Jim Friedland, Head of Investor Relations: Hi, everyone. Thanks for joining our Data Center Energy Strategy call today. I'm Jim Friedland, Head of Investor Relations for Alphabet, and we're pleased to be joined today by our subject matter expert, Amanda Peterson Corio, Global Head of Data Center Energy. Also with me on the call today is Nathalia Valdes from the IR team - who many of you know, and she will be helping guide the discussion today.

We would like to thank those who sent in questions ahead of time. We received a number of questions. On today's call, we will address the most common questions that you shared with us. I'll now turn the call over to Amanda.

Amanda Peterson Corio, Global Head of Data Center Energy: Hi**,** everyone. Thanks so much for having me. My name is Amanda Peterson Corio, and I do lead Google's Global Energy and Power team.

It's a pleasure to be with you today. I'm looking forward to answering all the questions that you've submitted. But first, let me tell you a little bit more about myself and the team.

Personally, I have over 20 years of both domestic and international experience in energy, power, and infrastructure. I spent my career, prior to Google, investing in, developing, and managing large scale, wholesale, power plants. I have been at Google for nearly 10 years, and today I have the honor of overseeing our Global Energy team, which really enables the backbone of Google's infrastructure, powering our global operations.

We do this by working with communities, utilities, governments, regulators, and other power users that we partner with and often develop innovative solutions to accelerate the rollout of advanced power technologies to meet our growth and our decarbonization goals, as well as to improve grid reliability and think about energy affordability.

Our team's mission is to enable Google to meet the company's power needs by ensuring responsible power infrastructure delivery that is affordable, reliable, and sustainable. And our track record over the last 15 years demonstrates this commitment. Since 2010, Google has signed over 170 agreements to purchase more than 22 gigawatts of clean energy worldwide, designed market leading solutions to balance the needs of our growth, utilities planning, and customer protection and we have entered into and invested over $3.7 billion in clean energy projects and partnerships.

Today, we're on the cusp of a new era, this era of innovation and growth that is powered by AI. Google customers and users need high performance computing around the clock, and demand for our services is growing every year, which is driving continued growth in our energy use as more and more people and organizations choose to use our products and services.

Meeting this growing demand is both one of the key challenges and opportunities of our time. And Google is steadfast in our commitment to meet this moment responsibly by being a good grid citizen.

Over the past decade at Google, we've built a sophisticated energy infrastructure team that has decades of energy, utility, and global power market experience. We provide the structure, the

tools and solutions that drive scalable system change to meet our growing electricity demand worldwide.

So thank you again for having me today, and I look forward to answering your questions.

Nathalia Valdes, Investor Relations: Thank you, Amanda. Good morning, everyone. As you mentioned, we received many questions ahead of this call. We'll discuss the topics that were most frequently raised.

So Amanda, given the pace of change you just highlighted, if we look at this year versus last year, what have been the most significant changes to Alphabet's overall energy strategy?

Amanda Peterson Corio, Global Head of Data Center Energy: Yeah, it's a great question. I think to understand where we are today, it's important to reflect back on the fact that just a year ago, the power and utilities industry was only just beginning to think about growing electricity needs for the first time in decades.

Now electricity needs are front and center for Google data centers, and it's led us to focus on an “energy first” mindset on how we approach securing power supply for our operations. This means that we are assessing the power supply, reliability, and impact upfront before we make an investment. We also analyze how our presence in certain locations impacts the communities and how we can show up to be a good grid citizen, by catalyzing grid investments and helping to make more affordable, reliable, and clean energy available on our systems.

I will say that there is no “one size fits all” solution on how we can deliver power globally and that's because while the power infrastructure may look the same physically everywhere in the world, the electricity and regulatory market structures vary greatly across the many markets where we operate.

The good news is that, as I mentioned, we have a team of industry leading experts across our global markets operating here, and we've had this benchmark team preparing for this moment, for scale development for power over the course of many years. We've been moving Google from a power customer to an infrastructure partner to be able to meet the needs of today.

It's our ability to deeply understand the power and utility sector and design scalable solutions that work in both regulated and deregulated markets alike, that I believe truly set us apart for success to deliver and meet these needs.

Nathalia Valdes, Investor Relations: Thank you, Amanda. Translating that “energy first” mindset into execution brings us to the next question from our investors. How does your team work with utility partners and regulators to ensure that the new power demand doesn't strain existing grid capacity?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, and this is another great question.

Before we make any decisions or break ground on our own development, the first conversation

we usually have is with our partners, both at the state and local level, as well as our utility partners to really understand where within the system it makes sense to cite a load like ours.

So we ask: Is it going to be helpful? Is it going to incur any additional strain or require extraordinary amounts of new infrastructure in the time to serve? And when we start to have this dialogue and conversations, we start to plan out what is needed and where does it make the most sense to put our load. It starts with the partnership there.

Now, how we go about it and how we work with state regulators and our utility partners, again, differs depending on the energy market where we operate. But the most important thing we learned along the way is the value of transparency. And this goes both ways. So both for Google to be open and transparent about what we are working to build, as well as understanding what our partners' needs are, including the challenges, and how we can work together to have a successful integration of our loads within a shared utility grid.

Nathalia Valdes, Investor Relations: Asking a question more specifically, how do you ensure that utility costs for consumers won't be higher as a result of these new data centers?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, Google has a responsible growth strategy in place to prevent our expansion from burdening local communities or energy users.

We, again, proactively collaborate with our utility partners and regulators to make sure that the cost of new infrastructure that is required to meet our growth is paid for by Google.

So in Georgia, for example, the Public Service Commission and local utility have both credited large load customers like Google for their ability to freeze base rates for their customers over the next three years.

Google's also utilizing innovative structures, like our Capacity Commitment Framework, which empowers the utilities to make long term infrastructure investments with greater revenue certainty. This is ensuring power for Google while also ensuring the cost of our infrastructure required to serve us, is paid by us and not by others. This framework has proven to be a scalable solution to address affordability concerns by the growth of data center infrastructure. And since we introduced it last year by working in concert with our partners, we have seen it be adopted in 8 states, and it's pending more approval over time.

Google also partners with the local community where our data centers operate to support energy affordability and reduce household energy burdens in our communities. So for example, just last week in Texas, we announced a $30 million Energy Impact Fund to help scale critical affordability initiatives throughout state.

And this is similar to programs that we've announced previously in Arkansas, just last month, which builds on the broader programs we funded for the years in North and South Carolina, as well as in other states. This funding includes focus on weatherization and pre-weatherization of community homes, reducing the energy burden, and energy efficiency upgrades for local communities, homes, and public schools.

Nathalia Valdes, Investor Relations: As you think about the next 3 to 5 years, could you walk us through the most critical current bottlenecks in securing power for our data centers? Is the primary constraint today power availability, or construction labor and trade resources?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, there are a number of current bottlenecks.

The first is really access to power capacity. This is really caused by the underinvestment of the build out of infrastructure of our grids that has happened previously, combined with the growing demand that we're seeing now of the electrification of everything, including the growth of our data centers. And it's really created the need for greater capacity build out.

Now, it could be capacity that's constrained either by the need for new transmission or the need for new generation. In some cases, there's plenty of generation capacity, but there isn't enough room on the wires to deliver the power to where it's needed. Or conversely, there could be enough generation transmission but not enough generation. You can even have both, in some cases, be the constraining factor.

I think you've also hit on a critical point, that the bottleneck for deploying compute capacity, as well as the build out of needed infrastructure, is the need for skilled labor required to build and connect that power. It's really a both/and.

There's a well known shortfall in the U.S. of U.S. electrical workers that are going to be required to modernize our grids. An independent study estimated that 130,000 additional electricians will be needed by 2030 to build out new data centers and manufacturing facilities alone. And it's estimated that nearly 10,000 American electricians either retire or change their careers each year, with only 7,000 new entrants joining the field.

So to help fill this gap, Google announced support earlier this year for an effort to train 100,000 electrical workers and 30,000 new apprentices in the U.S. through Google.org funding to the Electrical Training Alliance. Thanks to the investment, the Alliance aims to increase the electrical workforce pipeline by 70% within the next five years, setting a model that we hope for how public and private sectors can collaborate to quickly deploy the workforce required to meet this bottleneck.

Nathalia Valdes, Investor Relations: So when you think about sourcing power for newer data centers, do you want to be connected directly to the power, so behind the meter? Do you want to connect directly to the grid? Or a mix of both?

Amanda Peterson Corio, Global Head Of Data Center Energy: This is a question we increasingly get more and more.

As I mentioned earlier in the call, there's no one size fits all solution. The grid provides strong and efficient resiliency as a system. It creates redundancy of power supply and efficiency of pooled assets that really helps to optimize cost and an efficient power system to deliver that power to all customers.

So for that reason, we prioritize grid connected load that is served by grid-connected generations, using transmission lines to transport the power between the two. There are plenty of untapped efficiencies that can be unlocked in our electricity grids today to provide timely access to capacity and growth. In fact, the U.S. Department of Energy has estimated that even if the U.S. does not build another megawatt, it can unlock 100 gigawatts of extra power just by modernizing the current U.S. transmission and distribution system to be more efficient.

At Google, we support policy and utility measures that can unlock grid connected energy supplies for data centers, including measures that accelerate deployment of advanced transmission technologies and permitting reforms that can speed construction of new transmission lines.

However, given significant transmission constraints on electricity grids across the country, this preferred model is not always an option to us. Further, as we discussed, there is no ‘one size fits all.’ So for example, in markets where it is regulatorily allowed, we do explore co-location of generation of our data centers with generation and our data centers while still building a path to ultimately interconnect these co-located power and data center assets to the grid.

So we are working with our utility partners, our generation owners, and our developers to plan and develop solutions that are additive and responsible.

An example of this is our partnership with Intersect Power and TPG Rise Climate, which will bring new generation capacity to the electric grid, co-locating with our load, rather than interconnecting new load and taking capacity away from the grid.

Nathalia Valdes, Investor Relations: Could you walk us through how you're managing current and future grid and transmission bottlenecks?

Amanda Peterson Corio, Global Head Of Data Center Energy: Sure. Yeah, one way I could do that is explain two of the exciting partnerships we announced this year to address this very issue.

We are collaborating with CTC Global, this was announced in June, to help scale the use of high capacity, U.S. manufactured, advanced conductors. This is a proven technology that has been demonstrated to increase grid capacity and reliability at unparalleled speed. We're talking about a potential to double the transmission capacity in months versus years and about half the cost of conventional structural rebuild. So we've been working with CTC Global to identify high-impact transmission lines to unlock this grid capacity in the U.S.

And in April, we announced that we're bringing together the power of Alphabet, including Tapestry, which is an X company, and Google Cloud and Google DeepMind to build and deliver a set of collaborative AI tools that will enable PJM, which is North America's largest regional transmission grid operator, to connect energy resources to the grid much faster.

So Tapestry is building an AI powered tool to help streamline and accelerate the inner connection application of critical parts of the verification process that will allow new generation

that is currently waiting to be interconnected to come online much, much faster.

I think beyond these efforts, we, again, strongly support policy measures, at both the Federal and State levels, that can help unlock timely construction of regional and interregional transmission lines that we are going to need to meet this next wave of economic growth.

Nathalia Valdes, Investor Relations: Thanks, Amanda. So many of the solutions that we've discussed focus on the supply side. Now, let's turn to the demand side. Investors asked: How is Alphabet leveraging demand-side management and load flexibility solutions? To what extent are we using those? And what are the primary barriers preventing wider adoption?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, we've been focusing on this for many years now, trying to figure out and working with our partners to bring flexible demand capabilities into our data center fleets.

These capabilities are often referred to as demand response or demand flexibility, and they allow us to shift or reduce power demand to help relieve stress on the grid during peak demand or during grid emergencies.

So for example, if there's a day in the middle of summer when everyone cranks on their air conditioning at the same time, and the grid becomes overloaded, we're exploring whether or not or how we can ramp down. Can we actually shift our loads to other times of day, or even in our network to other data centers, to ensure that neighbors have access to reliable power?

It's really an important tool in our toolbox that offers faster, more cost efficient alternatives to building new power supply that's only being built to meet a few hours of the day or a few days of the year. But the amount that we can curtail, which is to reduce our power load, varies by data center location and also varies by the type of workloads being run in the data centers that they serve.

Now we've been able to demonstrate this in a number of markets over the past few years. To date, Google has successfully driven demand side demonstrations with Omaha Public Power District, this is in Nebraska, where we reduced power demand during three grid emergencies in 2024.

We also used our capability here during the European Energy Crisis in 2022 when prices hit historic highs, and we were able to offer reducing loads during times of high grid strain.

We do this also in Taiwan, where we've been able to leverage this capability to help our grid operators maintain reliability during those periods of the year when demand on the grid is the highest.

And building on that, this year, we progressed with two new utility agreements. One with Indiana Michigan Power and the second with Tennessee Valley Authority, and these agreements were aligned to reduce our power consumption associated with machine learning workloads when the grid is strained.

Finally, in October, Google announced a $4 billion investment to build our first data center in Arkansas with Entergy. And here, we will also be implementing demand flexibility at the data center to support the growth and reduce power usage during peak times.

So I'll just say, there's a lot of work being done in this regard and has already been done for a number of years to help us prepare to think about how we can be more flexible as a tool to help meet our power needs.

Nathalia Valdes, Investor Relations: Let's talk now about energy efficiency and how you think about that in our data centers. What are some of the levers to improve energy efficiency?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yes, energy efficiency is a huge area of emphasis for Google. We've built efficiency across every layer of our AI systems, from custom hardware, to highly efficient models, to robust server systems that are the machines that make these models possible.

Our data centers now deliver 6x more computing power per unit of electricity last year than they did just 5 years before. And I'm pleased to share that Google data centers last year used 84% less overhead energy than the industry average for functions like cooling and power distribution. This ensures that the highest amount of energy usage is really being used to drive compute, and we continue to innovate on how we can make our data centers more efficient.

In August, for the first time, we shared data on energy, water, and carbon footprint per Gemini Apps prompts. And the findings demonstrated that Gemini's full-stack efficiency improvements, over a 12 month period, the energy footprint of a median text prompt dropped by 33x. To a level that is equivalent to watching TV for a little less than nine seconds.

So these improvements really are a result of designing every element for maximum performance per watt. This includes our custom TPUs, our smarter models, and again, a lot of work is going into building highly efficient data centers.

Nathalia Valdes, Investor Relations: The next question is about future solutions, an area of high investor interests. What are Alphabet's current priorities for enabling the development and scaling of future clean energy power technologies? And are there any that you're particularly excited about?

Amanda Peterson Corio, Global Head Of Data Center Energy: We're doing a lot in this space. We are actively implementing energy strategies that incorporates both established and cutting-edge technologies. This approach that we're using leverages proven technologies like solar, wind, hydro, power, and battery, while at the same time, we're driving research and development, as well as the deployment of advance energy solutions like enhanced geothermal, long duration energy storage, and as you've seen, advanced nuclear.

I'll speak to nuclear for a second. When it comes to nuclear, we're working to really revitalize legacy nuclear infrastructure to unlock greater capacity for the system in the near term. An example of this is through our recently announced collaboration with NextEra Energy. And we worked with them in partnership to restart the Duane Arnold Energy Center in Iowa.

Simultaneously, we are investing in advanced nuclear technologies that also have a long term potential for commercial scale. This includes our agreement with Kairos Power for a small modular reactor, or SMR, as well as our bet on fusion energy.

So in June, we signed a large, direct corporate offtake agreement for fusion, which is, to date, the largest agreement with Commonwealth Fusion Systems to power our data centers in Virginia.

As a source of clean-firm energy, we see nuclear as a rapidly growing and important piece of our energy portfolio to meet both short and long term needs as we move forward.

Another technology that we're excited about is enhanced geothermal, which harnesses the heat within the earth's crust to create clean burn power. Geothermal has strong potential in many regions where we operate, including the U.S. and Asia Pacific and we are working to unlock it through a growing portfolio of partnerships and investment.

While geothermal, as a technology, has been a long, established source of energy, by investing in enhanced geothermal, we can broaden the locations where we can access and tap into this clean and firm resource.

In 2021, we signed our first corporate agreement to develop an enhanced geothermal project with our partners at Fervo Energy. This project is now operational. And in 2024, we expanded our partnership with them to build a larger, 115 megawatt project in Nevada.

This April, we also signed a long term, partnership agreement with the geothermal developer Baseload Capital, which includes the first PPA, or corporate PPA, for geothermal power located in Taiwan.

So while we're addressing the short term needs for a data center, it's really critical for us to continue to plant the seeds to meet the long-term needs for our power supply in the future. And that's exactly what we're doing when you see us making these advanced energy bets.

We're confident that these partnerships and investments are going to really unlock greater supply in this decade, but also in the next decade. And we've already seen how we can start, for example, through Fervo Energy, from small demonstration projects to building them out at scale. We look to unlock these similar partnerships as we continue to invest in the future.

Nathalia Valdes, Investor Relations: Amanda, you mentioned your collaboration with Kairos Power. Investors asked if this collaboration could bring scalable solutions? And if so, what is the timeline?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, in 2024, we began our long-term collaboration with Kairos Power, and we worked with them to unlock 500 megawatts of nuclear power for the U.S. electricity system by 2035 and we agreed to do this through multiple deployments of their small modular reactor.

This year, in August, we were able to share the first deployment against this framework agreement in Oak Ridge, Tennessee. We see this as a promising and scalable solution. And again, we are making those investments now so that we can start to build out the pipeline and see scaled growth in future.

It's by committing to this “order book” framework, where we purchase electricity from multiple reactors versus just one reactor at a time, that we're sending an important demand signal that's going to help jumpstart the supply chain required to build out this capacity to meet our long term needs.

I will share that the U.S. Department of Energy said that repeated deployments of SMR designs will help to lower costs, and we believe that as well. It's going to be critical to making this technology commercially viable and widely available for everyone.

Nathalia Valdes, Investor Relations: Thanks, Amanda. Could you share more details on the strategy to use natural gas, particularly with Carbon Capture and Storage? How do you reconcile the use of this power source with our long term carbon-free energy ambition?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, when Google published our strategy to advance our next generation of clean electricity resources, this was in 2023 we identified a suite of technologies that we would work with to help commercialize, including advanced geothermal and advanced nuclear, which I just spoke about, in addition to long duration energy storage. But this paper also identified natural gas with carbon capture and storage as a critical source of clean burn power, and we outlined a stringent strategy and environmental criteria that we would use when we evaluate potential CCS projects.

It's on the back of those standards that last month we announced our first-of-a-kind, 400 megawatt, gas plant in Decatur, Illinois that will capture and permanently store approximately 90% of CO_2 emissions. This is the first project in a longer term collaboration with the developer, Low Carbon Infrastructure, LCI, a portfolio company of the leading infrastructure investor I Squared Capital. And we are working together to develop future CCS facilities in the U.S. to be able to demonstrate how we can deploy CCS projects for power generation, again, at commercial scale.

We view this as a crucial step in de-risking a technology that leading global institutions have concluded is critical to achieve our goals of decarbonization.

Incorporating natural gas-fired power generation with a high threshold for carbon capture really helps us, both grow reliable energy, as well as lower our emissions in the long term.

Nathalia Valdes, Investor Relations: Thanks, Amanda. So we’ve discussed the strategies for power sourcing, managing bottlenecks, and investing in next generation technologies. This last question ties all of these back to our ambitions. Given the rapid growth in energy consumption due to AI, how will Alphabet meet its climate ambitions? And what are the biggest challenges?

Amanda Peterson Corio, Global Head Of Data Center Energy: Yeah, at Google, we like hard problems. We set our carbon-free energy at net-zero ambition. We were very clear that these

are moonshots designed to push the boundaries and really unlock the breakthroughs that we need to see for innovations to meet these goals. And I'm going to acknowledge that achieving them has become much more complex and challenging. Our growing demand for digital services, including AI, really is putting pressure on the amount of power that we need.

And external factors are creating new headwinds in this space, including slower than needed deployment of clean capacity. There's a number of policy uncertainties and regional challenges.

But at the same time, we continue to make important progress in responding to ramping up our clean energy procurement of our energy portfolio. We have and continue to build a pipeline of new, clean energy projects that are additional and that we expect to help us stay ahead of the curve, even as our energy grows.

We estimate that once operational, these new, clean energy projects that we are working to purchase power from, those that we signed just last year, could generate nearly 4x more electricity than the incremental load growth we experienced last year. So this, coupled with significant strides in efficiency, is really helping to set us up for success.

And one other data point on this, last year, despite our data center electricity consumption growing year-over-year, we were still able to reduce our data center energy emissions by 12%, and this was, in large part, due to all of the new, clean power we were able to bring online preparing for that growth. And that successfully decoupling our operational growth from its associated carbon emissions.

Nathalia Valdes, Investor Relations: Well, thank you so much, Amanda, for spending time with us today. We really appreciate it.

Amanda Peterson Corio, Global Head Of Data Center Energy: Thank you for having me.

Jim Friedland, Head of Investor Relations: Thanks, Amanda. Thanks, Nathalia. That concludes our call for today. If anyone has any questions or feedback, please send us an email at investor-relations@abc.xyz. Thanks, everyone, again for joining us. And Joelle, if you could close out the call. Thanks.