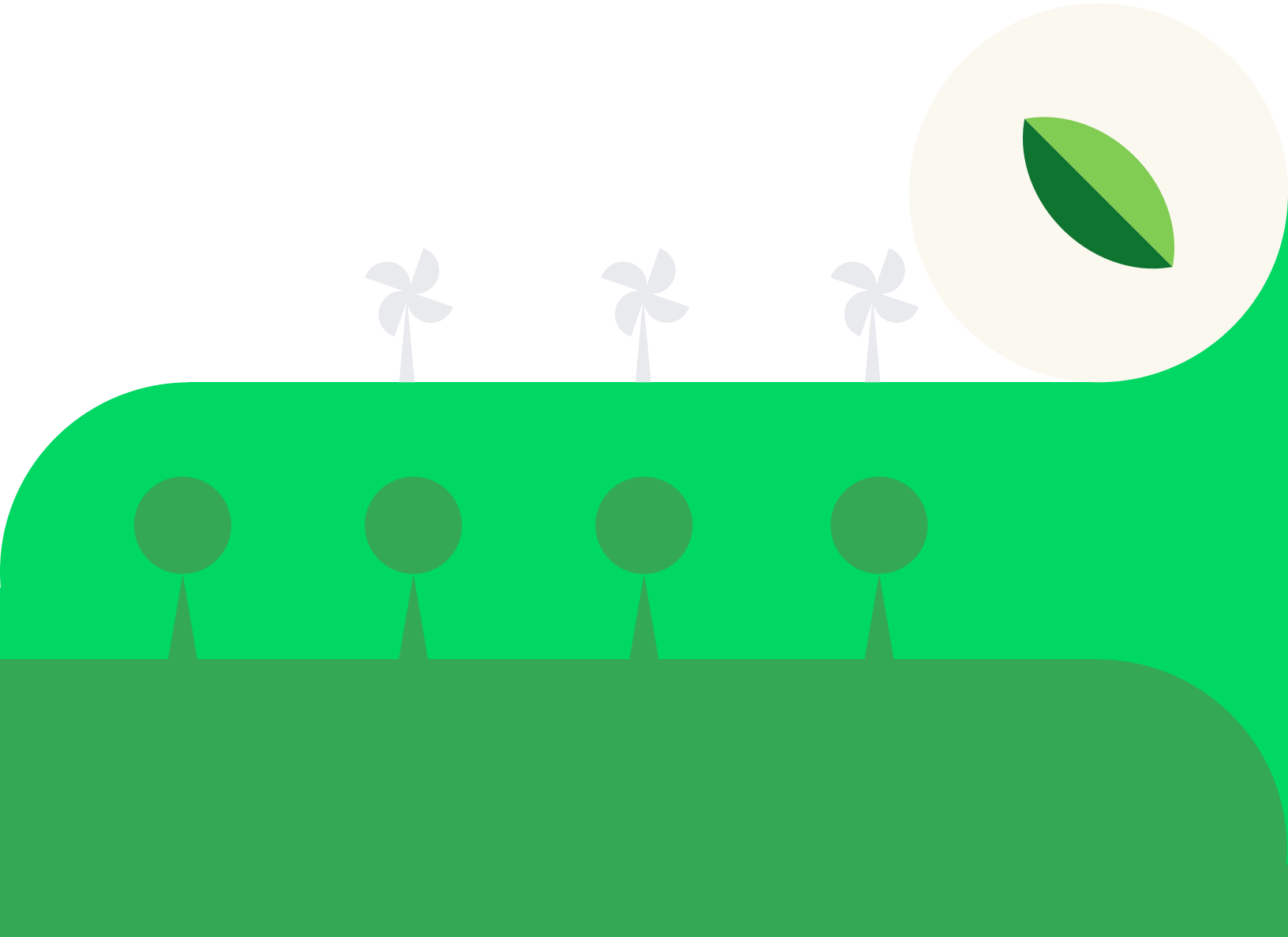
Nest Renew

# Supporting a Clean Energy Future with Nest Renew



# Introducing Nest Renew

Nest Renew is a service that helps people play a part in the fight against climate change from home. By combining existing Nest thermostat programs with new user education tools, intelligent automation, nonprofit funding focused on clean energy equity and renewable generation support, Renew makes it easy to support a clean energy future.

Google has long strived to help move the world closer to a carbon-free future, and with Nest Renew we are working closely with our partners to empower people with impactful tools that help them support the energy transition. Because when we each do a little, it adds up to a lot.

# Support for Clean Energy Starts at Home with Energy Shift

The challenge of transforming our aging electric grid from a centralized, fossil-based system to the carbon-free grid of the future will require innovations beyond large-scale carbon-free energy technology, particularly in demand-side management. To make meaningful progress, we need to make it easy for people to take control over their energy usage. Our research shows that even those who are most energy-aware and engaged can feel disempowered when it comes to contributing to a cleaner energy future. Easy, affordable, and insightful tools are needed to enable individuals to fully access the programs and incentives available today and in the future.

For over a decade, Nest thermostats have helped automate energy savings and guided consumers towards more informed and efficient energy use-leading to a cumulative savings of over 100 billion kWh. Connected devices have also given individuals more control over their energy use-from lighting and appliances to water heaters-with Google Assistant alone connecting over 150M devices in the home.

Nest Renew can help people understand how the electric grid works and improve communication between the home and the grid, empowering them to leverage their connected devices-starting with compatible Nest thermostats-to support a cleaner and more flexible grid.[1]

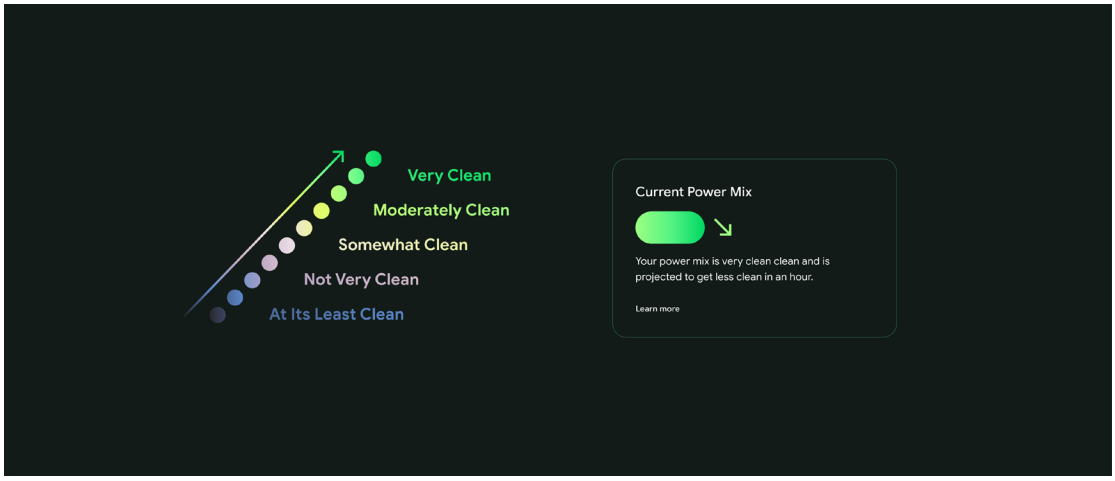
[1] Nest Renew requires 3rd generation Nest Learning Thermostat, Nest Thermostat E, or the newest Nest Thermostat, connected to a Google account (sold separately).

Nest Renew builds on Google Nest's experience in home energy management, including demand response programs with energy partners through Rush Hour Rewards. Rush Hour Rewards is an existing residential demand response program that Nest provides through Distributed Energy Resource Management System (DERMS) providers for energy companies and grid operators that collectively serve millions of U.S. households. Rush Hour Rewards programs can now be surfaced to all Renew users in eligible areas making enrollment more accessible, decreasing friction, and enabling demand response programs to have an even greater impact on grid stability.

With Nest Renew, we are taking the next step toward simplifying energy management at home, putting new tools for supporting clean energy front and center with a new feature for compatible Nest thermostats called Energy Shift.[2] Energy Shift helps users prioritize heating and cooling electricity usage for lower grid emissions or less expensive electricity. Over time,
we aim to increase the number of devices in the home that can communicate with Renew, amplifying the power of the smart home as a tool in the clean energy transition.

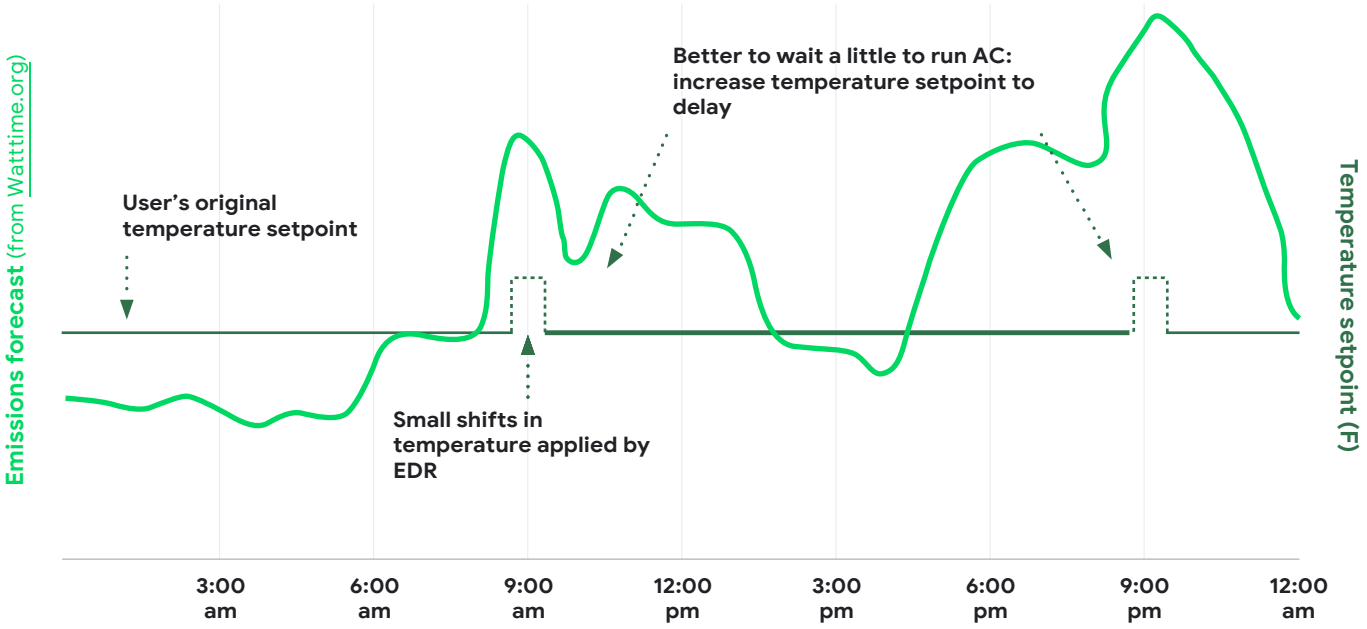
## Emissions-Based Energy Management

With Nest Renew, users will have access to a near real-time view of the estimated marginal emissions on their grid.[3] This tool can help users understand how the carbon profile of their grid changes throughout the day, empowering them to adjust their electricity use in response. This can help users choose to reduce consumption when the grid mix is carbon intensive and run appliances and other larger loads when carbon-free electricity is abundant.




[2] Nest Renew requires 3rd generation Nest Learning Thermostat, Nest Thermostat E, or the newest Nest Thermostat, connected to a Google account (sold separately).
[3] Only available in areas served by major continental US grids, see here.

Nest Renew will help users automate these changes by making adjustments in response to a forecast of the marginal carbon content on the grid, shifting electricity use away from times when the grid is less cleaner. Small changes will be made to heating and cooling loads that balance impact with comfort. As always, users retain control and will be able to adjust their thermostats anytime.




## Time-of-Use Based Energy Management

Over the past decade, we have seen considerable progress in modernizing the electric rate structures that are available to residential electricity customers. Many customers now have access to a number of rate options like time-of-use rates. These rates provide price signals that encourage users to avoid consumption during peak demand periods that typically coincide with high cost and often high-emissions hours. However, without automation or scheduling technology, the rates rely on daily, individual behavioral change.

Nest Renew users will have the option to input their current rate plan. Then, for users on certain utility time-of-use rate plans, Renew can work with their Nest thermostat to help them automatically respond to price signals embedded in their utility rate, working to reduce usage when it's more expensive while balancing comfort and ease of use.[4] Users always maintain control and can adjust their thermostats at any time.

## Schedule Tuneups

Schedule tuneups are a new take on our existing Seasonal Savings feature for Nest Renew users, now including personalized season start times. A few times each year, Energy Shift will help users tuneup their Nest thermostat schedules by making small adjustments that can help make them more efficient. These tuneups will generally take place around the beginning of the heating and cooling season and can help users to save energy in future seasons, too.

## Simple and Automated

Nest Renew users can take advantage of the experiences described above through a single integrated feature called Energy Shift. Energy Shift works by offering elements of intelligent energy use that are available and make sense for the user.[5] The goal is to make it simple and easy for users to find energy savings and prioritize usage of cleaner energy. Just turn on Energy Shift, and Renew will help the user with the rest. Users will be able to see when these functions are working-through visual indicators on the thermostat, emails, and activity summaries available through the user experience.


[4] Adjustments only shift heating and cooling. At initial launch, emissions-based energy management will not work concurrently with time-of-use energy management. Google intends to enable concurrent time-of-use and emissions-based energy management in the future.
[5] For users enrolled in Rush Hour Rewards and Nest Renew, Nest Renew will prioritize responses to signals from our Rush Hour Rewards DERMS providers over activation of other elements of Energy Shift.

# Extending Your Impact

Climate change is a global problem with no single solution. We know that many people are concerned about climate change-and willing to change their behavior to help the environment-but they often feel like they lack meaningful approaches to act in a way that they find impactful. To further empower people to extend the impact they have at home to their broader community, the Nest Renew experience includes the Energy Impact Program and support for wind and solar.

## Investing in Communities with the Energy Impact Program

Climate change affects us all, but not equally. Our fossil-based energy system has disproportionately impacted frontline communities, communities of color and low-income communities for generations. As we transition to a carbon-free electric grid, it will be vital that there is support for programs that help to build this new energy economy in a manner that is just and equitable.

Renew gives users a means to help steer our support to nonprofit partners on the ground working for an equitable clean energy future. We aim to support work in the following areas:

### Expand Clean Energy Access

Nest Renew's nonprofit partners work to expand clean energy access and bring the benefits of clean energy to underserved communities. These projects can provide direct access to clean energy and may enable communities to achieve financial savings associated with clean energy installation.

### Increase Energy Affordability

Millions of US households struggle with energy insecurity, spending a disproportionate portion of their income on energy needs. We support nonprofit partners addressing this challenge by providing underserved communities with programs designed to improve energy efficiency, decrease energy costs and increase home comfort and safety.

### Support Clean Energy Careers

Transitioning to a clean energy economy can create millions of jobs but will require training. Nest Renew supports non-profit organizations offering career training programs to transitioning and underserved populations.

Through the Nest Renew experience, users earn Leafs by actively using the service and taking actions at home that can save energy and help the environment. As users reach certain Leaf milestones, they can direct Renew funds to their choice of non-profits from our list of partners across the US[6] As we go forward we'll work with our nonprofit partners to understand how Renew can have the most impact in the communities they serve. Stay tuned for more about the Energy Impact Program and how to get involved.

## Supporting Wind and Solar

Users that opt-up to Nest Renew Premium will support generation from wind and solar plants in the United States. Renew will purchase renewable energy credits (RECs) to match the fossil fuel electricity in users' homes with enough clean energy to cover the average US household.[6] Nest Renew Premium can complement local carbon-free energy options, including rooftop solar and green tariff programs, many of which supply electricity directly to a user's local grid. Nest Renew is not providing electricity or replacing a user's utility company or electricity provider.

**Carbon-Targeted Procurement**

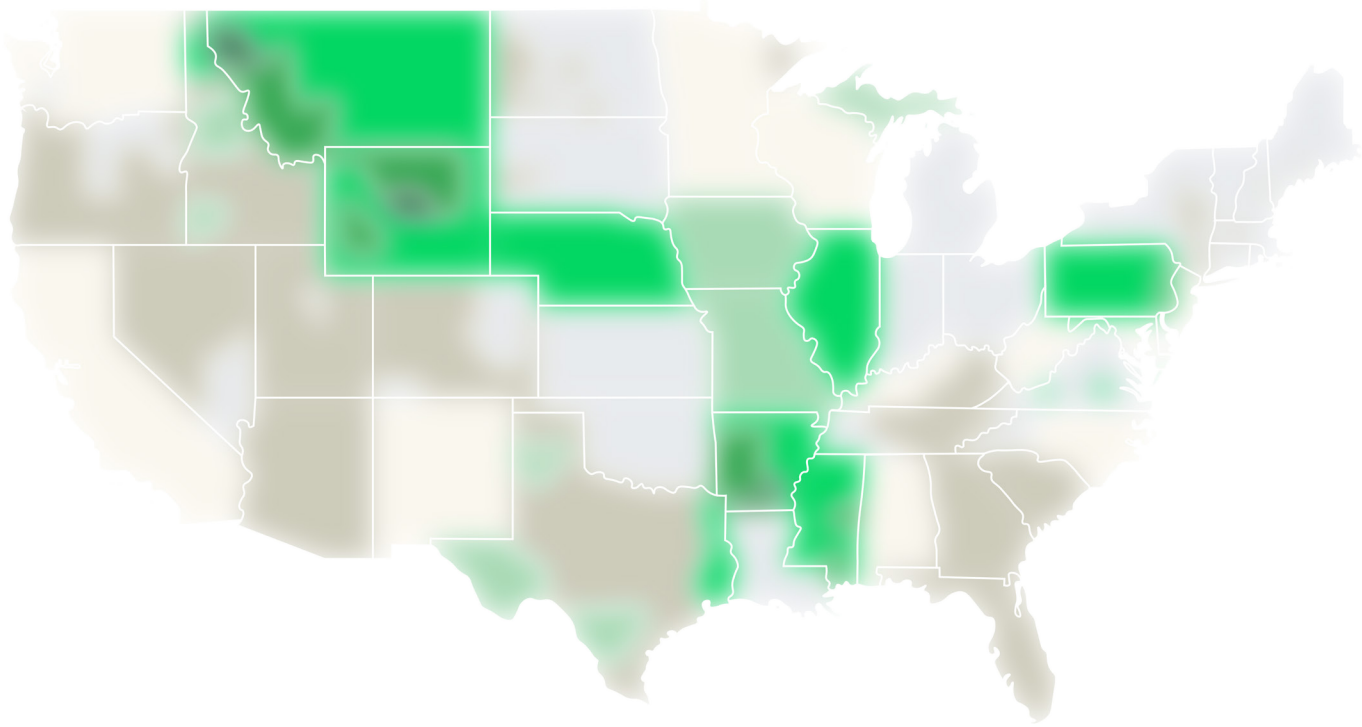
Over the last decade, Google has worked to develop high-impact approaches to procure carbon-free energy. Nest Renew will build on that work to provide a new way for residential electricity customers to support clean energy that integrates explicit consideration of carbon emissions. In evaluating projects, Renew analyzes the expected carbon reductions from new projects in the hours and locations in which they will generate-a concept we call carbon-targeted procurement.

[6] $10/month Nest Renew Premium subscription is required. Learn how this is done with renewable energy credits. Nest Renew will be purchasing RECs from wind and solar plants in the United States. The majority of these RECs will come from our flagship project Bethel Wind in Castro County, TX, with the remainder coming from US solar.

To inform this approach we've worked with Vibrant Clean Energy to analyze the expected carbon emissions avoidance from new wind and solar projects across the country. The model examines existing infrastructure, forecasted weather conditions and grid operations dynamics to assess the complex interactions a new wind or solar plant may have on the grid. From this modeling, we see that grid topology and neighboring generation technologies can have a significant impact on the amount of carbon that new wind and solar plants are expected to avoid. The map below highlights areas of the country where our initial modeling shows that new wind and solar may have the greatest impact. This model will continue to be refined over time to provide greater granularity into the potential impacts of carbon-targeted procurement.

**FIG. 2**

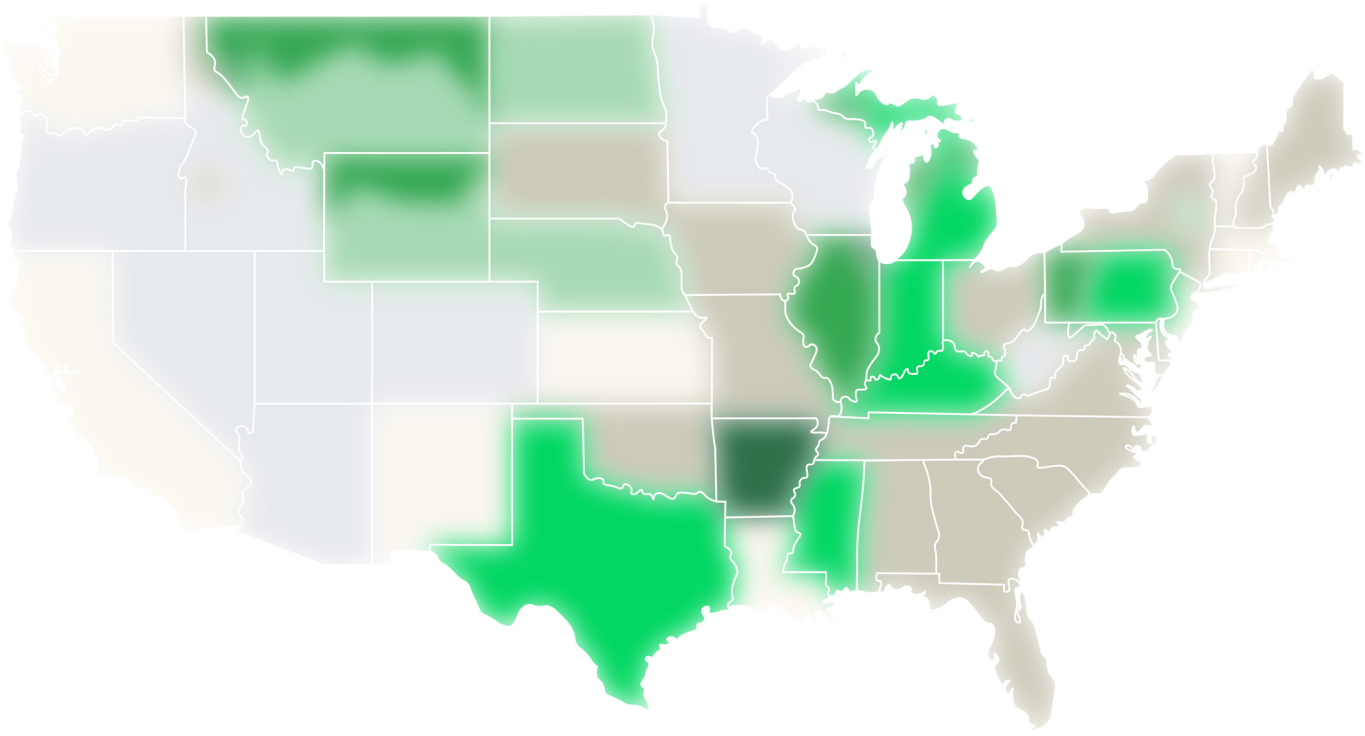
## Emissions Factor of New Wind Generation



**Change in CO2emissions (ton/MWh)**

FIG. 3

## Emissions Factor of New Solar Generation



**Change in CO2emissions (ton/MWh)**

This carbon-targeted framework clearly tells us that not all RECs are created equal. As we implement our carbon-targeted procurement strategy over time, we will prioritize REC purchases based on two emissions-related criteria: Emissions Factor and Carbon Score. Emissions Factor will look at the carbon-effectiveness of additional generation based on the generator's expected hourly profile and the hourly operations of the grid to which it would connect. Emissions Factor will be measured by looking at the estimated $CO_2$ equivalent avoided per REC purchased ($CO_2$-e/REC). This data will be used to define the extent to which a given project is carbon-targeted. For projects that have a sufficiently high Emissions Factor, we will analyze each investment's Carbon Score, measured in \$/$CO_2$-e. By incorporating both unit impact and unit cost we will extend the reach and impact of REC purchases for our users.

Carbon-targeted procurement is an emerging concept. As the Nest Renew program grows, we plan to expand our purchases and partnerships in this space to further support the clean energy transition. We may also refine our approach to carbon measurement over time as research on carbon-targeted procurement evolves. Getting to total decarbonization of the grid is a monumental challenge; we see carbon-targeted procurement with Nest Renew as one of many tools in the toolkit for our sprint to a carbon-free energy future.

## The Nest Renew Portfolio

Nest Renew sourced most of our initial REC supply from renewable energy projects that have been, or will be, built to meet Google's ongoing commitment to match 100% of its global annual electricity use with renewable energy and support its goal to operate entirely on 24/7 carbon-free energy by 2030. In its clean electricity purchases, Google has committed to stringent requirements to ensure its investment results in a cleaner grid. Renew has committed to future purchases of RECs from these projects beginning in 2023 —above and beyond Google's purchases of renewable energy. During early preview 100% of our RECs were sourced from Bethel Wind. Our planned current sources of RECs can be found here, and Nest Renew will report the mix of RECs actually
delivered for Clean Energy Match annually.

**Bethel Wind** is a 276 MW wind project in Castro County, TX that was commissioned in 2017 and is owned by Southern Power (a subsidiary of Southern Company). In 2015, Google signed a power purchase agreement to purchase the output from 225 MW of generation capacity prior to this project being built. An additional 51 MW of generation capacity was also constructed and was previously uncontracted, from which Renew will purchase RECs.

**Roseland Solar**, a 500 MW solar project under development in Falls County, TX, and owned by Enel Green Power, will be built in two phases and is expected to be online in 2023. In 2019, Google signed a power purchase agreement to purchase the output from the first 250 MW of generation capacity, and Nest Renew has now committed to purchase RECs from the remaining 250 MW of generation capacity for a three-year term.

We are excited for Google and Nest Renew Premium users to play a part in these projects side-by-side. As Renew Premium enrollment grows, we will be applying our carbon-targeted procurement approach to consider new projects, and we hope to announce more in this space in the future.

## Google's Energy Journey and Nest Renew

In September of 2020, Google announced its ambition to operate on 24/7 carbon-free energy at all of its data centers and office campuses by 2030. To support this effort, Google has focused on direct procurement of clean electricity to increasingly match its hourly electricity supply on every grid where we operate. The core focus of our collective efforts should be the complete, rapid, and cost-effective decarbonization of electricity systems, which is why Google is focused on decarbonizing its own electricity supply at all hours and on all grids. In doing so, Google is moving from a net-zero model of "emit and compensate" for its electricity-based emissions and instead targeting "absolute zero" where we aim to never emit carbon from electricity usage in the first place.

Nest Renew builds on Google's energy leadership with a procurement approach that enables residential consumers across a wide range of geographies to support clean energy. By leveraging analytics surrounding hourly carbon profiles, the carbon-targeted procurement work with Nest Renew will provide a new tool for users to get involved in shaping our climate future. Over time, we believe that every person should ultimately have the opportunity to access 24/7 clean energy, and we are actively working to create the market structures and policies that will make that vision a reality. However, supporting the growth of clean energy is an urgent imperative and our users want to act now. Renew's carbon-targeted procurement provides them a tool to do so.

## How Nest Renew works with Utilities

Since 2013, Nest has collaborated closely with utility partners and energy service providers on demand response and energy efficiency measures to maximize value for users and the grid.

With Nest Renew, we will build on this collaborative model, working closely with utilities across the country to enhance Renew's impact.

We believe that Nest Renew can amplify and strengthen the utility-customer relationship by promoting existing programs and elevating new opportunities to support the transition to clean energy, promote electrification and enhance load management programs.

## Building for a Cleaner Future

Nest Renew aims to make it easy to take action to help fight climate change and create cleaner air in our cities and towns, right from home. As we grow, we will expand the universe of services available to our users and partners. Over time, we aim to move beyond the thermostat, connecting an increasing number of devices to the Energy Shift platform and looking into novel tools to make it easier for users to reduce emissions from a broad range of household energy uses, for example, through electrifying transportation and heating. Nest Renew is a platform that can support a simple, streamlined energy experience for our users and partners, allowing them to make their homes better for the world around them.