FACTS Reports

Field Actions Science Reports
The journal of field actions

Special Issue 24 | 2022
The social and economic challenges of ecological transformation

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OpenEdition Journals

Electronic version
URL: https://journals.openedition.org/factsreports/6910
ISSN: 1867-8521

Publisher
Institut Veolia

Printed version
Date of publication: 7 October 2022
Number of pages: 44-47
ISSN: 1867-139X

Electronic reference
Maud Texier, "Making low-carbon energy available 24/7", *Field Actions Science Reports* [Online], Special Issue 24 | 2022, Online since 07 October 2022, connection on 08 November 2022. URL: http://journals.openedition.org/factsreports/6910

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MAKING LOW-CARBON ENERGY AVAILABLE 24/7

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Maud Texier heads the 24/7 Carbon-Free Energy project at Google, a company she joined in 2019. She leads a team responsible for developing and scaling 24/7 carbon-free energy for Google's data centers worldwide. Prior to joining Google, Maud was Head of Industrial Energy Products at Tesla. She previously worked for Electricité De France (EDF) as part of the Innovation unit in charge of new technologies for the group. She has an engineering MS in Energy and Power Systems from Ecole Centrale Paris.

In the face of the challenges raised by the accelerating climate emergency, the question of digital's environmental footprint is a major issue facing all the industry players. In response to this challenge, and in addition to a decarbonization drive set in motion several years ago, Google is running a program to ensure that all its data centers and offices run entirely on carbon-free energy by 2030, in real time, 7 days-a-week, 24 hours a day. The company is working on a number of fronts internally and externally, including local purchases of decarbonized electricity, technological innovations and infrastructure, and market reforms to make sure its entire value chain is actively working for the emergence of a decarbonized ecosystem.



Digital is increasingly central to solutions for ecological transformation. But the carbon footprint of digital infrastructures raises further questions. How does a business like Google intend to tackle these issues?

Maud Texier: It is entirely normal, desirable even, for civil society's expectations to focus on carbon footprints. Given the climate emergency, it is vital that every actor pays very close attention to their carbon footprint, taking responsibility and rolling out whatever steps are needed to reduce it.

In the case of Google, I'd first like to quickly remind you of how data centers and the internet operate. To simplify things, the internet is like electricity, with data centers being the internet's power plants. Just as an electricity grid is made up of power plants and cables carrying electricity from one place to another, so the internet is made up of, on the one hand, data centers where data is created and processed by servers and, on the other hand, fiber optic cables that connect the various data centers to places where the data will be used. This means that turning our data centers into sustainable infrastructures is central to Google's strategy, because most of what we do takes place at our data centers.

Google has always seen this imperative as a great opportunity for innovation, and technological innovations lie at the heart of the company's DNA. This is why Google has been developing its own data centers over the past couple of decades; we design them from top to bottom, from servers to the buildings themselves. We have made countless improvements to our designs in recent years, specifically in terms of boosting energy efficiency at data centers. Our sustainability targets have progressively evolved: over and above energy efficiency of buildings and servers, current projects such as our 24/7 Carbon-Free Energy program are focused on upstream issues in our value chain, such as the electricity supply. We're committed to decarbonizing our energy use, with the aim of operating worldwide, all week and around the clock, entirely on carbon-free electricity by 2030. Google did actually announce its target of net zero carbon by 2030 at COP26 in 2021. These two interlinked targets give us the ability to act on our direct and indirect greenhouse gas emissions.

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More specifically, what solutions are you putting in place to meet the goal of a round-the-clock real-time supply of decarbonized electricity for every data center by 2030?

M.T.: Our approach is based on driving progress in three complementary areas.

The first comprises identifying and purchasing decarbonized electricity for use across our entire electricity network. We took our first steps toward this target a



little over a decade ago, with our initial power purchase agreement for decarbonized electricity from a wind farm. We have come to understand that you cannot simply buy electricity produced anywhere worldwide at any time; it's critical that electricity is locally sourced and produced. This means rethinking our electricity purchase policies and sourcing renewable electricity even in parts of the world where the electricity market is not deregulated.

The second area concerns technological challenges. We know that we will certainly have to use a lot of electricity from wind and solar if we're going to reach our 24/7 target, but there are a variety of reasons why this alone will not be enough. First, they are intermittent sources that are not available round the clock. Then there's the fact that these energy sources remain very limited in some parts of the world, because of lack of space or opportunity. This is why we've developed a specific program designed to address these technological challenges: we're currently working with new hardware technologies to help us produce decarbonized electricity instead of renewable electricity, or to let us store this electricity more efficiently and cost effectively, which means we can use more of it.

As part of these efforts, we're also working on new battery technologies and solutions for storing and producing electricity, such as next-generation geothermal technology. For instance, we're piloting a solar with battery storage project in Nevada, and a battery storage project in Belgium. The goal is to identify new tools that will help us diversify our solutions.

We're working on the data and software side of things too, so that we can improve oversight of the various uses made of our electricity network and our own use. As an example, we're working to boost the flexibility of our data centers' power demands. This is quite a challenge when you think that they are famously inflexible, because the internet has to work all the time. The goal is to be able to dynamically shift the time and place where certain computing tasks are performed, to time slots and locations with more decarbonized electricity availability.

This shows how the challenge lies not just in identifying external solutions for producing decarbonized electricity, but equally in examining how best we, as client and user, can adapt to new conditions in electricity networks.

The final area concerns regulation and advocacy. We know that for Google to truly operate 24/7 using decarbonized energy sources will require major changes to electricity networks and the ways they are regulated, to allow for a massive uptick in the share of decarbonized electricity carried by these networks. The goal here is not to meet a set of targets set by a single company. It's actually about altering how electricity networks themselves are designed and the conditions governing access to decarbonized electricity.

This is why we're running a series of actions on this issue, collaborating with regional and local actors to support them in the push for change. They could include setting targets for decarbonized electricity in their network, or changes in electricity market regulations to accelerate

the rollout of decarbonized energy sources. Actions at this level are harder to highlight and not as easily quantifiable, but they represent critical changes that will help us meet our targets by 2030.

Is the challenge mostly about technology in your view?

M.T.: Google's size and importance mean it has a responsibility to represent consumers' voices. Alphabet companies are major customers of several electricity networks, which means we have a responsibility to encourage these markets to accelerate the shift to clean energy sources. Take the example of our data center in Taiwan. Six or seven years ago there was no decarbonized electricity available on the Taiwanese market, neither for businesses nor for private households. We teamed up with other electricity users to launch a campaign to promote decarbonized electricity, which led to changes in the regulations. Today, we can see that setting up these new power purchase systems has directly accelerated the development of renewables. A number of major companies have built large-scale wind farms in Taiwan. So, to answer your question, the challenge is not simply technological, it centers more on regulatory barriers and changes to rules and markets.

We absolutely have to collaborate with other actors in our value chain, not only with buyers like Google but also with companies that produce the electricity

Google also has a responsibility to help private individuals to better identify and understand actions they can take to help the general drive for sustainability. Today's consumers are fully aware of the scale of the challenge the climate emergency poses, and the many problems that need solving. Given that all our day-to-day actions create greenhouse gas emissions, it is very hard to know precisely which levers of action are the most useful. This is why we're trying to develop tools that offer transparency about emissions, and looking into ways to raise awareness of these issues.

For our data centers and the cloud, we're creating tools for our customers to give them a better understanding of the carbon footprint of the cloud services they use, mostly in the form of dashboards and assessment tools. Once they've run their diagnosis, we can then offer them some recommendations. For example, if machines are switched on but unused at certain times of day, we will suggest they are turned off; if we can see that they are running a service in a region that already emits a lot of carbon, we will suggest they shift it to a region with lower carbon intensity, without any loss in the quality of service. We take a lot of care to make it as easy as possible for our customers to take decisions that are actionable.

What are the main difficulties you face?

M.T.: First of all are the external barriers that hamper the rapid rollout of decarbonized electricity. In the USA, many projects face difficulties relating to supply issues or new regulations that can slow them up, or even put a stop to them. And processes in Europe for deploying renewables are just as slow.

We are lobbying to speed up these processes so that the production capacity for decarbonized electricity can be doubled or tripled, maybe even increased tenfold. This is absolutely critical, as demand for electricity will continue to rise, and as well as efforts to strip out carbon from economies, considerable electrification efforts will be needed to meet the growing need for electricity.

A second challenge centers on making sure that the entire ecosystem is on board. We understand that we can only reach our 24/7 target if the rest of the market and the entire industry also move in the same direction. We absolutely have to collaborate with other actors in our value chain, not only with buyers like Google but also with companies that produce the electricity. As we design and release 24/7 solutions and products, it will become easier for consumers to choose to purchase them, leading in turn to a reduction in cost. This can only be a virtuous circle if several actors pull together to work in the same direction. So, the overarching challenge we face is to move beyond designing a Google-only program, and instead adopt an approach that also works for other actors in the market.

I've seen a fundamental shift in the situation since I first arrived at the company three years ago. Back then, sustainability was something we were pushing to our customers. Today it's our customers who are reaching out to us for help with improving their sustainability strategies. This major change in the dynamic also signals a shift in focus. It underlines just how keen our customers are to align business opportunities with CSR principles, and is in itself an invaluable tool to develop new products. At Alphabet, we now have teams dedicated solely to supporting our customers in different sectors of the economy (manufacturing and services). We help them understanding how to use various services, the cloud, data analysis, optimization, to analyze their carbon footprint right across their value chain, then to run targeted actions to shrink it.