Google

24/7 by 2030: Realizing a Carbon-free Future

Introduction

Electricity is the fuel that enables Google to serve our billions of users' needs, around the world and around the clock. Yet in many places the energy we use is still produced in ways that result in carbon emissions. That's why we've long strived to lead the way to a carbon-free future.

We started in 2007 by going carbon neutral, setting a standard that many have since adopted as a first step to compensate for their operational emissions. A decade later, with new tools at our disposal, we took another leap forward by becoming the first major company to match 100% of our annual electricity consumption with renewable sources. Today, Google is the world's largest corporate purchaser of clean energy; all told, we've brought more than 5.5 gigawatts of new wind and solar to communities from Astoria, South Dakota, to Tainan City, Taiwan.[1]

And now, building on what we've learned and helped create, we're excited to share that we're embarking on the final and most ambitious phase of our energy journey: **by 2030, Google intends to run on carbon-free energy everywhere, at all times.**

Currently, even though we buy as much total renewable energy as we use electricity each year, we must still contend with times and places when the wind does not blow or the sun does not shine. During those hours, our data centers often have to rely on carbon-emitting resources such as coal and gas power plants. Achieving 24/7 carbon-free energy means we will have clean energy available for every hour on every grid—completely eliminating carbon emissions associated with Google's electricity use. By taking on this

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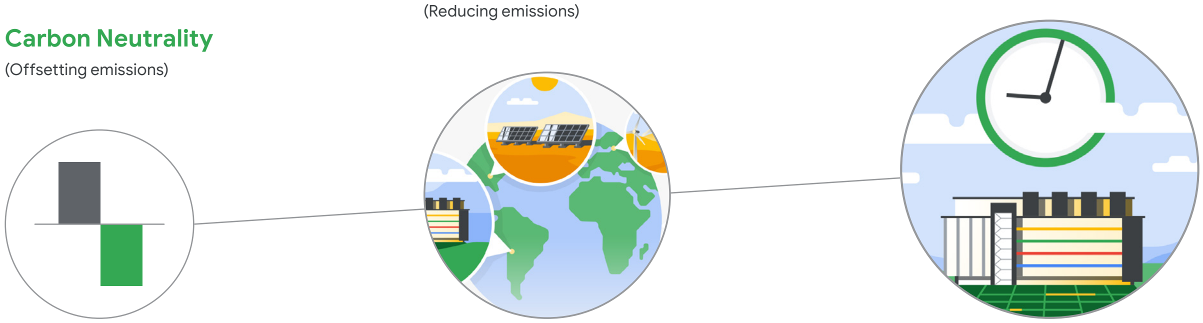
FIG. 1

Google's energy journey

Carbon Neutrality
(Offsetting emissions)

100% Renewable Energy
(Reducing emissions)

24/7 Carbon-free Energy
(Eliminating emissions)



Since 2007

Google has purchased enough high-quality carbon offsets and renewable energy to bring our net operational emissions to zero.

Since 2017

Google has matched its global, annual electricity use with wind and solar purchases. However, our facilities still rely on carbon-based power in some places and times.

By 2030

Google intends to match its operational electricity use with nearby (on the same regional grid) carbon-free energy sources in every hour of every year.

challenge in our operations, we aim to prove that a carbon-free future is both possible and achievable fast enough to prevent the most dangerous impacts of climate change.[2]

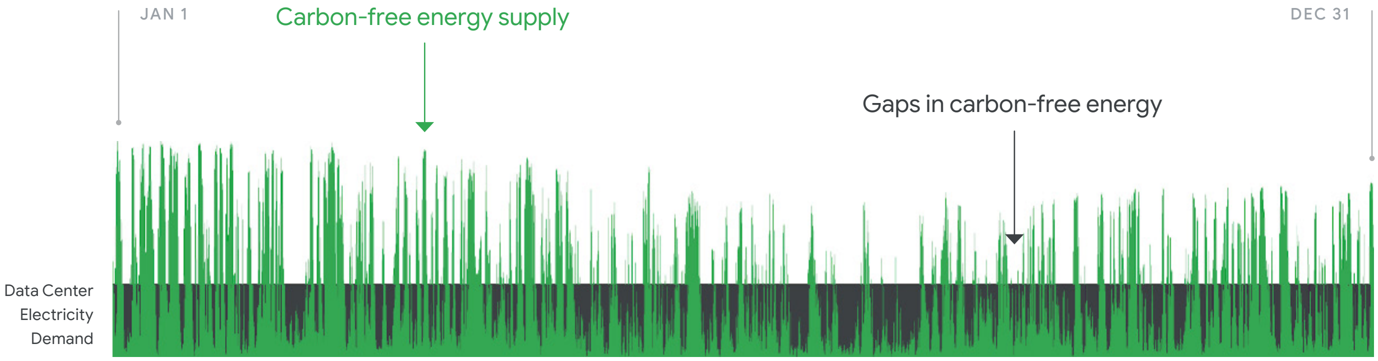
We don't make this commitment lightly: even in 2018, when we first shared our 24/7 carbon-free aspiration in a discussion paper, we couldn't put a firm date to our goal. But we have continued to make rapid progress on clean electricity, and a sea change is underway in the global energy system. For the first time, we're confident we'll soon be able to serve our users in a way that doesn't produce carbon emissions.

This is not to say the road ahead will be easy. While we know full-scale decarbonization is necessary to address climate change, there are numerous reasons no other company has yet taken on the task: 1) wind and solar are inherently variable, 2) some regions have limited resources (e.g. land, wind, or sunshine), 3) policy and market mechanisms to transact for clean energy are still limited, and 4)

FIG. 2

Hourly carbon-free energy performance at an example data center

While Google buys large amounts of wind and solar power (symbolized by green spikes below), these resources are variable, meaning that our data centers still sometimes rely on carbon-based resources.



most next-generation technologies beyond renewables are still too costly for large-scale deployment. These obstacles make achieving 24/7 carbon-free energy challenging, particularly at some of our sites in Asia, but we believe that with meaningful progress in these areas, we can be successful.

Reaching our goal will require a systemic approach. We'll need to transform Google's operations, and also help accelerate a just transition to clean energy across entire grids where we operate. We'll need to accelerate development of new technologies, invent new approaches to transacting for clean energy, and advocate for smart policy. Above all, we'll need to work with others. Google will only be able to reach 24/7 carbon-free energy in partnership with governments and industry, our customers, and the communities in which we operate.

By the same token, we're committed to working toward our goal in ways that break down barriers and create opportunities for others to take action on climate and clean energy. Ultimately, we want to hasten the arrival of a world in which everyone has access to affordable, clean power that doesn't contribute to climate change or harm communities with air pollution.

In our 2018 discussion paper, we established a framework for measuring carbon-free performance at Google data centers; explored examples from specific facilities; and offered initial insights about how we might achieve 24/7 carbon-free energy. This paper provides an update on three aspects of our energy efforts:

1. Google's first global assessment of carbon-free performance across all of our data center sites

2. Our rationale for setting a 2030 target for achieving carbon-free energy

3. Our roadmap for how we plan to use technology, transactions, and policy to achieve this ambitious goal

Measuring Progress Toward 24/7 Carbon-free Energy

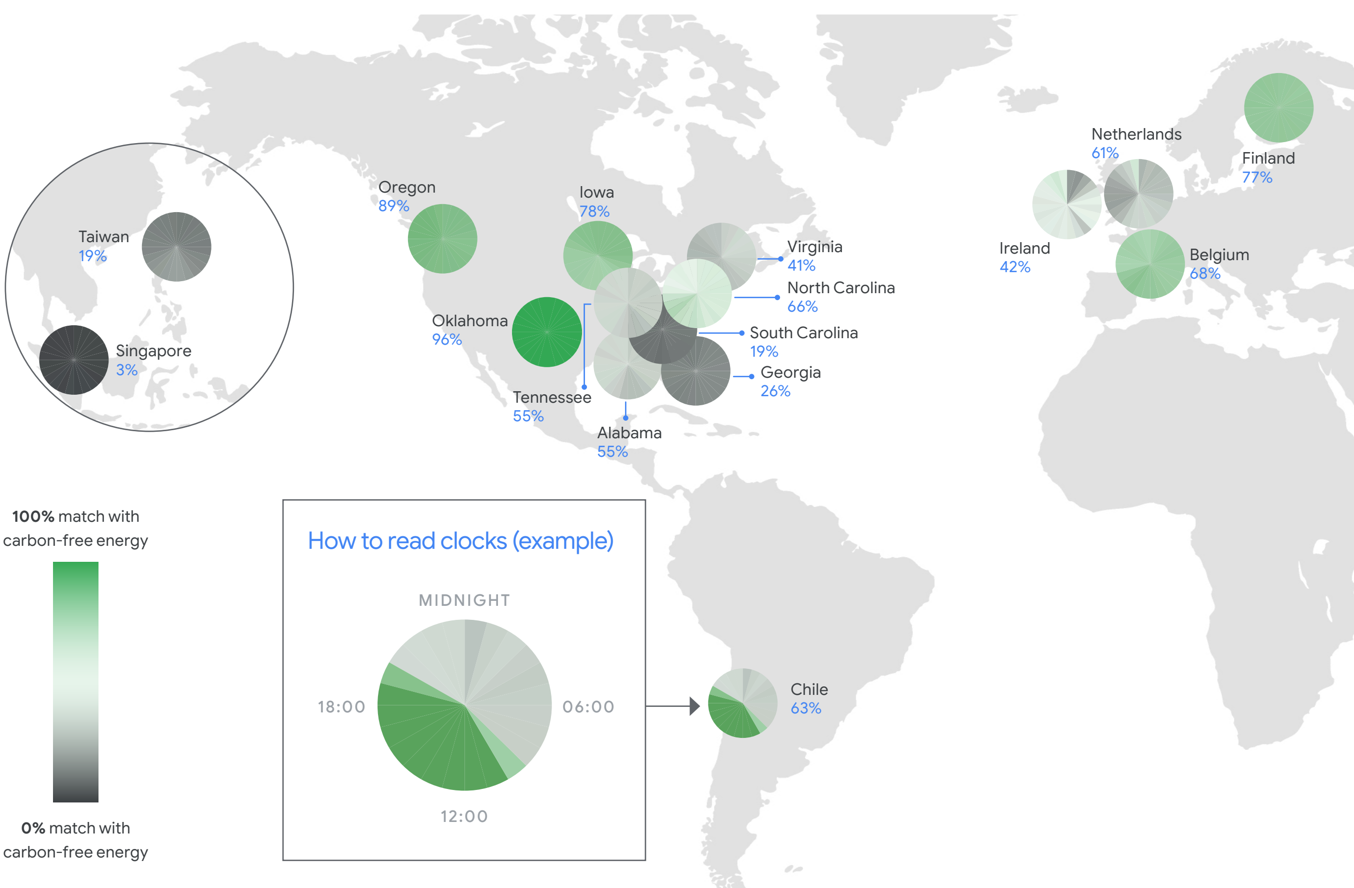
As we began to investigate pathways to 24/7 carbon-free energy, one of the first steps we took was to examine the energy supply at individual Google data centers. We published a look at this data in our 2018 paper, in the form of "carbon heat maps" that make it easy to visualize carbon-free energy at Google facilities across every hour (8,760 in total) in a year. But heat maps and the data behind them were just a first step. We've since been hard at work gathering information to help us better measure Google's progress on a global level and chart the fastest course to our goal.

We've been struck along the way by how hard it is to access even basic information on the world's electric grids. Flip on a light switch in many regions today, and you'll have no way of knowing what mix of technologies produces the electricity you use—or how much carbon is emitted as a result. Working with our partners, Tomorrow[3] and WattTime, Google built a data pipeline that enabled us to overcome this barrier. We then assembled the following data for every hour in every Google data center worldwide: 1) our contracted clean energy production on the grid where we operate, 2) the resource mix of the grid where we operate, and 3) our consumption.[4] Aggregating these hundreds of thousands of data points, we were able to compile the following assessment of our worldwide operations.

FIG. 3

Hourly carbon clocks for a September day

Average annual carbon-free energy performance (numbers in blue) at Google data centers in 2019 ranged from 3% in Singapore to 96% in Oklahoma. Carbon clocks show hourly carbon-free energy performance at each Google data center on September 14, 2019—one year prior to the publication of this paper.



Although we matched 100% of our global, annual electricity consumption with renewable energy in 2019, on an hourly basis 61% of all the electricity we used was matched with regional, carbon-free sources. Without Google's purchases of renewable energy this figure would have only been 39%, equivalent to the existing "grid mix" in regions where we operate.[5] However, these global averages mask significant differences both day-to-day and across sites (see Figure 3). In Singapore, most grid electricity comes from natural gas, and our data center was only matched with 3% carbon-free energy. In breezy Oklahoma, on the other hand, our purchases of wind power helped drive carbon-free energy performance at our data center to 96%. For detailed figures by site, see the Appendix.

Our portfolio review also yielded information necessary to develop forward-looking models for each of Google's regional grids and data centers. Each model takes into account global trends; local conditions (e.g. renewable resources, existing policies, and market structures); and actions Google can take to accelerate clean energy progress.

As a whole, our projections tell a hopeful story: Google can achieve 24/7 carbon-free energy far faster than we would have once imagined. Crucially, we also believe we can reach our goal in a cost-effective manner, meaning other companies could quickly follow suit.

Setting Google's 2030 Target

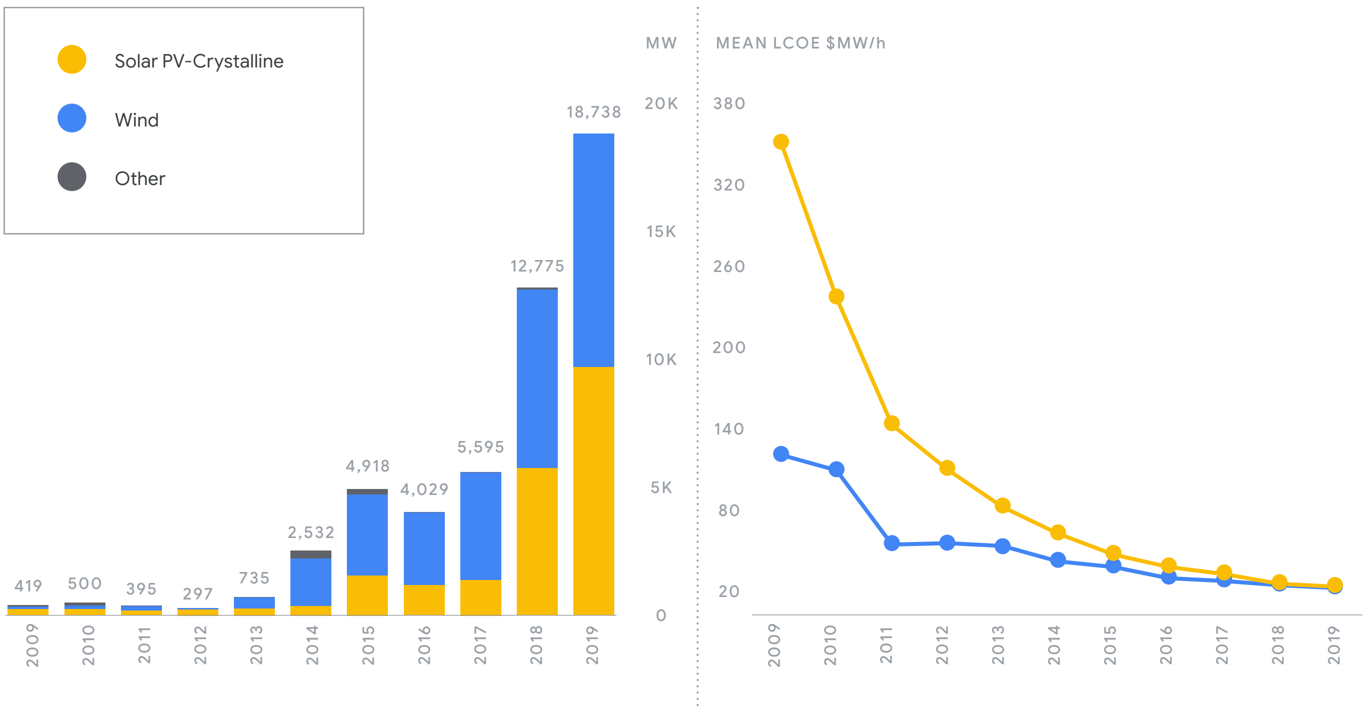
So why do we think Google can achieve 24/7 carbon-free energy in our operations by 2030? The short answer is: clean energy has come so far, so fast in recent years that it's now possible to envision a new paradigm. Google and many others have laid a foundation that will enable rapid progress in the years ahead.

A major shift in energy production technology plays a big part in this story. From 2009 to 2019, costs for wind and solar power declined by 70% and 89%, respectively, such that the two technologies are

FIG. 4A & 4B

Corporate renewable energy procurement is booming as wind and solar prices fall

Corporate renewable energy purchases (MW) and technology costs since 2009[7]



outcompeting carbon-based resources in an increasing number of markets. In turn, corporations bought 65 times more renewable energy last year than a decade before (see Figure 4A & 4B). For those that follow the industry, it sometimes seems like clean energy reaches a new milestone every day. In the U.S., renewables this year will produce more electricity than coal for the first time. And in Denmark, which is not known for its sunny skies, Google recently agreed to buy power from the country's first subsidy-free solar farms. Because these new projects will complement abundant wind power already on the Danish grid, our forecast suggests that our new data center there will be one of our highest performing sites in terms of carbon-free energy—from the very start.[6]

Other kinds of carbon-free technologies are finally coming to fruition, as well—and many have seen dramatic increases in funding in recent years. Utility-scale batteries, in particular, are ready for primetime (prices for storage capacity declined 76% between 2012 and 2019), while demand response programs are becoming increasingly common (Google Nest users in many utility regions can now earn rewards by choosing to automatically reduce their air conditioning use during "rush hours" on the grid). Meanwhile, a number of emergent technologies—e.g. advanced nuclear, enhanced geothermal, low-impact hydro, long-duration storage, green hydrogen, and carbon capture and storage—appear to be making good progress. Combined, these trends mean that carbon-based resources are simply no longer necessary to compensate for the variability of renewables, and true round-the-clock clean energy is achievable. In fact, alternative approaches to using clean energy for grid balancing are already succeeding commercially and at scale.[8]

New policies and transactional models are also speeding the transition to cleaner grids. For example, well-organized regional energy markets, like Regional Transmission Organizations in the United States or Nord Pool in Europe, have helped grid operators integrate variable renewables and lowered consumer electricity costs. At the same time, reverse auctions have enabled governments to procure clean power at greater scales and lower prices than ever before (in 2019, Google published a case study that details how we adopted this approach to complete the largest-ever corporate purchase of clean power). Finally, utilities are developing programs or entering into partnerships that make it simpler for a broader array of energy users to purchase renewable power.

Another indicator for how the paradigm is shifting is the growing number of governments and power providers targeting a clean electric system. In the U.S., 17 utilities and several states have committed to achieving 100% clean electricity or a similar goal by 2050. In Europe, deep decarbonization legislation is now commonplace; Denmark, Finland, the Netherlands, and Ireland all plan to source more than 50% of their electricity from renewable

FIG. 5

Renewable energy in land-constrained regions

We're taking creative steps to bring new renewable energy to grids everywhere we operate. In Taiwan (left), we'll buy power from 40,000 panels elevated over fishing ponds, while in Singapore (right) we recently agreed to purchase electricity from close to 500 public housing buildings with rooftop solar installations. However, achieving carbon-free energy at scale in these and other land-constrained regions will ultimately require deploying new solutions, such as long-distance transmission lines or next-generation high capacity factor technologies.

sources by 2030. Moreover, research suggests ambitious energy policy can have huge economic benefits. A recent study found that decarbonizing the U.S. electricity system by 2035 would create 500,000 jobs every year, save $1.2 trillion in avoided health and environmental costs, and lower electricity costs by 13%. While Google's goal is the first of its kind in our industry, and uniquely aggressive in terms of timeline, many are joining us in imagining—and building—a carbon-free future.

None of this is to say we won't have to overcome obstacles on the way to our goal—and of course we're already closer to 24/7 carbon-free energy in some places than in others. Land-constrained regions such as Singapore and Taiwan (see Figure 5) present unique challenges because wind and solar require significant amounts of usable land to scale relative to our data center demand. In other places, energy policies hinder rather than favor renewable development, even when relying on carbon-based energy is economically unsound. For instance, the Southeastern U.S. lacks an organized market, which has created unnecessary costs and significantly slowed deployment of clean energy relative to other parts of the country.[9]

However, on balance, our analysis provides reason for optimism. The world is poised to transition to carbon-free energy, though doing so at the speed demanded by climate change will require concerted effort. In the next section, we lay out a roadmap for how we plan to move toward 24/7 carbon-free energy in Google's operations in a way that helps drive progress for all.

A Roadmap to 24/7 Carbon-free Energy

To achieve 24/7 carbon-free energy in Google's operations, we'll need to 1) advance new approaches for procuring clean energy, 2) drive progress in next-generation technologies, and 3) work with partners to advocate for smart public policy. As we did with 100% renewable energy, we'll strive to move toward our goal in a way that creates opportunities for others and accelerates a global energy transition.

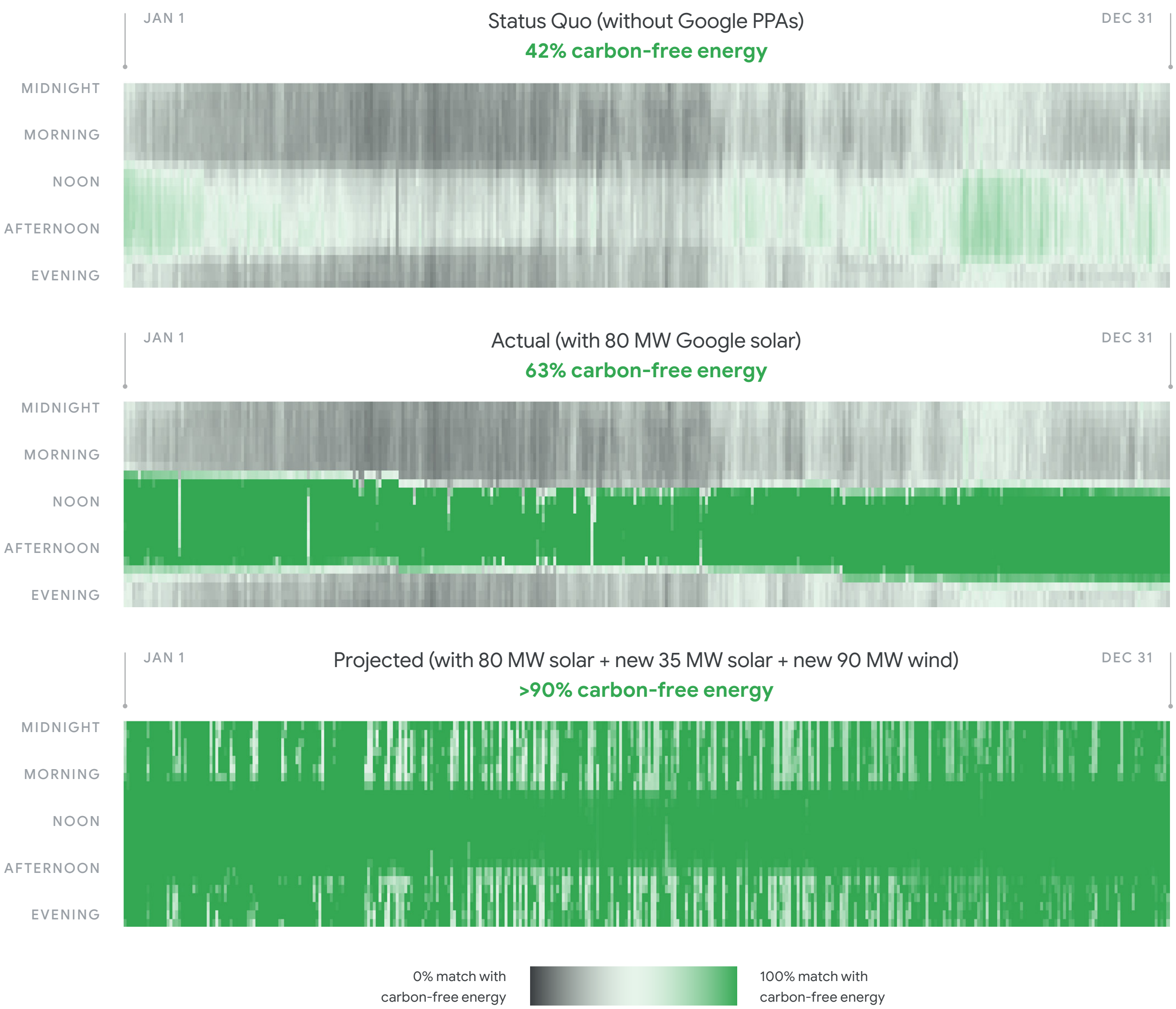
Developing new approaches for buying clean energy

In 2010, Google signed its first Power Purchase Agreement (PPA) for electricity from an Iowa wind farm, helping to popularize a tool that has since become a mainstay for companies that purchase renewable energy. Yet as important as traditional PPAs have been and will continue to be, they also have limitations. We can break down barriers that prevent Google and others from buying clean

FIG. 6

Impact of combining carbon-free technologies

Without Google's renewables purchases, just under half our energy use in Chile would be matched with carbon-free sources on an hourly basis (top). By signing an 80 MW solar PPA in 2015, we boosted our performance, matching 63% of our data center consumption with carbon-free electricity on an hourly basis (middle) in 2019. Because the wind blows at different times than the sun shines, our most recent, blended purchase (35 MW solar + 90 MW wind) will fill in gaps in our carbon-free energy supply, helping us match our data center with more than 90% carbon-free energy on an hourly basis (bottom).



energy by developing new transactional approaches, such as: 1) moving from single-source PPAs to multi-source and multi-technology blended PPAs, 2) creating utility programs to enable broader access to affordable clean energy, and 3) developing new models where multiple users can share clean energy assets.

Buying power from a diversity of technologies is one way Google can fill gaps in our carbon-free energy supply. In Chile last year, we agreed to purchase electricity from both a new 90 MW wind farm and a new 35 MW solar facility (see Figure 6). Because the sun generally shines at different times than the wind blows, the two projects will complement each other and help us move closer to round-the-clock carbon-free energy. In the future, we expect to sign more blended resource deals as the industry develops technologies with differing production profiles.

We are also continuing to seek out and work with our utility partners to create clean energy programs. Google began executing PPAs as a workaround: at the time, most utilities simply didn't offer renewable energy options. However, since then, we've helped design programs in several U.S. states that enable businesses to buy wind and solar energy through their power provider. Crucially, these programs increase clean energy access for other consumers beyond Google. Going forward, we'll seek out additional approaches that enable access to carbon-free power for all who desire it, not just those with the resources to navigate the complexity of PPAs.

Finally, as Google moves toward round-the-clock clean energy, we'll have opportunities to pursue entirely new kinds of partnerships with utilities. In Nevada, for instance, we're collaborating with our prospective power provider, NV Energy, to create one of the largest-ever solar-plus-storage projects. Google will purchase battery capacity to better match our future data center with carbon-free energy. But the utility will share use of the battery, meaning that the new resource will be used to its fullest extent to benefit the overall grid. In general, one of the advantages of moving from 100% renewable energy matching to 24/7 carbon-free energy is that the latter goal better aligns the interests of consumers and utilities.

Rather than simply adding renewable energy to grids, Google will need to do what utilities do: find ways to balance production and load in a single region at all hours of a year. This common challenge creates opportunities for collaboration.

Driving technology innovation

Wind and solar power have played a critical role in enabling Google's energy progress, but the variability of these resources means we'll need to improve and diversify our technology toolkit to reach 24/7 carbon-free power. We can drive progress that enables us to meet our goal and helps scale clean energy more generally by: 1) optimizing existing energy production technologies, 2) helping to accelerate commercialization of next-generation resources, and 3) developing smart solutions for managing electricity demand.

A key first step for decarbonizing grids as fast as possible will be to make existing technologies more useful—and our early efforts in this area have yielded promising results. Recently, Google and DeepMind developed a machine learning system that predicts power output from wind farms 36 hours in advance. Because energy sources that can be scheduled (i.e. deliver a set amount of electricity at a set time) are often more valuable to grids, the predictive algorithm has boosted the value of power produced by Google wind projects in the Midwest by up to 20%. Our hope is that this kind of approach can bolster wind power's business case and drive adoption of carbon-free energy around the world.

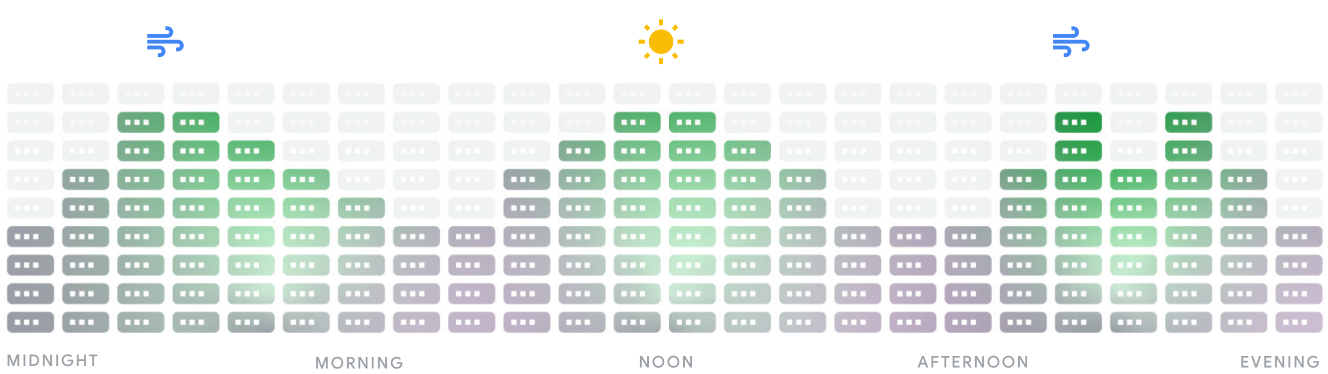
However, renewables can only do so much; decarbonizing Google's electricity supply will also require deploying entirely new kinds of energy production and storage technologies. Near-term, this means we'll scale our purchasing of battery capacity, but batteries are not themselves a panacea. To reach our goal in locations with limited land or renewable resources, or to address seasonal variations in wind or sunshine, we'll explore opportunities to source power from emerging tools, such as advanced nuclear, enhanced geothermal, green hydrogen, long-duration storage, or carbon capture and storage technologies. By seeking to be an early adopter for these and other new technologies, Google can do what we helped do for wind and solar power: accelerate learning curves, drive down costs, and democratize access to tools the world urgently needs to address climate change.

On the opposite side of the grid, we can more intelligently manage Google's electricity demand. Our new carbon-intelligent computing platform shifts certain, non-urgent jobs at Google data centers to times when low-carbon power sources, like wind and solar, are most abundant on regional grids (see Figure 7). In the future, we expect to expand the program to also shift computing work across different data center sites, enabling alignment with carbon-free resources in two dimensions. And because carbon-intelligent computing requires no new hardware and reduces energy costs, the solution should find wide applications across a variety of industries.

FIG. 7

Aligning compute load with carbon-free energy

Google's carbon-intelligent computing platform shifts flexible loads to times when wind and solar are abundant on the grid.



Advancing public policy

As we survey the global landscape of markets where Google operates, one thing is abundantly clear: policy is essential to accelerating the transition to a decarbonized electricity system. That's why, as we target 24/7 carbon-free energy, we'll work with partners across every sector to advocate for government action that 1) supports carbon-free technology development and deployment, 2) advances smarter energy markets, and 3) empowers energy consumers.

Google has already played a key role in advancing policies that accelerate clean energy technology deployment. In Taiwan, for instance, we worked with our utility partners and other stakeholders to support an amendment to the Taiwan Electricity Act, which made it possible for any organization to directly contract for renewable energy. The change enabled Google's first Taiwanese solar project, as well as other projects that have since been carried out by other companies—including the world's largest-ever PPA for wind power. We'll continue to support policies that drive rapid deployment of clean energy, help commercialize next-generation technologies, and speed retirement of carbon-based resources. Additionally, we'll fund important research that charts pathways to decarbonization on grids around the world.

Looking beyond technology, we'll advocate for organized regional energy markets and more interconnected regional grids. Across our global portfolio, Google operates in a range of market types, from fully deregulated energy markets to regions serviced by a single, vertically integrated utility. Our experience (and an independent body of research) suggests that competitive energy markets, operating within regionally integrated transmission systems, have the most potential to drive clean energy forward while lowering consumer electric bills.[10] We'll continue to back policies that create and expand these kinds of markets.

Finally, we'll do all we can to empower energy consumers with more choice and control. Google played a key role in launching two coalitions focused on expanding clean energy access—the Renewable Energy Buyers Alliance in the U.S. and the Re-Source Platform in Europe—and we know from our work with these groups that we're far from alone in our ambition. We look forward to working with our partners to make it easy for any organization, large or small, to choose carbon-free energy.

Working Together to Build a Carbon-free Economy

It was once hard to imagine a world powered entirely by carbon-free energy, but that's no longer the case. Google has billions of users around the globe; last year, we used more electricity than the state of Hawaii. The fact that we can target carbon-free power in our operations by 2030 is a sign of how incredibly far clean energy has come. The time for full-scale decarbonization of the planet's electric grids has arrived—and we must seize it.

Starting with our data centers, and then moving on to our office campuses, we aim to bring clean energy to Google's operations in a way that eliminates our emissions and accelerates a global energy transition. If you're a technologist, policymaker, utility leader, or just someone with a good idea, we want to work with you to reimagine the way the world produces and uses electricity. Our ultimate vision is a future where everyone can access affordable, round-the-clock, carbon-free energy.

Realizing this vision as soon as possible is imperative for addressing climate change. At the same time, the carbon-free energy transition will result in hundreds of thousands of new jobs and drastically reduce air pollution health impacts in communities that have borne the brunt of the fossil fuel economy for too long. Make no mistake: while building an energy system that doesn't include fossil fuels is a daunting challenge, it's also an epic opportunity—a once-in-history chance to fundamentally reshape the world's energy systems for the better.

Google will continue to lead the way toward a clean energy future in our own operations, but to create broader change we need your help. Let's work together and make a carbon-free economy a reality, this decade. The planet can't wait any longer.

Notes

1. To ensure that Google is the driver for bringing new clean energy onto the grid, we insist that all projects we buy electricity from be "additional." This means that we seek to purchase energy from not yet constructed generation facilities that will be built above and beyond what's required by existing energy regulations.

2. Google remains unwavering in our commitment to the United Nations Framework Convention on Climate Change's 2015 Paris Agreement, which targets aggressive global emission reductions by 2030 "in order to keep global temperature rise this century well below 2°C above pre-industrial levels."

3. Based on data from the electricityMap platform.

4. In calculating a data center's hourly match with regional carbon-free energy (CFE), we first count Google's renewable Power Purchase Agreements (PPAs). We do this because we have a contractual right to that electricity production and its environmental attributes, and our PPAs have directly led to the addition of that carbon-free energy to the grid (see our discussion of "additionality").

5. Google typically defines regional grid mix as encompassing all generating resources under a given balancing authority, including resources that might be under contract by specific parties via PPAs. While we recognize this can lead to double-counting issues, there is currently no consistent data available to help us evaluate residual mix across our global portfolio. We will update our methodology when this level of granularity is reached. Regional grid CFE includes wind, solar, geothermal, biomass, nuclear, hydropower, and pumped storage or battery storage discharge.

The regional grid CFE % is based on the hourly consumption mix in the region as provided by the company Tomorrow. The annual grid CFE % is weighted by hourly data center load.

6. Google will begin reporting CFE performance for our Danish data center in our next update.

7. Corporate purchasing figures are from BloombergNEF. Technology cost curves are from Lazard's Levelized Cost of Energy Analysis (Version 13).

8. For example, the Hornsdale Power Reserve (until recently the world's largest lithium-ion battery) has enabled unprecedented grid resilience and renewables integration in South Australia, while also creating opportunities for its owners to profit from energy arbitrage. The facility is now being expanded and numerous other big battery projects have recently come online or are underway on multiple continents.

9. A recent report finds that creating a competitive market in the Southeast United States could save an estimated $384 billion over the next 20 years and reduce CO2 emissions by 37%.

10. Numerous studies in the United States have found that regional transmission organizations have created billions of dollars in savings for electricity customers (see, e.g. MISO, PJM, SPP). In Europe, achieving the continent's clean energy goals will require much greater investments in cross-border grid interconnection and electricity exchange.

Appendix: 2019 Carbon-free Energy Performance at Google Data Centers

We matched 100% of our global, annual electricity consumption with renewable energy in 2019. On an hourly basis, 61% of all the electricity we used was matched with regional, carbon-free sources. However, this global average masks significant differences across sites:

- Our lowest clean energy percentage is in Singapore where most grid electricity comes from natural gas, and our data center was only matched with 3% carbon-free energy.
- Our highest clean energy percentage is in Oklahoma (Southwest Power Pool), where our purchases of wind power helped drive carbon-free energy performance at our data center from 41% to 96%.

APPENDIX TABLE 1

CFE REGION	DATA CENTER(S)	GRID CFE %	GOOGLE CFE %	TREND SINCE 2017(3)
Global Portfolio	**All**	**39%**	**61%**	**Stable**
Energy Market Authority of Singapore	Singapore	3%	3%	Stable
Taiwan Power Company, Taiwan	Changhua County, TW	19%	19%	Increase
Elia, Belgium	St. Ghislain, BL	68%	68%	Increase
EirGrid, Ireland	Dublin, IE	42%	42%	Increase
Fingrid, Finland(1)	Hamina, FI	76%	77%	Stable

CFE REGION	DATA CENTER(S)	GRID CFE %	GOOGLE CFE %	TREND SINCE 2017(3)
Tennet, Netherlands(2)	Eemshaven, NL	24%	61%	Decrease
Sistema Interconectado Central, Chile	Quilicura, CL	42%	63%	Stable
Midcontinent Independent System Operator (MISO), U.S.	Council Bluffs, IA	29%	78%	Stable
Southwest Power Pool (SPP), U.S.	Mayes County, OK	41%	96%	Decrease
Pennsylvania, Jersey, Maryland Power Pool (PJM), U.S.	Loudoun County, VA	41%	41%	N/A new data centers since 2017
South Carolina Public Service Authority (SC), U.S.	Berkeley County, SC	19%	19%	Increase
Southern Company (SOCO), U.S.	Douglas County, GA	26%	26%	Stable
Tennessee Valley Authority (TVA), U.S.	Jackson County, AL Montgomery County, TN	55%	55%	N/A new data centers since 2017
Duke Energy Carolinas, U.S.	Lenoir, NC	60%	66%	Stable
Bonneville Power Administration (BPA), U.S.	The Dalles, OR	89.3%	89.3%	Stable

Google

Notes on Appendix

1. Finland Google CFE % is lower than what was published in 2018 due to a change in accounting methodology related to grid definition. In 2018, we grouped Nordic countries (Norway, Sweden, Finland and Denmark) under one balancing authority; however, we now count each country as its own CFE region. Therefore, we no longer count renewable energy projects outside of Finland against our data center load.

2. We have identified a gap in the Tennet data that is most likely leading to an underreporting of grid CFE % and are actively working with Tomorrow on a solution to address this gap.

3. Trends are defined as follows: 1) “Stable”: Google CFE remained within +/- 1% since 2017, 2) “Increase”: Google CFE increased by 1% and higher since 2017, 3) “Decrease”: Google CFE decreased by 1% or more since 2017, 4) “N/A”: Data center was not yet operational in 2017.