

24/7 Carbon-Free Energy by 2030

Accelerating the transition to a carbon-free future

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Google

OCP Tech Talk
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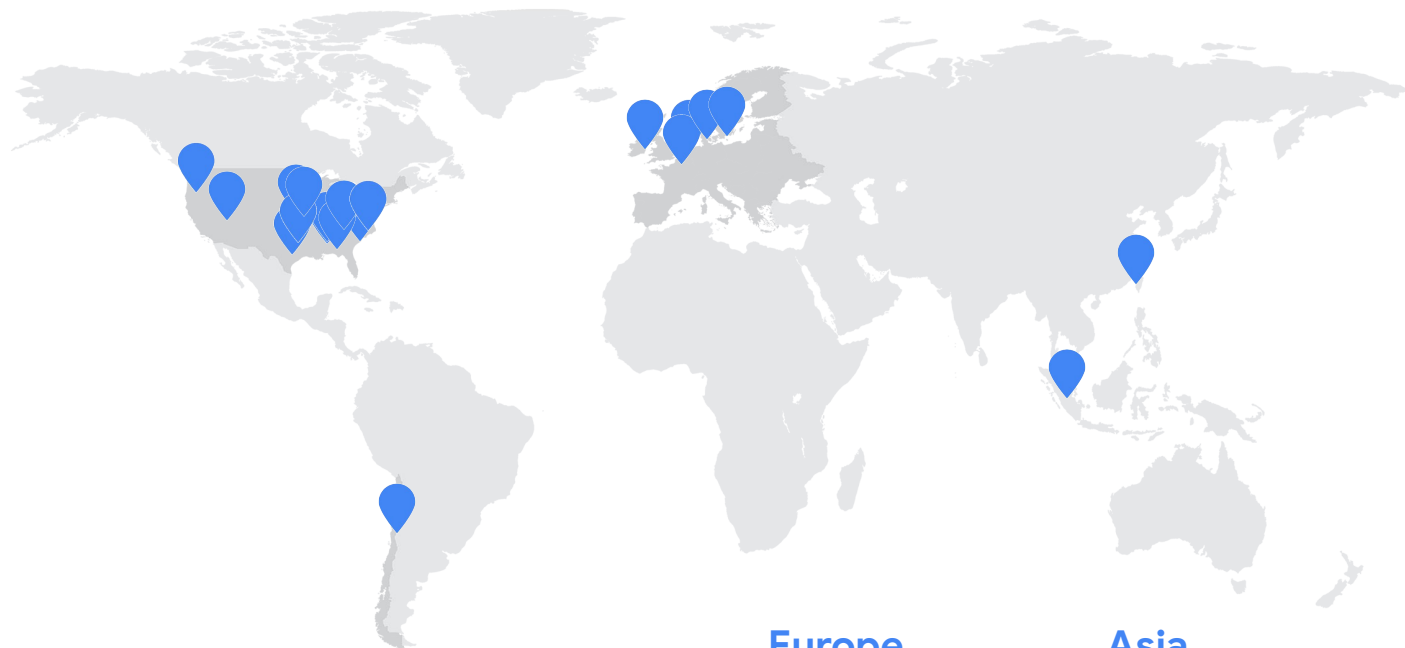


21

locations for
owned and
operated
data centers

4

continents



Americas

Berkeley County, South Carolina
Council Bluffs, Iowa
The Dalles, Oregon
Douglas County, Georgia
Henderson, Nevada

Jackson County, Alabama
Lenoir, North Carolina
Loudoun County, Virginia
Mayes County, Oklahoma
Midlothian, Texas

Montgomery
County, Tennessee
New Albany, Ohio
Papillion, Nebraska
Quilicura, Chile

Europe

Dublin, Ireland
Eemshaven, Netherlands
Fredericia, Denmark
Hamina, Finland
St Ghislain, Belgium

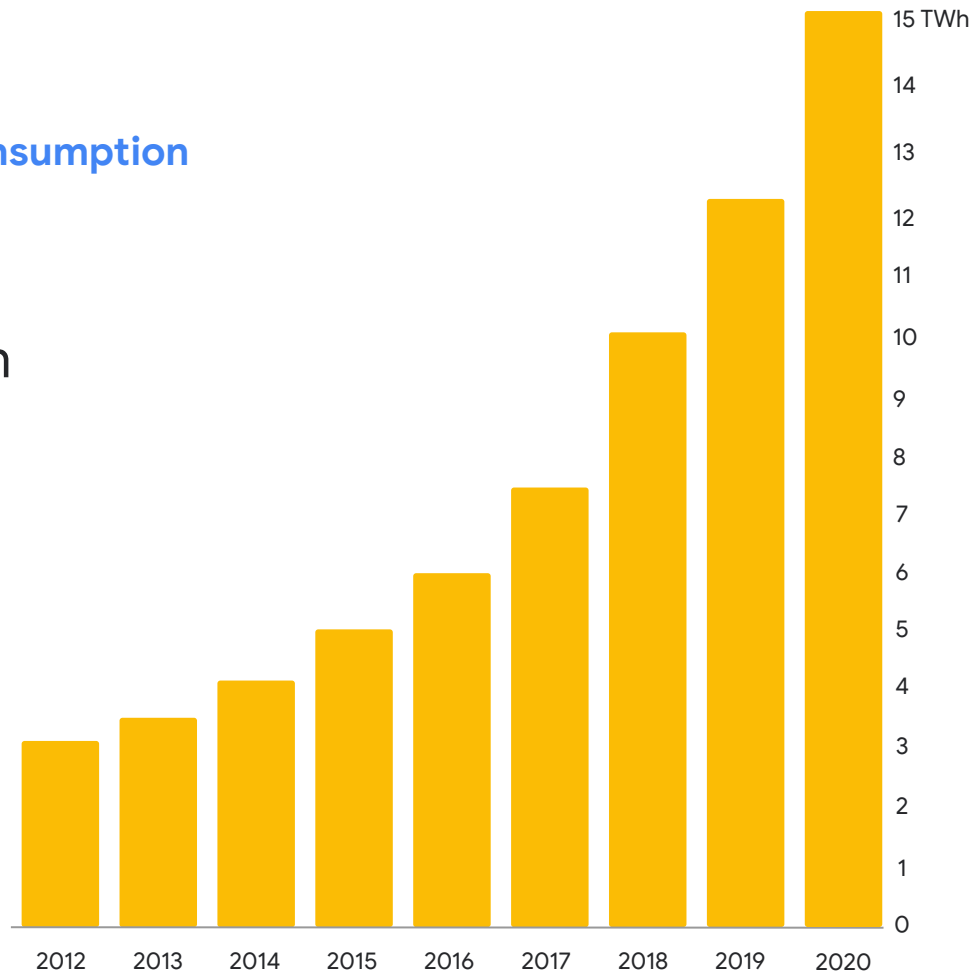
Asia

Changhua County, Taiwan
Singapore

Google's annual electricity consumption

Demand for our services
is growing every year,
driving continued growth
in our energy use

● Total electricity consumption (TWh)



Source: Google Internal Data

Google

Google's energy journey

Since 2007



Carbon Neutrality

Compensating for operational emissions

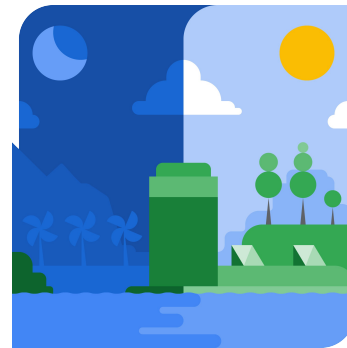
Since 2017



100% Renewable Energy

Reducing emissions

By 2030

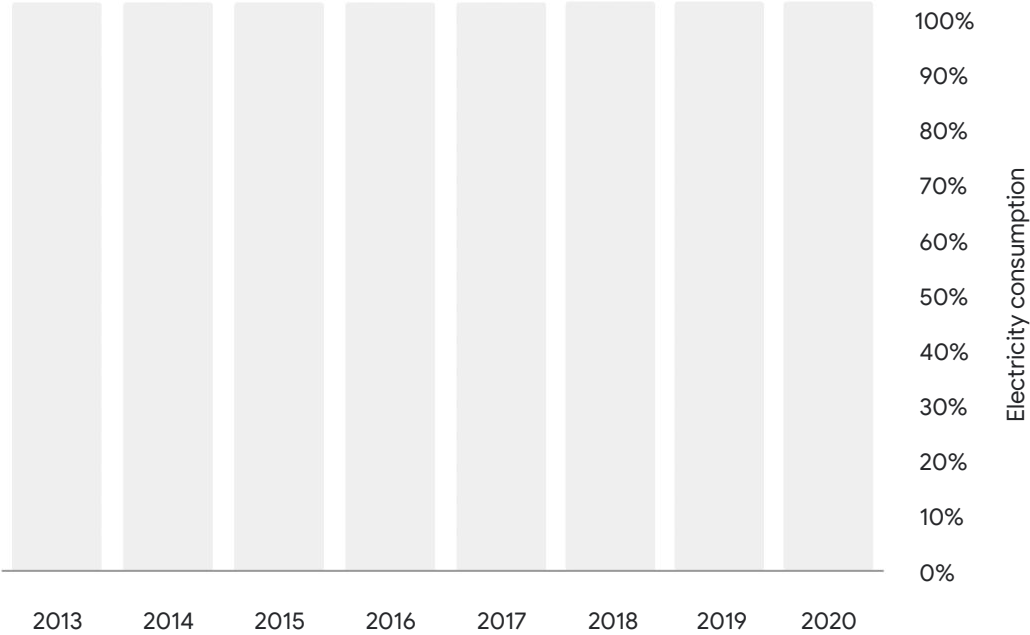


24/7 Carbon-Free Energy

Eliminating electricity emissions

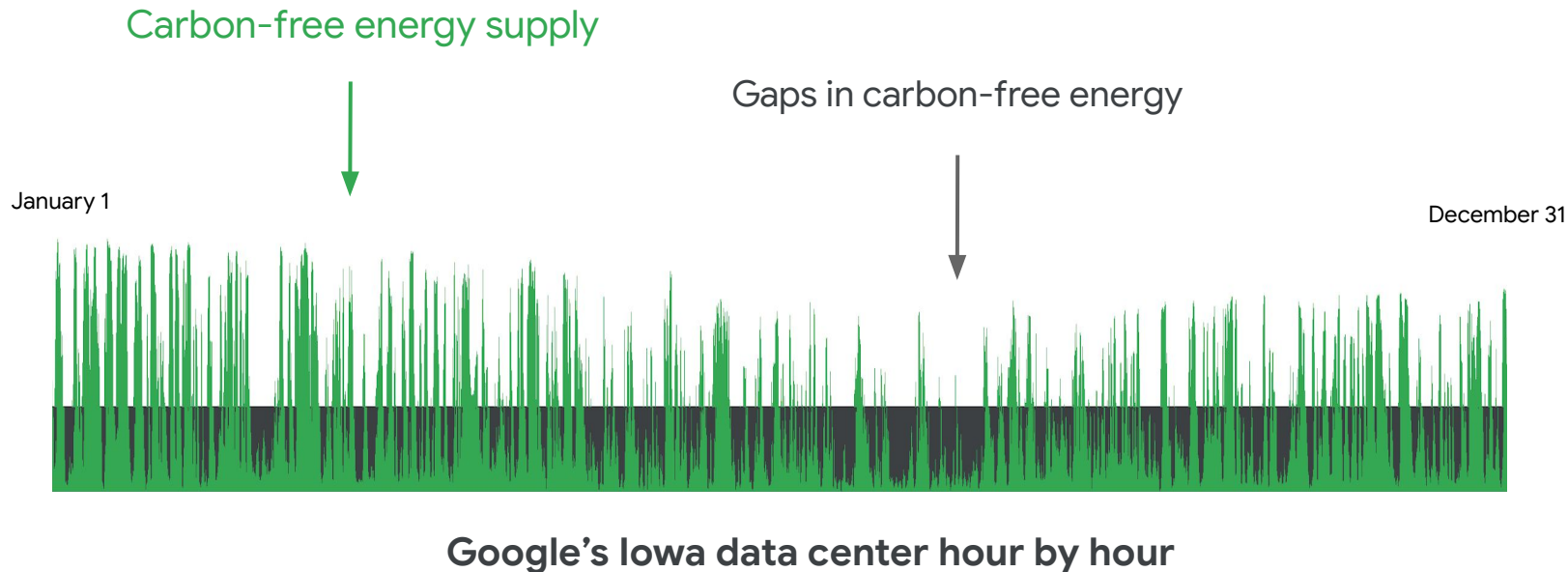
Renewable energy purchasing compared with total electricity use

- Total electricity consumption
- Renewable energy



100% RE does not fundamentally solve the problem

Due to the variability associated with renewables, we still rely heavily on fossil fuels from the grid during periods of low wind or solar



A world map with a green background. Numerous small, semi-transparent green dots are scattered across the map, primarily concentrated in North America, Europe, and Asia, representing Google's global operations. The text "24/7 Carbon-Free Energy" is centered over the map.

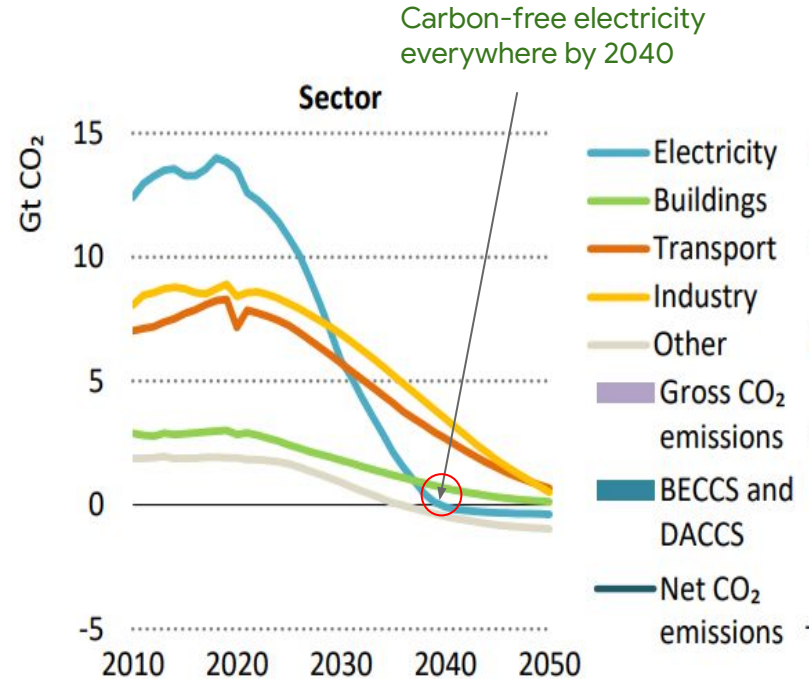
24/7 Carbon-Free Energy

By 2030, we intend to source carbon-free
energy for Google's operations
in all places, at all times

Google

Why is 24/7 carbon-free energy necessary?

To achieve a net-zero emissions global economy, **we must create zero-carbon electricity systems even faster.**



Source: IEA Net Zero by 2050 report, fig. 2.3

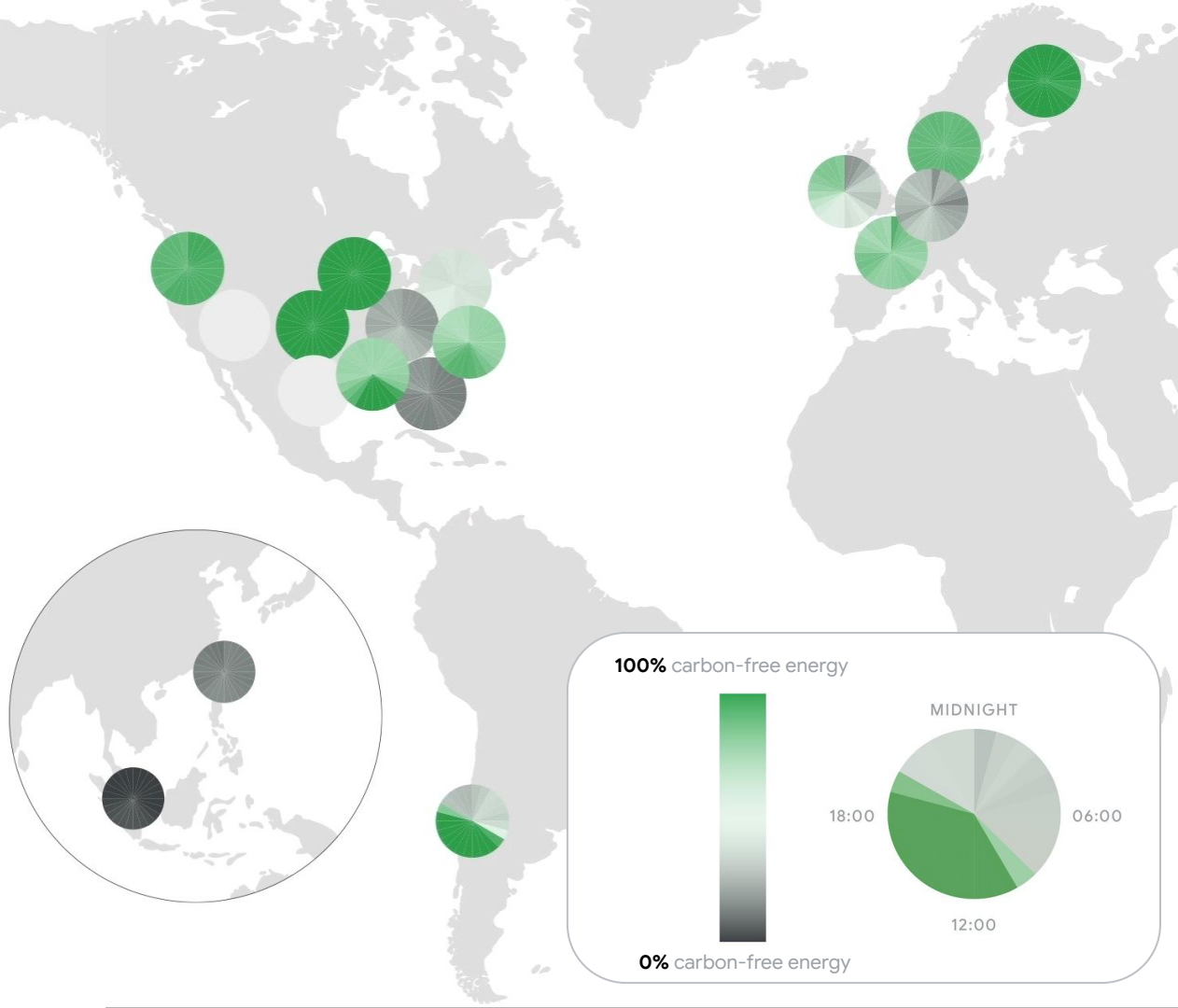
Progress

In 2020, Google reached
67% carbon-free energy
globally on an **hourly basis**.

In the same year, **five of our
data centers** operated at
90% carbon-free energy.

Every hour of Google's carbon-free
energy sourcing in January 2020

January 01, 2020



Program Principles

1. **Time-based Matching:** moving from annual volume-based goal to **hourly** matching of load
2. **Local Procurement:** moving from global matching of demand to **local** (regional grid)
3. **Technology-inclusive:** moving from renewable energy only to **all carbon-free energy** (includes nuclear, carbon capture sequestration (CCS), etc.)
4. **Additionality:** adding new clean energy projects to the grid through procurement, but recognize additionality is a spectrum.
5. **The Grid is the Ultimate Goal:** broader goal of 24/7 CFE is to decarbonize the entire electricity grid



Our Third Decade of Climate Action

24/7 Carbon-Free Energy
by 2030

Our approach



Purchasing: Buy more and different types of clean energy deployed locally



Technology: Accelerate energy technology innovation



Policy: Advocate for policy changes to decarbonize electricity grids



Google

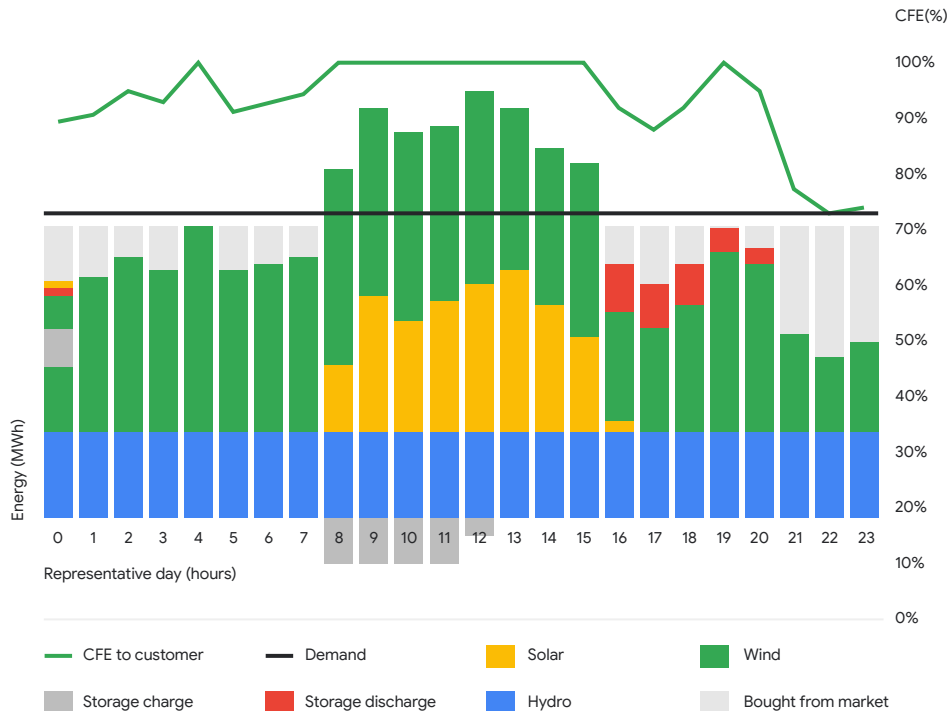
Example: Purchasing

First-of-its-kind energy deal

In May 2021, Google and AES announced a first-of-its-kind supply agreement that will guarantee that Google's data centers in Virginia will operate on **90% carbon-free energy by 2024**.

500 MW

New clean energy portfolio added to PJM electricity grid, comprising wind, solar PV, battery storage, and run of river hydro.



Example: Technology

Next-generation geothermal

Partnership with Fervo Energy to develop “**always-on**” clean energy for Nevada’s electricity grid.

A step taken locally to advance geothermal energy use globally.



Example: Technology

Time-Based Energy Attribute Certificates (T-EACs)

A new and growing system that enables energy consumers to know exactly what kinds of energy are being produced, consumed, and traded on an hourly basis across electricity grids around the world



Example: Policy

Spurring a Global Movement

U.N. 24/7 Carbon-free Energy Compact

A global group of companies, governments, and organizations actively engaged in accelerating the technologies, policies, tools, ideas, and advocacy that will collectively realize 24/7 CFE for all. ~60 signatories and counting.

Clean Energy Buyer's Association

A community of ~300 energy customers and partners committed to achieving a 90% carbon-free U.S. electricity system by 2030.

Momentum: Others Adopting 24/7 CFE goals

U.S. Federal Government, Microsoft, Iron Mountain,
City of Des Moines, +++



⚡ GoCarbonFree247.com



⚡ cebuyers.org

NEWS BRIEF

24/7 Carbon-Free Energy is the New Net-Zero

Des Moines, Iowa, joins Google in aiming for 24/7 carbon-free electricity—a target that necessitates managing energy loads in buildings.

24/7 carbon-free energy
everywhere
all the time
for everyone.

Thank you!

➔ goo.gle/carbonfreeenergy

✉ 24-7cfe@google.com

