region was supplied with carbon-free energy on an hourly basis. Maximizing the amount of carbon-free energy that supplies your application or workload will help reduce the gross carbon emissions from running on it. Of course, all regions are matched 100% with renewable energy on an annual basis, so the CFE% tells you how well matched the carbon-free energy supply is with our demand. A lower-scoring region has more hours in the year without a matching, local amount of carbon-free energy.



As we work on increasing the CFE% for each of our Google Cloud regions, you can take advantage of locations with a higher percentage of carbon-free energy. You must also consider your data residency, performance and redundancy requirements, but here are some good ways to reduce the associated gross carbon emissions of your workload:

1. **Pick a lower-carbon region for your new applications.**

Cloud applications have a tendency to stay put once built, so build and run your new applications in the region with the highest CFE% available to you.

2. **Run batch jobs in a lower carbon region.**

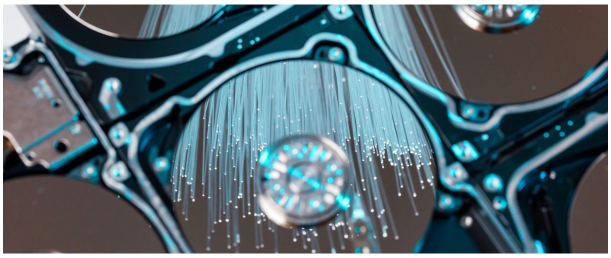
Batch workloads are often planned ahead, so picking the region with the highest CFE% will increase the carbon-free energy supplying the job.

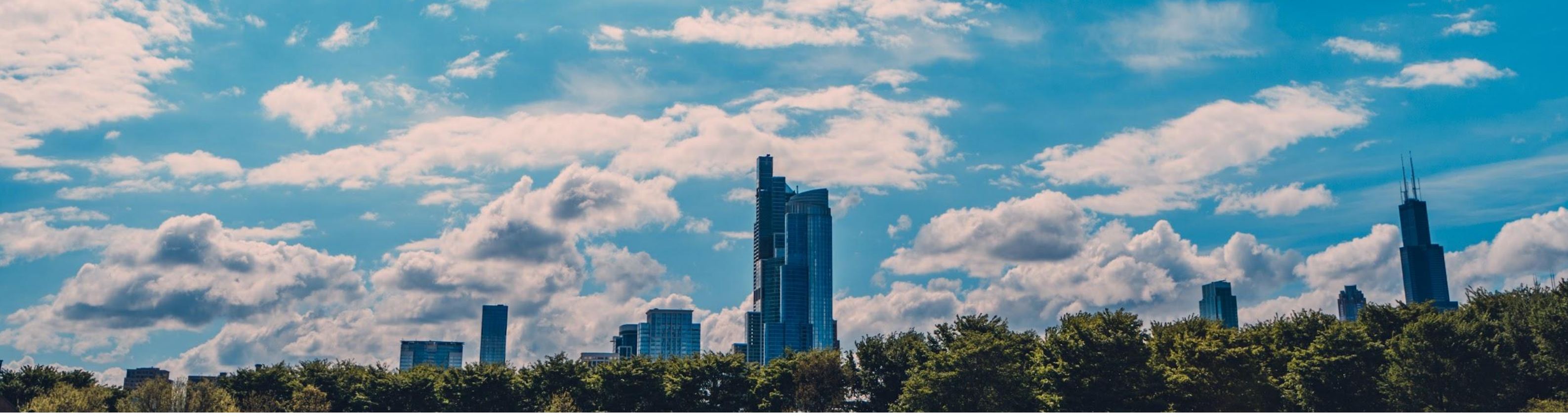
3. **Set an organizational policy for lower carbon regions.**

You can restrict the location of your cloud resources to a particular region or subset of regions using organizational policies. For example, if you want to use only US-based regions, restricting your workloads to run Iowa and Oregon, currently the CFE% leaders, rather than Las Vegas and S. Carolina would mean your app would be supplied by carbon-free energy an average of 68% more often.

And remember, the cleanest energy is the energy you didn't use in the first place. Increasing the efficiency of your cloud applications will translate into using less energy, and often less carbon emissions. Try serverless products that automatically scale with your workload and take advantage of rightsizing recommendations for your compute instances.

24/7 carbon-free energy is the goal we're chasing for all of our Google Cloud regions around the globe. Along the way, we're working on new ways to help you make lower-carbon decisions and lower your Google Cloud Platform carbon footprint. Stay tuned, and make sure you read the full details of today's launch here.



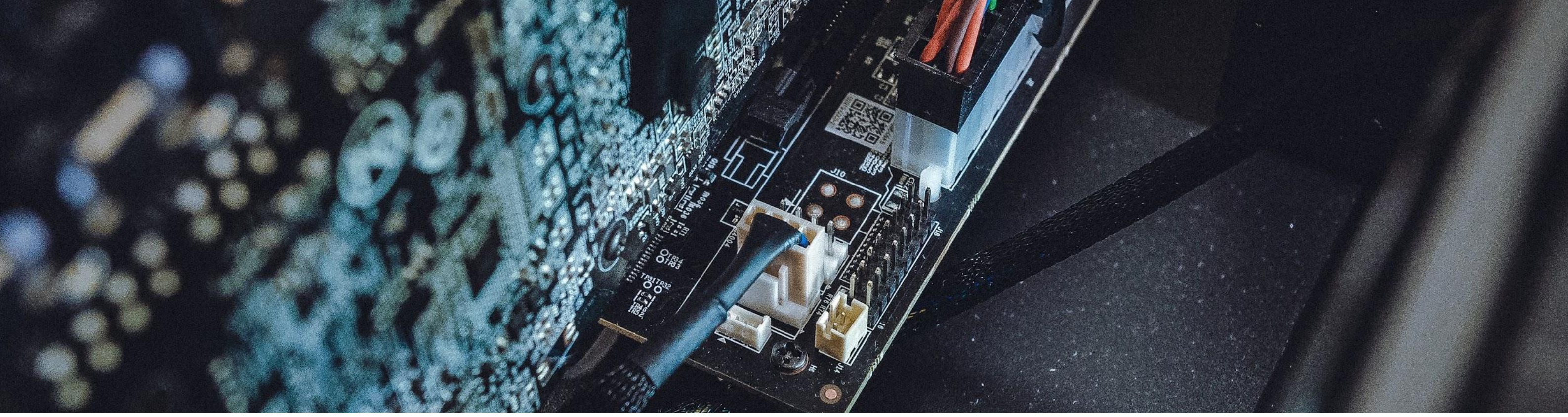


Data centers are more energy efficient than ever

While Google is the world's largest corporate purchaser of renewable energy, we're also taking action on climate change by minimizing the amount of energy we need to use in the first place. For more than a decade, we've worked to make our data centers as energy efficient as possible. A new paper in Science validated our efforts and those of other leaders in our industry. It found that efficiency improvements have kept energy usage almost flat across the globe's data centers—even as demand for cloud computing has skyrocketed.

The new study shows that while the amount of computing done in data centers increased by about 550 percent between 2010 and 2018, the amount of energy consumed by data centers only grew by six percent during the same time period. The study's authors note that these energy efficiency gains outpaced anything seen in other major sectors of the economy. As a result, while data centers now power more applications for more people than ever before, they still account for about 1 percent of global electricity consumption— the same proportion as in 2010.

What's more, research has consistently shown that hyperscale (meaning very large) data centers are far more energy efficient than smaller, local servers. That means that a person or company can immediately reduce the energy consumption associated with their computing simply by switching to cloud-based software. As the data center industry continues to evolve its operations, this efficiency gap between local computing and cloud computing will continue to grow.



Searching for efficiency

How are data centers squeezing more work out of every electron, year after year? For Google, the answer comes down to a relentless quest to eliminate waste, at every level of our operations. We designed highly efficient Tensor Processing Units, (the AI chips behind our advances in machine learning), and outfitted all of our data centers with high-performance servers. Starting in 2014, we even began using machine learning to automatically optimize cooling in our data centers. At the same time, we've deployed smart temperature, lighting, and cooling controls to further reduce the energy used at our data centers.

Our efforts have yielded promising results: Today, on average, a Google data center is twice as energy efficient as a typical enterprise data center. And compared with five years ago, we now deliver around seven times as much computing power with the same amount of electrical power.

By directly controlling data center cooling, our AI-powered recommendation system is already delivering consistent energy savings of around 30 percent on average. And the average annual power usage effectiveness for our global fleet of data centers in 2019 hit a new record low of 1.10, compared with the industry average of 1.67—meaning that Google data centers use about six times less overhead energy for every unit of IT equipment energy.

Leading by example

So where do we go from here? We'll continue to deploy new technologies and share the lessons we learn in the process, design the most efficient data centers possible, and disclose data on our progress. To learn about our efforts to power the internet using as little power as possible—and how we're ensuring that the energy we use is carbon-free, around the clock—check out our latest Environment Report or visit our data center efficiency site.

Reaching our solar potential, one rooftop at a time

The sun produces an astonishing amount of energy. In one second it generates enough to meet the needs of civilization for 500,000 years. More important, enough sunshine hits the earth in a single hour to power the global economy for a full year. Unfortunately, only a tiny fraction of that energy is captured. If all the suitable rooftops in the U.S. had solar panels, they could supply 39% of the nation's energy needs. In short, humanity is sitting on — or rather, under — some massive potential with solar energy.

Why is solar still so undervalued? It's partly an infrastructure problem; the traditional power grid isn't ideally suited to renewable power sources. It's a marketing problem as well: Way too many people still think of solar for their home as an expensive luxury when in fact solar production costs are at an all-time low, and behind-the-meter solar is now often cheaper than grid power.

But ultimately it's an information problem. For most people, the road to solar power is paved with questions: about affordability, weather and light patterns, usable roof area, angle and tilt, government incentives. The information is scattered across the web, from databases by the U.S. Department of Energy to solar suppliers' websites. Going solar, in other words, isn't anywhere near as easy as it should be, and could be.

But several years ago Carl Elkin, an engineer in Google's Cambridge, MA, office, had a realization: If you pulled together a bunch of different data streams and did a bit of tricky math, you could produce, for any given address, a solid estimate of how much solar energy that rooftop could provide.

The idea started with the rooftop satellite imagery displayed in Google Earth: Those shots provide a digital surface model showing the direction a roof faces (south or southwest exposure is best), the angle of its tilt, and the presence of shady objects like trees. From there you can model how much sunlight hits a rooftop surface by tracking the light through the day, using 3-D geometry. Add in data about weather patterns, calculate the averages over the course of a year, convert from sunlight to kilowatt-hours, and boom: a baseline estimate of that roof's solar potential. From there, it's just a few extra calculations to provide a cost estimate customized to that address.

The Sunroof interface showing solar capacity in Manhattan

Elkin shared the idea with colleagues. Dozens of people in five offices volunteered to pursue it. “People started coming out of the woodwork,” Elkin says. As the project team evolved the tool, other ideas were added. Sunroof averages 20 different energy usage scenarios, and people can input their exact costs and usage to make it even more accurate. The team also employed machine learning to help Sunroof do things like better distinguish roofs from trees and measure light from every area of the sky.

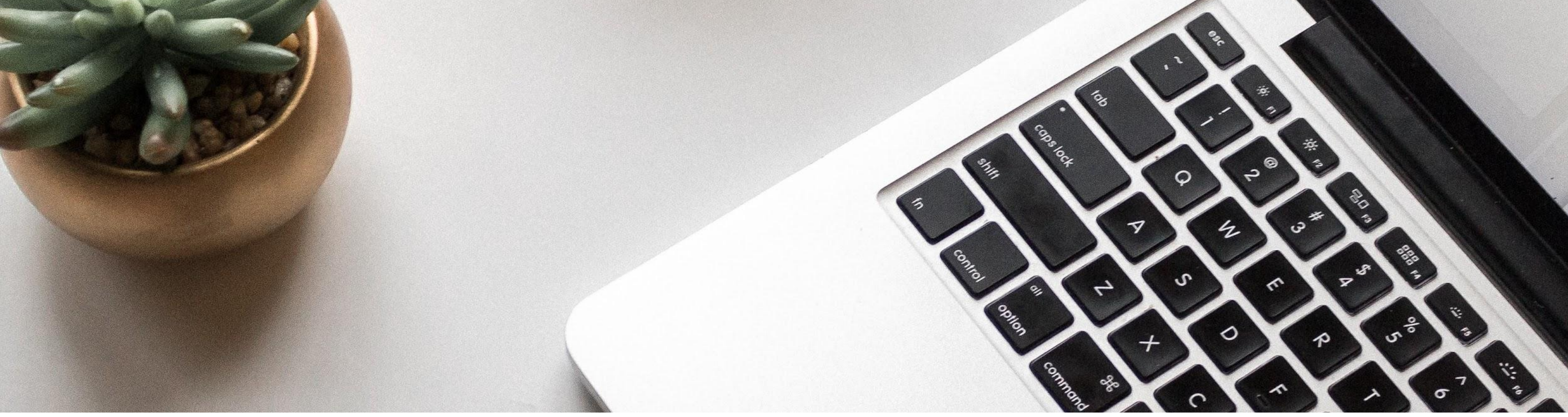
“Enough sunshine hits the earth in a single hour to power the global economy for a full year. Unfortunately, only a tiny fraction of that energy is captured.”

Sunroof processes roughly 1 petabyte (1,000 terabytes) of data: height and color for 43 million homes; weather information; about 1,000 state and local incentives; and hundreds of local electricity rates.

Over the past 3 years, Sunroof has grown from a part-time project to a full-time job for Elkin and his team. Initially launched to drive consumer awareness and education, the service now also makes it easy for interested homeowners to connect with solar providers in their area. Sunroof covers 43 million rooftops in the U.S. — which is more than 50% of all households — and in the coming months will be available in all 50 states.

The team is also exploring international expansion and recently launched Data Explorer, a tool that gives researchers, community advocates and local policy makers access to more aggregated data of solar potential to help them make the case for larger solar deployments at the state, county, city, and neighborhood levels.

One of the industry’s biggest financial impediments has actually been customer acquisition cost; competition is so tight that providers spend almost 44% of the cost of an installation just to win new contracts. To offset this problem, Sunroof gives referrals to solar providers for free. We can’t think of a better way to help let the sun shine in.



Your Google Cloud Contact

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