Google

Carbon-free Energy Performance at Google Data Centers (2020)

Introduction

As we move toward our goal of 24/7 carbon-free energy by 2030, we're committed to being transparent about progress, areas for improvement, and lessons learned along our journey. In our experience, open access to data and insights can play a key role in accelerating adoption of any transformative technology or advancement. By sharing both our progress and our setbacks, we hope to empower others to fully decarbonize their own operations.

Transitioning electricity grids to provide round-the-clock clean energy will require significant advances in technology, energy procurement, and policy. It will also require collective goal-setting, innovative collaborations across sectors, and the tenacity to overcome long-standing challenges. All of this will benefit from a culture of accountability and data transparency, which is why we're sharing our annual, overall carbon-free energy (CFE) performance for every region, every year.

Comparing our data across 2018, 2019, and today reveals some interesting trends and fluctuations from year to year. We expect this variability will continue in future years, due to the dynamic interplay between new projects coming online, changes in regional grid mixes, and robust demand growth for Google services in different parts of the world.

Every step toward a carbon-free future becomes more difficult the closer we get to our goal of completely decarbonizing Google's operations. The significant gains made in 2020 may not be reflected in future years. But even if our progress is uneven, we'll continue to provide updates and make this data available.

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Highlights from 2020

- Traffic in our data centers grew substantially in 2020, while our carbon-free energy procurement also increased. Globally, 67% of the electricity use at Google data centers was matched with carbon-free energy on an hourly basis, up from 61% in 2019. Calculating this annual, global CFE% is more complex than averaging the numbers in the data table below; to reach this number we consider the scale of electricity use at different data centers along with factors like regional grid CFE. For more detail on how global CFE% is calculated, see our methodology paper.

- In 2020, we were pleased to see that five data centers in North America and Europe had at least 90% of their electricity consumption matched with carbon-free energy on an hourly basis: Fredericia, Denmark; Hamina, Finland; Council Bluffs, Iowa; Mayes County, Oklahoma; and The Dalles, Oregon. We hope to see more data centers hit these high percentages in the coming years, and we'll continue to work to develop solutions for more challenging locations, like those in Asia.

- In 2019, Google announced a historic package of renewable energy projects, many of which came online in 2020. Across the United States and in countries around the world, hundreds of new wind turbines and hundreds of thousands of solar panels started contributing clean energy to electric grids, helping to improve carbon-free energy performance at several data centers.

This year, we're excited to be able to share significant progress toward 24/7 carbon-free energy in so many regions. As we move forward, the data may not show such obvious leaps from one year to the next, but what will be constant from year to year is a committed effort to hit our 2030 target.

Over time, as we develop new technologies, establish transaction models focused on hourly power procurement, and advocate strongly for clean energy policies, we're confident that the pieces will come together for our biggest achievement yet: operating on clean energy, every hour of every day, everywhere.

REGIONAL GRID	LOCATION OF DATA CENTER(S)	2020 GRID CFE %	2020 GOOGLE CFE %
Energy Market Authority of Singapore	Singapore	2%	4%
Taiwan Power Company, Taiwan	Changhua County	18%	18%
Elia, Belgium	St. Ghislain	64%	79%
EirGrid, Ireland	Dublin	42%	42%
Energinet, Denmark	Fredericia	83%	90%
Fingrid, Finland	Hamina	83%	94%
Tennet, Netherlands	Eemshaven	30%	60%
Sistema Interconectado Central, Chile	Quilicura	43%	65%
Midcontinent Independent System Operator (MISO), U.S.	Council Bluffs, IA	32%	93%
Southwest Power Pool (SPP), U.S.	Mayes County, OK	43%	92%
Pennsylvania, Jersey, Maryland Power Pool (PJM), U.S.	Loudoun County, VA New Albany, OH	41%	63%
South Carolina Public Service Authority (Santee Cooper), U.S.	Berkeley County, SC	27%	27%
Southern Company (SOCO), U.S.	Douglas County, GA	30%	42%

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Tennessee Valley Authority (TVA), U.S.	Jackson County, AL Montgomery County, TN	57%	70%
Duke Energy Carolinas (DEC), U.S.	Lenoir, NC	62%	67%
Bonneville Power Administration (BPA), U.S.	The Dalles, OR	90%	90%
Electric Reliability Council of Texas (ERCOT), U.S.	Midlothian, TX	37%	37%
Nevada Energy (NVE), U.S.	Henderson, NV	19%	19%