



Google Cloud

Integrando tecnologías
vanguardistas para la
sostenibilidad

Building technology that helps
people do more for the planet.

Google Cloud



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Climate change is happening now

Recent reports confirmed that 2010 to 2019 was the hottest decade since record keeping began 140 years ago.

Source: [NOAA](#), [NASA](#) 2020

Corporations play a big role

All industries contribute to our total global emissions each year

51% of Europeans think responsibility lies with business and industry for tackling climate change.



Source: [European Commission](#), 2019

“We’re optimistic that by harnessing new technologies, investing in the right infrastructure and tools, and empowering partners, nonprofits and people, this can be the most decisive decade for climate action yet.”

Sundar Pichai, CEO of Google and Alphabet

Source: [Google Cloud Blog](#), Sep 2020



Why IT is a contributor?

Data centers globally consume about 1% of the world's energy

With the number of connected devices expected to grow, this figure will likely only increase.

CIOs can be agents of change

1



Greening of IT

Reducing the immediate impact of your IT operations and lowering your associated emissions

2



Greening by IT

Use IT innovation to reimagine your solutions and business models to be more sustainable

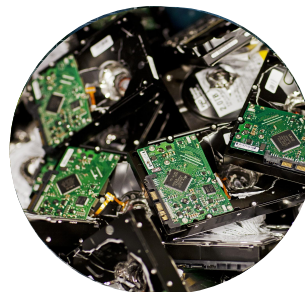
What makes Google Cloud sustainable?



**Smart and efficient
data center**



**Renewable energy
and carbon
neutrality**



Circular economy



**Data-driven
innovation**

Greening of IT

Greening by IT

Smart and efficient data centers



The Original Google

In 1996 Larry Page and Sergey Brin, Stanford CSD, started the Digital Library Project, the amount of disk space to test the PageRank™ algorithm on a wide-web data. At that time, they assembled 10 of these low-cost cabinet.

In Nov 1999, Google Inc. by the one of the primary search engine, provided replacement capacity to the Digital Library that we could move this original assembly into our history di-

As of September 2000, Google, searching and web crawling, LINUX operating system.



 **24**

REGIONES

 **73**

ZONAS

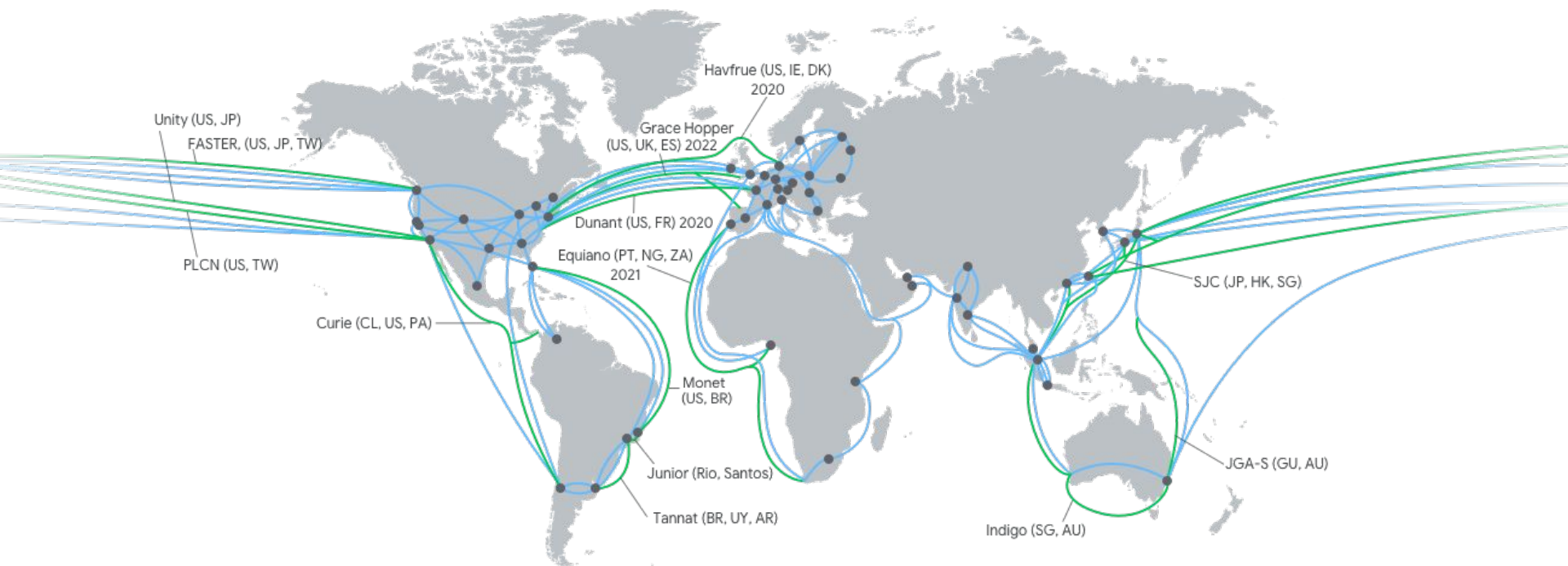
 **144**

UBICACIONES DE PERÍMETRO DE RED

DISPONIBLE EN
 **+200**

PAÍSES Y TERRITORIOS

PRÓXIMAMENTE Seguiremos ampliando la disponibilidad de Google Cloud a las regiones de Delhi (India), Doha (Qatar), Madrid (España), Melbourne (Australia), Milán (Italia), París (Francia), Santiago (Chile), Toronto (Canadá) y Varsovia (Polonia).



Data center efficiency

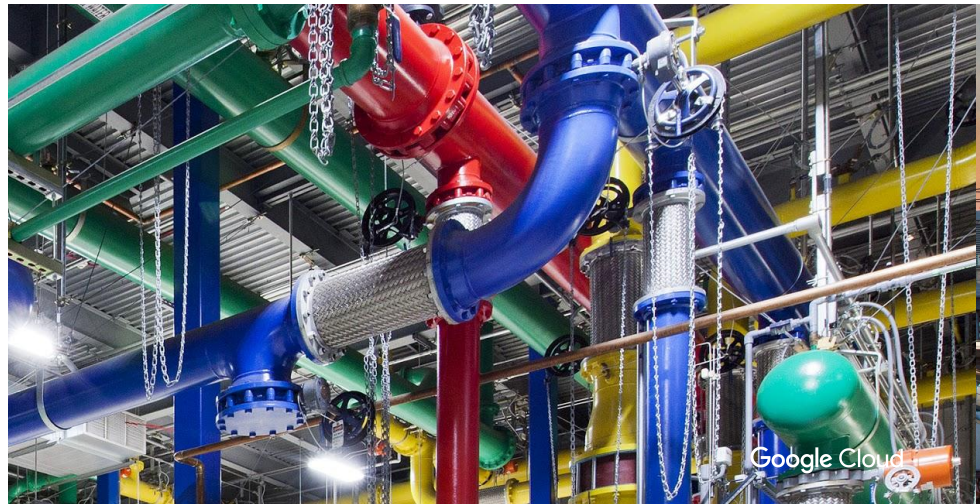
Efficient data centers help us better serve our users, in a more sustainable way

Highly efficient servers

Energy efficient TPUs

Innovative water sourcing

AI cooling system





Our efforts are paying off

x7

Computing power with the same amount of electrical power

30%

Energy savings thanks to our AI cooling system

1.10_{PUE}

Average trailing twelve-month (TTM) PUE across our data center

Smarter data centers

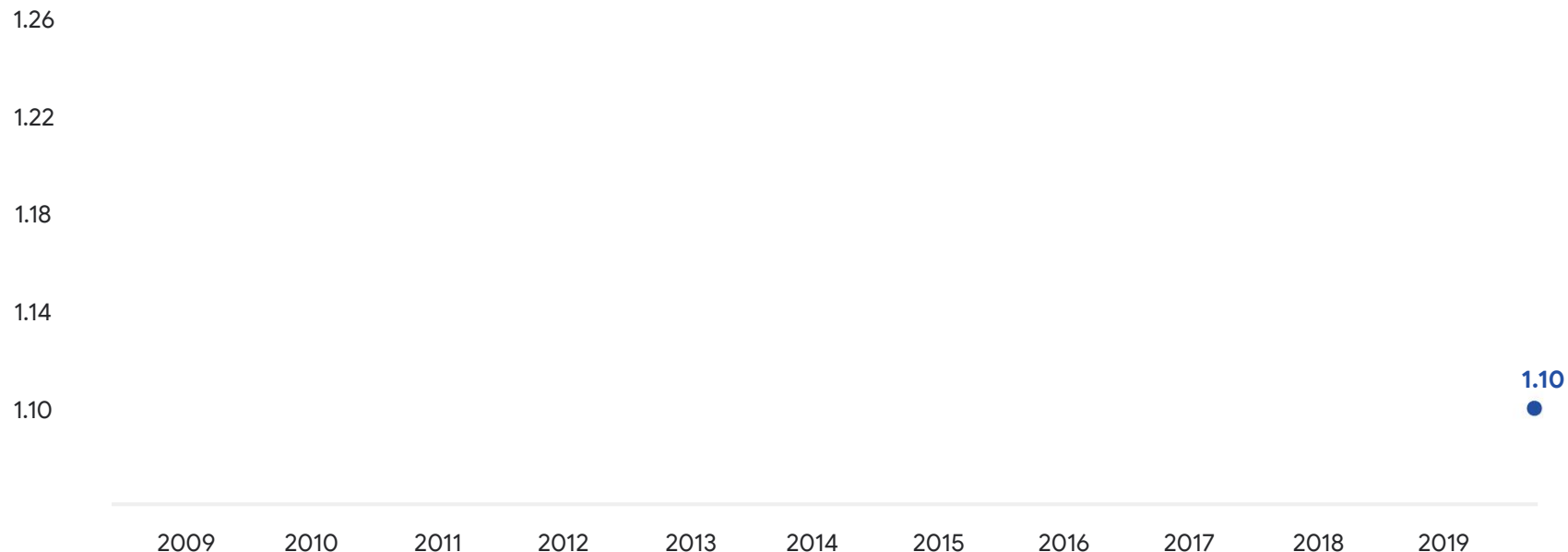
Applying AI to data center operations = 30% reduction in cooling



Average Power Usage Effectiveness (PUE) for all data centers


*2019 Industry average PUE: **1.67**

Quarterly PUE Trailing 12-month PUE





Renewable energy and carbon neutrality

A nighttime photograph of a historic town in Luxembourg. The scene is dominated by a large, illuminated stone bridge with multiple arches, spanning a deep gorge. The bridge is lit with warm yellow lights, and its reflection is visible in the water below. On either side of the bridge, the town's buildings are lit up, with warm yellow light emanating from windows and streetlights. The sky is a deep blue, suggesting dusk or dawn. In the foreground, the rooftops of several buildings are visible, some with dormer windows. The overall atmosphere is one of a well-preserved, historic town at night.

In 2018, Google used **1.5x** as much electricity as the entire country of **Luxembourg**

Decade 1 (Founding - 2010)

“REDUCING GOOGLE’S ENVIRONMENTAL IMPACT”



2007

First major company to go carbon neutral (purchased enough carbon offsets to bring our net annual emissions to zero for the first time)



2010

First major company to start buying renewable energy at scale (led to 100% RE), first major renewable energy equity investment (led to \$2.5B invested by 2015)

Decade 2 (2010-2020)
“EXPANDING ACCESS TO CLEAN ENERGY”



2012

Committed to 100% renewable energy



2017

Google is only major company to match 100% of our global electricity consumption with renewables



2019

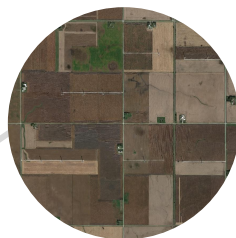
We became the largest corporate purchaser of renewable energy

Decade 3 (2021-2030) "SCALING SOLUTIONS TO EVERYONE"



2020

Eliminate all legacy carbon emissions since Google's founding (since 1998)¹



By 2020

Issue a \$5.7bn sustainability bond to double down on our investments in this space²



By 2030

Enable 5 GW of new clean energy in manufacturing regions¹

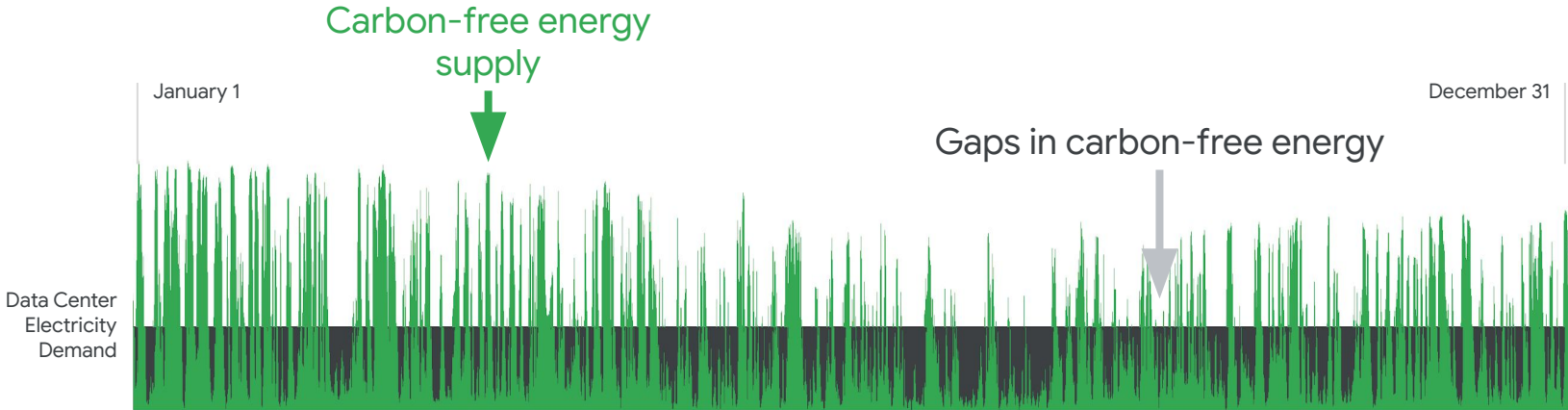


By 2030

Operate on clean energy, every hour and everywhere¹

Source 1: [Google Cloud Blog](#), Sep 2020
Source 2: [Google Cloud Blog](#), Aug 2020

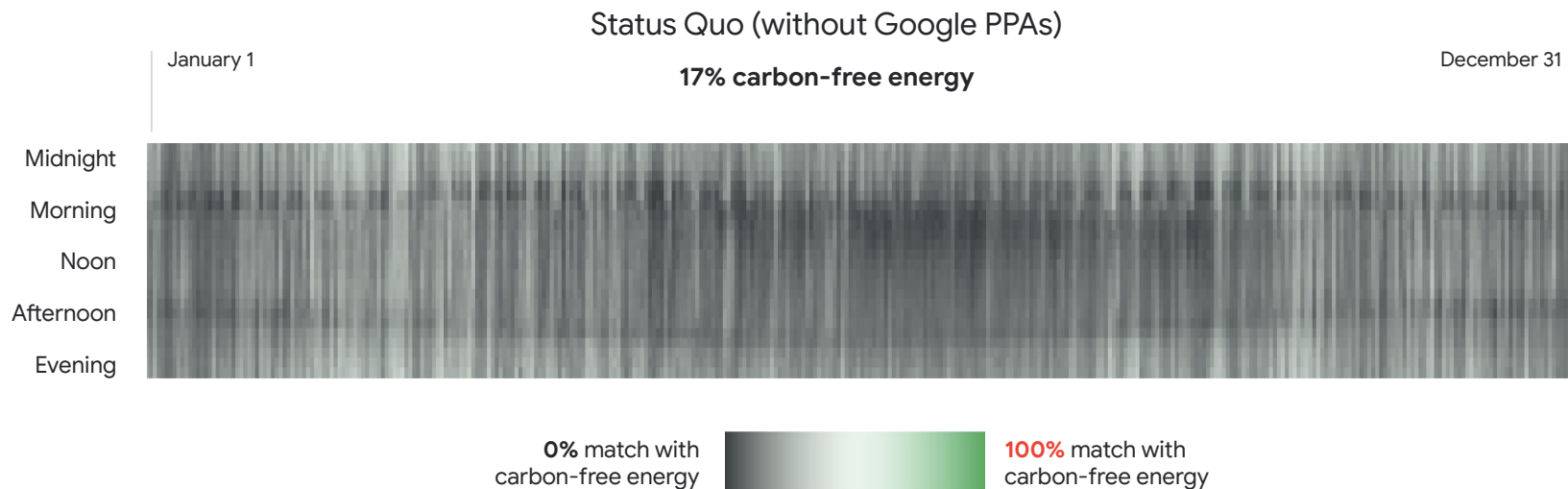
But 100% Renewables is Just a Start



2018 hour-by-hour at a given data center

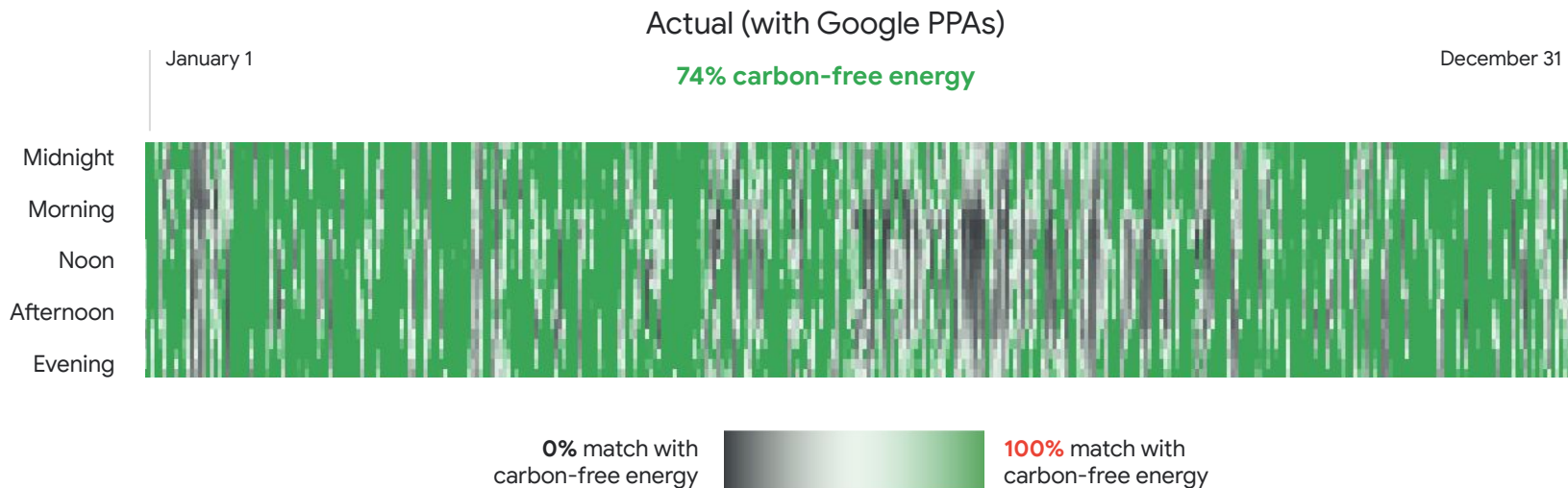
Scenario: every hour of electricity use at Iowa data center

Without solar and wind PPAs, our energy profile in some places would be problematic



Actual: every hour of electricity use at Iowa data center

PPAs have had a transformative impact on greening our energy profile



We aspire to source **100%** carbon-free energy at all times



Our global hourly carbon-free energy average is

61%

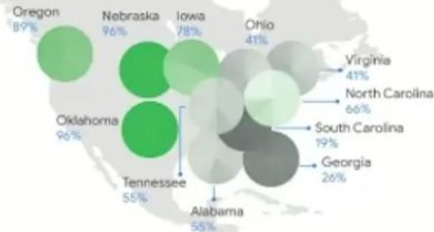


100% match with carbon-free energy



0% match with carbon-free energy

How to read clocks (example)



Key strategies

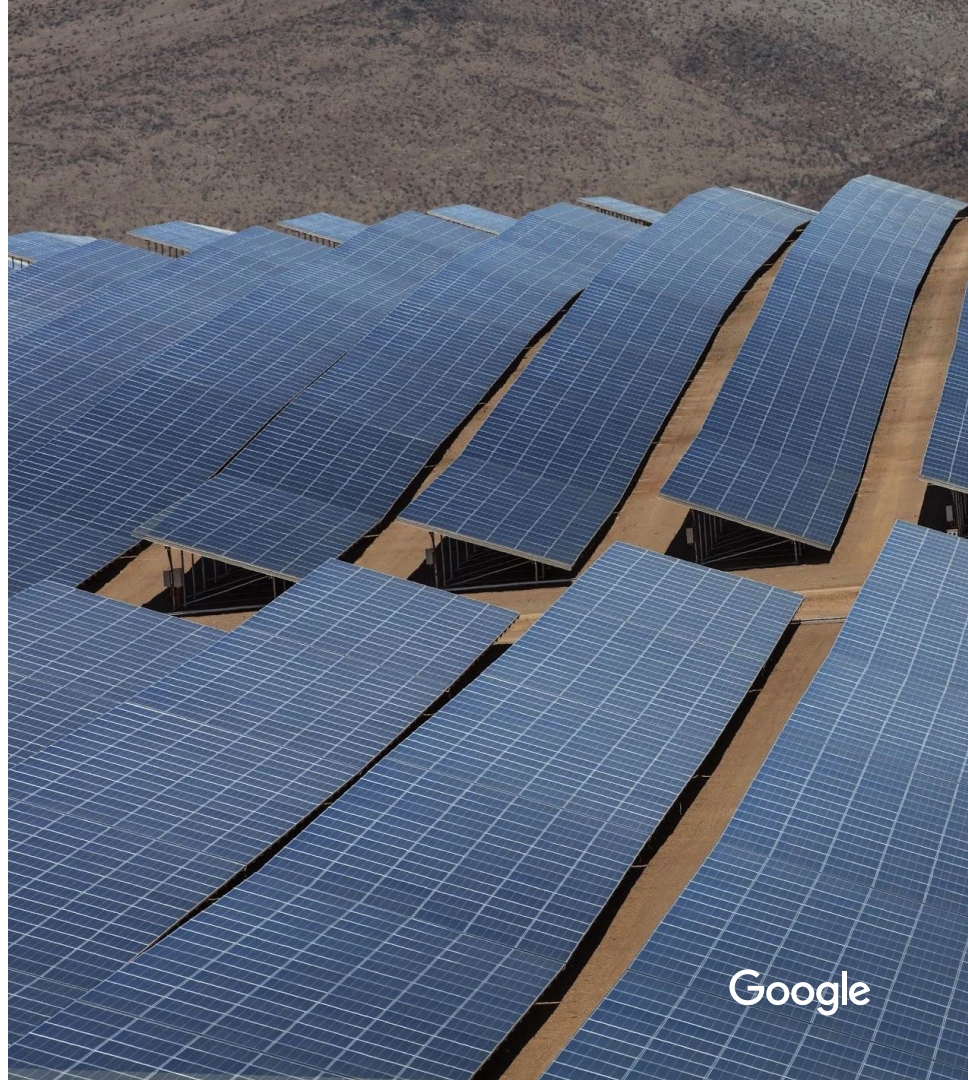
Moving toward 24x7 CFE

Purchase multiple types of renewables
in more regions

Employ technologies to improve
the economics and performance
of existing renewables

Explore next-generation carbon-free
energy technologies

Remove policy barriers



New carbon-intelligent computing platform

Conventional compute load

Execution of compute tasks throughout the day, regardless of carbon impact

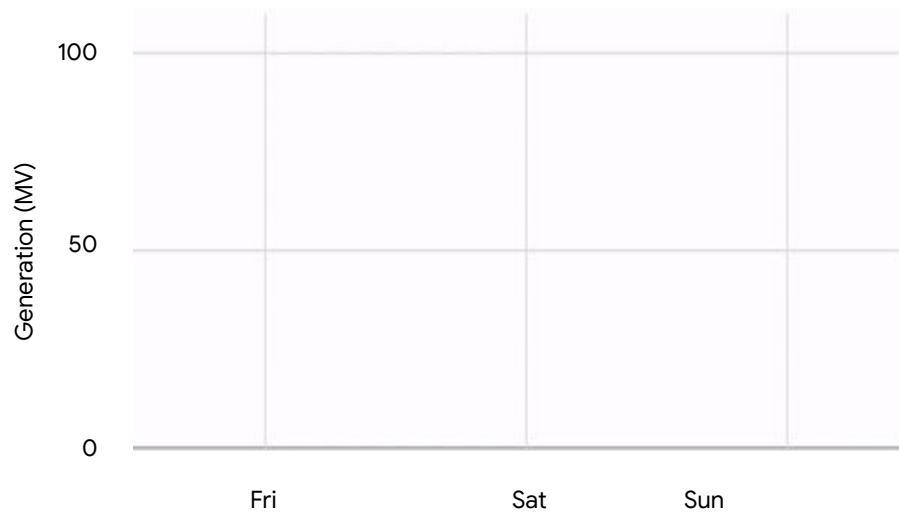


Technology for renewables

The DeepMind system uses a neural network to predict wind power output **36 hours** ahead

● Predicted

● Actual



Cleaner data centers, batteries included

In Belgium, we'll soon install the first ever battery-based system for replacing generators at a hyperscale data center.

Whereas diesel generators sit idle most of the year, batteries are multi-talented team players: when we're not using them, they'll be available as an asset that strengthens the broader electric grid.



Circular economy and zero waste to landfill





Our circular economy goal

To maximize the reuse of finite resources across our operations, products, and supply chains and enable others to do the same

Circular Economy Principles

Partnering with suppliers

100% of suppliers conducted a Responsible Supply Chain self-assessment.

236 on site supplier audits realized since 2013.

Refurbish or remanufacture

18%* of newly deployed servers were remanufactured machines.

Reuse or redistribute

2.1 million* units sold in secondary market.

Maintain or prolong

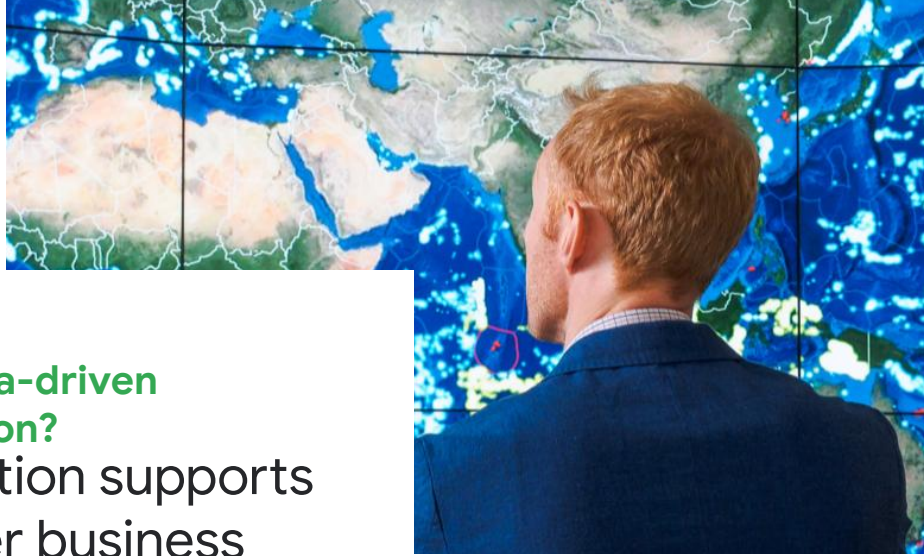
11%* of components used for machine upgrades were refurbished inventory.

Repurpose & Recycle

91%* of waste from our global datacenter operations diverted from landfill.

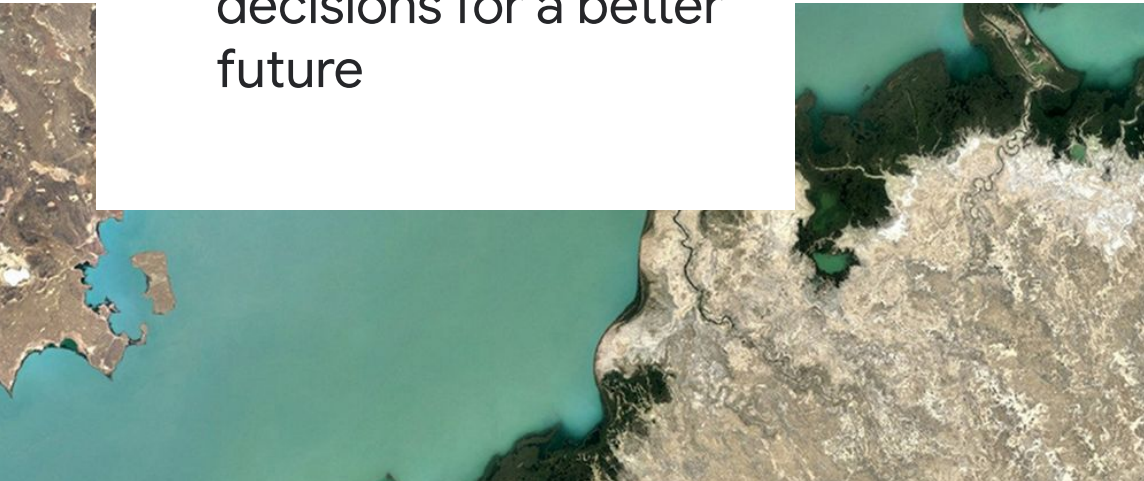


Data-driven innovation



Why data-driven innovation?

Innovation supports smarter business decisions for a better future



Tools to meet your sustainability goals

Empowering users with technology means we can do more for the environment, together.



BigQuery

Cloud Dataflow

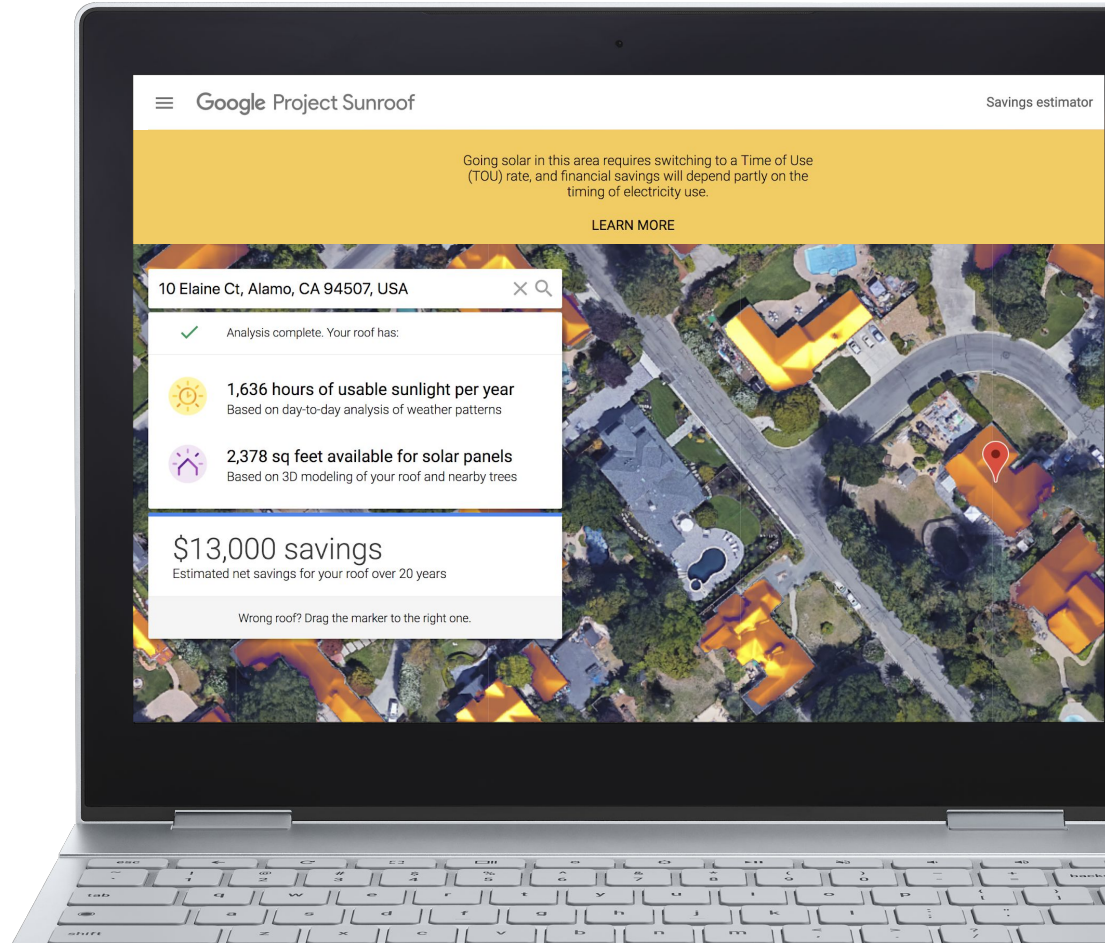
Cloud Storage

Cloud ML Engine

Cloud SQL



Project Sunroof puts Google's expansive data in mapping and computing resources to use, helping estimate renewable rooftop solar energy potential and savings





Migrations make an impact

The move of National Geographic's photo library to GCP reduces emissions by 16,992 kg Co2e per year.



Retail

Use Google BigQuery to analyze large data sets to help forecast demand and reduce inventory waste.



Transport

Use BigQuery and Cloud SQL to carefully manage the data of their fleet in real time to contribute to the decarbonization of the transport sector





Energy & utilities

Use Cloud Data Analytics to offer real-time energy consumption data to energy managers, helping them make decisions that reduce costs and CO2 footprint

e.on

Energies & utilities

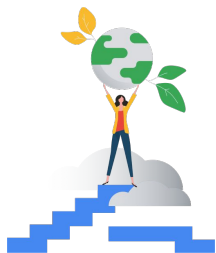
Leveraging Google tools like Google Earth Engine and Project Sunroof to support the development of a global solar estimation tool.



An aerial photograph of a tropical island. The water is a vibrant turquoise color, transitioning to a deeper blue further out. The island itself is a mix of green and brown, indicating lush vegetation and some cleared areas. The overall scene is bright and clear, suggesting a healthy, natural environment.

The business case for sustainability

Business benefits of sustainability



Brand image

Sustainability can be used as a competitive advantage.

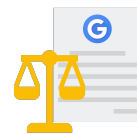
23% of businesses are motivated to become sustainable to gain a competitive advantage



Lower costs

Sustainable business practices lead to less waste and lower costs.

26% of businesses are motivated to become sustainable to improve operational efficiency



Regulation compliance

A sustainability strategy increases ability to comply with regulation

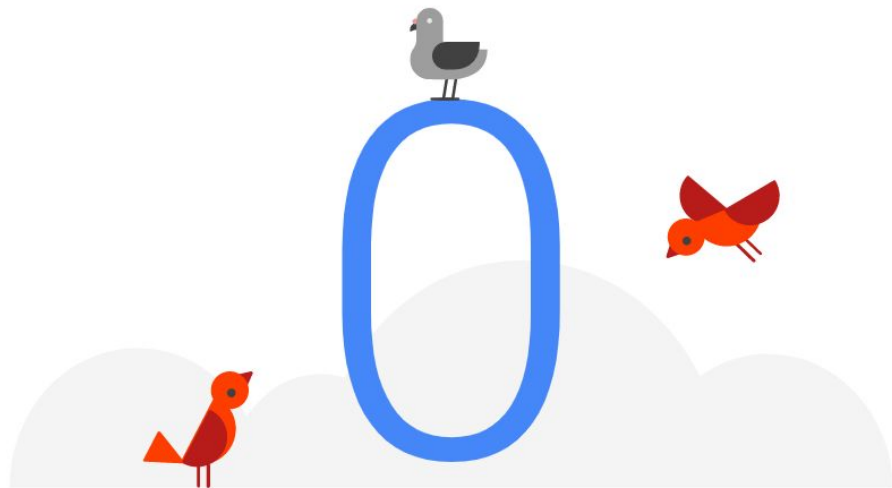
24% of businesses are motivated to become sustainable to meet regulatory standards



Attract employees

Both employees and investors can favour sustainable companies

19% of your peers are using sustainability credentials to attract and retain top talent



Compute Emissions

Industry leading efficiency

Because of our energy efficiency efforts, our cloud is better for the environment. By moving compute from a self managed data center or colocation facility to GCP, the net emissions directly associated with your company's compute and data storage will be zero.

DEC 2020 / DATA CENTERS AND INFRASTRUCTURE

Cleaner data centers, batteries included



DEC 2020 / GOOGLE IN EUROPE

Our data centers support Europe's green economic recovery

DEC 2020 / DATA CENTERS AND INFRASTRUCTURE

A new podcast explores the unseen world of data centers



NOV 2020 / GOOGLE NEWS INITIATIVE

Introducing Google News Initiative Conversations



NOV 2020 / SUSTAINABILITY

Creating new tree shade with the power of AI and aerial imagery



NOV 2020 / SUSTAINABILITY



<https://blog.google/outreach-initiatives/sustainability/>



Thank you