May 2020

Articulating the Cloud: Understanding Data Centers, Renewable Energy, and Public Policy

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ARTICULATING THE CLOUD: UNDERSTANDING DATA CENTERS, RENEWABLE ENERGY, AND PUBLIC POLICY

A Thesis
Presented to
the Graduate School
of Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
Communication, Technology, and Society

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by
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May 2020

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ABSTRACT

Experts urge that drastic steps must be taken to reduce carbon dioxide emissions as the ongoing climate crisis worsens. Amid this, it is also important to understand the relationships between media infrastructures and the finite resources they require. This thesis goes beyond arguing that data centers are inherently unsustainable media infrastructures that consumers rely on to access the Internet and cloud storage. Instead, this thesis focuses on Google as an industry leading company in the United States to assess how the company understands their role in the climate crisis, and how they define renewable energy and sustainability. To do so, this thesis used critical discourse analysis of Google's public-facing documents, government documents, and related joint reports between external research organizations and Google related to their data centers. The findings revealed the company defines sustainability as a commitment and company value, and that they have an immense renewable energy portfolio through additional acquisitions measures. Ultimately, this thesis argues that Google discursively positions themselves as corporately benevolent and masks retroactive sustainability in the guise of activism while simultaneously firing activist employees, having fossil fuel industry clientele, and financially contributing to anti-climate change organizations. This thesis contributes to important conversations related to media infrastructure sustainability, in particular emphasizing the complex tensions and dynamics at work to make banal technologies possible. It is important for consumers to understand the limitations and items lacking in corporate discourse to advocate for a more sustainable future for everyone.

DEDICATION

I first encountered data centers in 2017 as an undergraduate student and was immediately intrigued. Nearly three years later, I wrote a thesis about them and found a new research trajectory because Dr. James Gilmore encouraged me to pursue them. After submitting one of the most unique academic papers I have ever written for his seminar in my first semester, he was the first person to ever tell me my ideas were “brilliant,” that I was “brilliant.” Those words pulled me through my darkest doubts and my toughest days.

Dr. Gilmore pushed me to intellectually wrestle with tough concepts. With every conversation, very rough drafts, and every email exchange, he never stopped challenging me to do more while always encouraging me. On the days I felt like quitting and that everything was too hopeless and I could not possibly fix all that is happening in this world, he reminded me to “always find the silver lining” and to never stop believing that change is possible.

Dr. Gilmore, this thesis is dedicated to you. Thank you for the hours of your life you invested in me, in my theoretical lenses, and ultimately in the words on every single page of the biggest project I have ever completed in my life so far. When I say I would not be writing this today without your impact in my life, I truly mean it. I hope that one day I can be the advisor and mentor you have been to me for other students. I’m so grateful our Indiana paths converged at Clemson. Thank you for reminding me that I matter.

ACKNOWLEDGMENTS

In addition to Dr. Gilmore, I would also like to acknowledge my committee, Dr. Andrew Pyle and Dr. Travers Scott. My prospectus was so ambitious, and I needed the feedback both of you offered. Thank you for supporting me and for investing in me as my committee members. This project was the culmination of all your help.

I would also like to acknowledge my master's cohort because, without them, I daresay I would be finishing this graduate program at all. For every victory and every tough day, you were there for me. Because of each one of you, I believed in people again. I believed that other people could genuinely be happy for my successes and that I could feel safe asking for help when I needed it the most. I also realized just how much I needed the support you always gave me. I am forever thankful to have each one of you in my life.

Lastly, I would like to acknowledge my family. They may not understand exactly what I do but have cheered for me every step of the way. Thank you for listening to me, for supporting me, and for always reminding me that I can do it. I love you all so much.

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CHAPTER ONE

INTRODUCTION

Climate change is an ongoing global issue. The Intergovernmental Panel on Climate Change (IPCC), an organization by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP), issued their fifth climate report online in October 2018. In their report, IPCC stated that "limiting global warming to 1.5°C would require rapid, far-reaching and unprecedented changes in all aspects of society" (IPCC, 2018, para. 1). The 91 authors on this report concluded our "next few years are probably the most important in our history" (IPCC, 2018, para. 14). With the dire urgency to cut greenhouse carbon dioxide emissions by 45 percent by 2030, the dangers of not doing so are threatening rising sea levels, elimination of ice caps and coral reef extinction (IPCC, 2018). The IPCC will issue their sixth report by 2022, and currently provides some updates related to land mass and rising temperatures on their website.

One of the most common ways climate change reports, campaigns, and updates are propagated is through various Internet platforms. The Internet exists because of a plethora of physical materials. These materials include media infrastructures such as undersea fiber optic cables, wires, satellites, and data centers that work together to consume finite resources to power the Internet. Each data center contains numerous servers that work together to enable Internet functionalities. Data centers are therefore necessary media infrastructures, but they are also unsustainable; the cost of powering these centers has recently gained more attention as part of the climate change issue. Data centers are connected to local power grids around the globe and water supply to cool the servers as they constantly function. Despite the mounting concerns about their energy use, data centers have also contributed to the sense of progress the Internet affords. This is similar to what scholar Raymond Williams (1959) argued about the benefits of the industrial revolution for the working people, “never in a million years would you make us give up this power” (1959, p. 97). Users often rely on the Internet, and much of their lives are interwoven with the power of the Internet. Technological advances have enabled advancements and innovation, especially related to communication through media. In his 2011 book, *The Filter Bubble*, Pariser recorded Eric Schmidt, former executive chairman and CEO of Google stating that, “if you recorded all human communication from the dawn of time to 2003, it’d take up about 5 billion gigabytes of storage space. Now we’re creating that much data every two *days*” (Pariser, 2011, p.11). Emails, text messages, tweets, direct messages and posts via social media platforms, apps, search queries, streaming services, online gaming, cloud storage, and all the ways the Internet and technology are used increase the never-ending production of data. Companies rely on data centers that require massive amounts of infrastructure and energy to keep up with these exponentially exploding demands. Facebook, Google, and Amazon Web Services have invested in hundreds of warehouses around the globe to generate and meet these demands. In return, the natural and financial resource demands of these centers, are also enormous.

In 2009, Environmental Communication researcher Øyvind Ihlen studied the business responses to climate change. This study analyzed the “world’s 30 largest corporations" (p. 244) and found that companies most often published materials related to the situation's "gravity" (p. 253), referenced the reports of the IPCC and other "experts" (p. 250), and even saw intervention in the climate crisis as a "business opportunity" (Ihlen, 2009, p. 256). This study demonstrated that corporations disclose their relationships to resources and climate change discursively to the public through their materials. Ihlen (2009) also urged researchers to study how corporations position themselves in the climate crisis because "their vast resources and political clout directly and indirectly make them a particularly important object of study" (p. 257). Over a decade later, this thesis advances such conversations about businesses and the climate crisis, now with heightened urgency as the ongoing crisis worsens.

This thesis goes beyond arguing that data centers are unsustainable essential media infrastructures. Rather, this thesis analyzes the public-facing documents of Google, one of the leading technology companies who owns and relies on data centers. Because they are the material, physical embodiment of the ethereal cloud, these sites demand the continued attention of Communication scholars who emphasize digital technologies. The discourse analysis in this thesis was guided by three related research questions:

RQ1: How does Google describe their role in the climate crisis?

RQ2: How does Google describe their renewable energy and sustainability initiatives?

RQ3: Relatedly, how does Google define 'renewable energy,' specifically related to their data centers?

To answer these questions, critical discourse analysis was conducted on Google's public facing materials, relevant government documents from the EPA, and other joint publications between Google and research agencies. After analyzing these materials, this thesis ultimately argues that Google masks retroactivity under the guise of activism as they position economic and environmental rewards occurring simultaneously, and unfairly purports corporate benevolence as they tout being an industry leader in sustainable practices. Google also exemplifies common "soft law" (Nwete, 2007) practices that are not novel in industry. Alongside their materials, outside news agencies report instances of Google firing activist employees, fossil fuel companies as part of Google's clientele, and financial contributions to anti-climate change groups (Lutz, Dec. 2019; Newcomb, 2018; Lutz, 2019; Lutz, Dec. 2019). Scholars and consumers should be informed about such discourse, as it can reduce activism and lead to faulty assumptions that the corporation is doing enough in the ongoing climate crisis they have contributed to since their beginning.

CHAPTER TWO

REVIEW OF LITERATURE

Media infrastructure studies

On the most basic level, every material thing on Earth comes from a mixture of finite and renewable resources of the planet itself. Material things rely on resources for both their composition and their function, and this is particularly true of media infrastructures. Historically, media infrastructure studies have beginnings, like much of the Communication field, in Greek and early Roman origins. Beyond lenses of "Greek cultural techniques," media infrastructure studies really emerged out of periods of war, with Friedrich Kittler and German media theory during World War II launching "the next evolutionary step in media studies" (Peters, 2015, pp. 24-25). In addition to Kittler, scholars like Marshall McLuhan, Harold Innis, Lewis Mumford, Paul Edwards, Leigh Star, Geoffrey Bowker, Bruno Latour, Michel Foucault, and Martin Heidegger, for example, each forwarded the ontological, phenomenological, and epistemological foundations and lenses of studying media as infrastructure (Peters, 2015). The term infrastructure has moved beyond being a military term, with scholarship continuing to acknowledge how media have "something both ecological and existential to say" (Peters, 2015, p. 52). Media infrastructure studies are important because, as Edwards (2003) argued, "to be modern means to live within and by means of infrastructures" (p. 186).

Daily life in the digital age of the 21st century involves various and complex infrastructures. For example, using a cell phone to access the Internet often requires a WiFi network. Beyond this, the undersea cables, the satellites, the routers, wires, data centers, electricity, water, and other finite resources comprising the cell phone, etc. are all part of an infrastructural assemblage. An assemblage is a concept that Grossberg (2010) describes as the result of building relationships between concepts that may "not be readable from its appearance" (p. 53). Using the metaphor of an everchanging group of puzzle pieces or toy blocks, Grossberg (2010) argued that there may be multiple ways various pieces can fit together, and the fit between pieces often depends on "its own contextuality" (p. 53). Taken together, the contextuality or "possibilities of the context" create an assemblage of the concepts at hand (Grossberg, 2010, p. 53). To relate this back to the aforementioned infrastructural assemblage, energy, undersea cables, and data centers are all infrastructural puzzle pieces that fit together in dependent ways; these infrastructures work together to enable Internet functionality. However, while this infrastructural assemblage is important, the various pieces are often hidden, invisible, or unknown. Cables, wires, and warehouses full of server hardware are the essential elements of functioning technologies users rely on are often hidden or camouflaged. Starosielski' s (2015) research on undersea cables revealed that "many people in the cable industry perceive a general lack of public interest in their infrastructures" (p. 4). Another engineer who Starosielski (2015) interviewed "pressed" her "interest in making cables visible" by asking questions like: "Why would you want to know?" and "When you turn on a computer and you send an email, do you really care how it works?" (p. 5). However, such invisibility leaves little room for activism or decision-making, especially within communities who are directly impacted by the infrastructures (Starosielski, 2015).

The physical makeup of media infrastructures not only facilitates human communication, they communicate something themselves. From an architectural perspective, media infrastructures are often found running along train tracks as old telegraph wires transitioned to electric wires, or as landscape pieces like old television towers are built into iconic skylines in German cities, or as data centers in fields or near small towns in the Carolinas, or as satellites situated in the greenery along mountainsides (Mattern, 2017). Historically, media technologies like televisions entering the home radicalized the design of spaces, like living rooms (Spiegel, 1992). As Communication scholar Rich Ling (2012) has explored, technologies like telephones, automobiles, and cell phones have all relied on processes of making new and ostensibly strange infrastructures appear normal and even banal. For many new communication technologies over the last two centuries, being materially plugged-in to media infrastructures like telephone cables is an important first step, in addition to learning protocols, manners, and etiquette associated with usage (Marvin, 1992). As these technologies became domesticated, questions of how air waves and signals interact with one another did not and does not have to consume users' minds (Silverstone, 1994).

Scholars like Starosielski (2015) and Cubitt (2017) acknowledge that, with media infrastructure, it is possible to use the tangible devices and not consider the vast infrastructure that makes ordinary use possible until they cease to function properly. For example, it is possible to use a cell phone and never consider the finite materials comprising it that are being excavated at rates that are on the verge of depleting the planet forever (Cubitt, 2017). Similarly, it is possible to use a cell phone and never consider the ramifications of purchasing the latest model of the iPhone every year or two. It is possible to use Google Drive, back up documents, and never consider the ramifications of cloud storage on the environment. It is possible and acceptable to 'binge-watch' television shows and movies through streaming services like Netflix. When media infrastructure becomes ordinary, it becomes far less alarming and essentially invisible. Since technology has progressed to a point where WiFi and "cloud storage" are now part of the everyday for users in developed countries, they embody the invisibility of media infrastructure; users may not understand, be aware of, or know about. When users fail to understand the very infrastructure that makes their everyday possible, they therefore miss out on opportunities to advocate for ecologically-smart innovation, sustainable practices, or the awareness that they contribute to the environmental problems associated with finite resources being used up in the production process of the devices they know, love, and use.

To better explain these ideas, it is helpful to consider the related example of the fashion industry. It could be argued that tangible devices are no different from a vast array of other consumer products that stimulate and sustain capitalism in the United States. If one considers the environmental implications of fashion manufacturing and merchandising (Arrington, 2018), the invisibility of the behind-the-scenes process of creating and getting an item to the consumer is very similar to the invisibility of communication infrastructure. Consumers rely on these products, and like communication technologies and the infrastructure it takes to make them function, they are not going anywhere in the foreseeable future and are continuing on their current design of planned obsolescence, part of the ordinariness of each day of consumer demand (Arrington, 2018).

There is a power dynamic to communication infrastructures, in that in the invisibility of the ordinary use is the result of corporate powers who are responsible for the various articulations that together, form an assemblage of ordinariness (Felski, 2000). Consumers who conduct a Google search may not consider how they are using data centers around the globe, how those data center sites have negotiated energy contracts with the local power grid or renewable energy projects within the grid. Rather, conducting a Google search, though it involves all those articulations, is something so ordinary and part of the everyday. Infrastructures are the visible traces of functionalities that may be considered invisible. They matter because without them, the Internet would not exist. Communication infrastructures matter because they are the core, the crux of every form of digital or mediated communication that scholars study and humans use in technologically developed areas. In this regard, infrastructures are also reflexive; to research and understand them, to write about them, authors and users depend on their function (Stokes, 2002). Infrastructures are the extraordinary doing the ordinary.

Conversations surrounding media infrastructure studies also acknowledge that there are historical and current infrastructures which deserve to be studied. In some literatures, infrastructures are typically associated with sidewalks, bridges, or various things that make public transportation or public life possible (De Certeau, 1984). Technological infrastructures are a shift from this line of thinking, in that they deal with similar possibilities in a mediated format. For scholars like John Durham Peters (2015), media studies should involve "infrastructuralism," ensuring that "the basic, the boring, the mundane, and all the mischievous work done behind the scenes" are highlighted and represented because they make media possible (p. 33). Peters builds off other scholars, including Geoffrey Bowker and Susan Leigh Starr (1999), to assess the way such crucial, often hidden, background operations of media are critical parts of how they serve as "crafters of existence" (p. 15) and the importance of "the call to make environments visible" (p. 38). Such behind-the-scenes operations are thus imperative components of media theory.

Data Centers

Broadly, data centers are one of the most important media infrastructures in the current conjuncture (Grossberg, 1992). They are the physical houses of the ethereal Internet cloud, the "physical clouds of cloud computing" (Roach, 2018, para. 14). As Google asserts on their dedicated website, data centers are "where the Internet lives" (Google Data Centers, 2018, para. 1). Data centers are vastly and holistically more complex than a simple abode or dwelling. When a company like Google uses a house metaphor, they are essentially glossing over the processes that enable functionality and instead creating a comparison that users are more inclined to understand. On the earth's surface and underneath the oceans, data centers are literally physical warehouses situated in communities and regions. These large warehouses are filled with a multitude of technologies working simultaneously to power and cool the servers which they contain. Data centers contain millions of servers which are ultimately the operational center, of the ethereal Internet (Cubitt, 2017). Each server functions as a type of "bulked-up" computer containing the chips that process all the data collected (Glanz, 2012, para. 1). Additionally, other standby and backup servers are always powered in case of malfunction to continuously produce the storage space required to maintain documents, photos, posts, and essentially everything users rely on their Internet to do (Glanz, 2012). Data centers also store media that are accessed through streaming services like Netflix, YouTube, Hulu, and Amazon Prime, while Microsoft heavily relies on them for their vast gaming empire in addition to their Office Suite and SharePoint functionalities.

Establishing what data centers are is simpler when it is done on the physical, material level. Definitions of data centers get even more complex. Data centers contain a multitude of physical structures, like wires, water piping, lights, electricity and servers and beyond these structures are a myriad of other factors. Larkin (2013) asserts the "duality of infrastructures;" infrastructures cannot simply be defined by their physicality and technologies (p. 329). Rather, infrastructures are not the technologies they contain. Instead, data centers are infrastructures in which other infrastructures and technology operate while simultaneously being themselves operated within external systems and infrastructures (Larkin, 2013).

Most broadly, researchers have classified data centers as the current day "factories" (Cook & Van Horn, 2017; Pickren, 2017). Data centers function in a model that reflects elements of agriculture; they are physical locations that require the same finite resources of water and potentially wind or solar power to function, or other non-renewable energy sources, to produce an outcome of storage. Servers do the work of recording, sorting, organizing, and storing information that consumers want to back-up, are seeking, and creates records of those items. Thus, data servers are part of labor that also relies on natural resources. Understanding data culture through this lens is possible in cultural studies, especially since "Agri-culture was born of a dependency on the natural world and thus of a precarious situation" (Striphas, 2019, p. 7). Data centers, an agri-cultural component of the Internet, offer a variety of connections between the environment and objective of their existences: to produce, store, and keep data accessible.

Without data centers, Internet usage in developed regions of the world would not be possible. Such Internet access broadly has societal and cultural implications. Scholars like Raymond Williams wrote that "culture is ordinary … every human society has its own shape, its own purposes, its own meanings" and that "every human society expresses these, in institutions, in arts and learning" (1959, pp. 92-93). In much of the 21st century United States, such ordinary cultural expressions are performed through the Internet, which is, in turn, enabled by such crucial infrastructures. However, such mundanity has its costs, especially as often these hidden or taken-for-granted communication technologies and infrastructures can lack accountability for the controlling entities since the public is largely unaware of their existence unless malfunction occurs (Starosielki, 2015; Graham & Thrift, 2007). To understand the reality of data centers and the Internet requires an analysis of its "usually just forgotten infrastructure" (Peters, 2015, p. 38). The operations data centers allow are the direct result of the infrastructure and technologies contained inside of them, and yet, data centers, like undersea cables and hidden wiring, can go unnoticed by users not physically located near them (Starosielki, 2015). Additionally, Internet users are vastly unaware they are even utilizing cloud storage; one survey found that 95 percent of users believed they were not using cloud storage when they were (Holt & Vonderau, 2015). Such gaps in public knowledge and understanding are problematic in numerous ways, such as consumers being unaware of the ecological ramifications of their technology usage, ultimately revealing a gap in public awareness of such seemingly essential technology.

One way to understand the various connections between infrastructures and environments is through a framework of articulation and assemblage described earlier. Articulations have duality. In one use, articulations can be helpful in understanding the relationship to “historical conjuncture” of that which is being analyzed (Slack, 2006). In another use, articulations reveal the “sociocultural conjunctures” that demonstrate what is or is not valued, who are and who are not valued, and where and by who the benefits are received (Slack, 2006). Ultimately, Slack and Wise (2005) argued that the articulations of technologies should be considered “among the physical arrangements of matter…and a range of contingently related practices, representations, experiences, and affects” (p. 128). Articulations are the particular connections between different elements, revealing specific unity – or difference -- between them (Slack, 2005). Articulations are the puzzle pieces that can fit together in particular ways of tension (Grossberg, 2010, p. 53).

Thus, by such a definition of data centers, one must go beyond mere materiality to assess the various working articulations of articulations within the ultimate assemblage of communication technologies. Doreen Massey (1993) argued that “what gives a place its specificity is not some long internalized history but the fact that it is constructed out of a particular constellation of relations, articulated together at a particular locus" (p. 67). With data centers, for example, one constellation revolves around electricity that powers the data centers. Electricity is an assemblage of articulations on its own, as the various wires and infrastructure work together to join a larger grid, controlled by corporate interests and situated in different regions, which are also powered by some form of energy source, whether that may be coal, nuclear, or now renewable sources. Another interesting aspect of electricity is its synonym, power, almost as though there is an acknowledgement that those who can harness, create, or experience luminance, have the true power, and those who can afford it or live in developed areas that have access to it also have a smaller power. However, data centers seem to exist in a type of diffuse way, like a rhizome (Deleuze & Guattari, 1987). For data centers specifically, tubes, wires, and infrastructure interact with one another in regions around the globe, though they are now corporately and privately owned. Because data are constantly re-routed through various servers located at different geographies, it can seem impossible to truly identify where specific data is stored, where personal computers have been, and where all the various components leading to functionality are created. Such power relationships are another crucial aspect of media infrastructure studies, as starting analysis on the ground – and in the dirt -- often reveals what Innis would describe as "a hidden history of power and conflict" (Young, 2017, p. 235). This thesis explores such power and conflict through the concepts of renewable energy.

Ecological issues related to digital media

Digital media technologies are not sustainable. The various working components of digital media innovation come with a price, both financially and ecologically. As a result, there are also many conversations among researchers about the ecological conditions of technology use since the Internet relies on so many natural resources (Offenhuber, 2017). One conversation involves the of the price of the newest model of the iPhone in a store (i.e., a price tag of $999) and the obsolescence of the technology in the current model (i.e., upgrading a device every few years). Another conversation could juxtapose the price of the iPhone on the price placed on the villages from which the precious minerals required were mined, with the toll on both the physical environment, the mistreatment of the workers and the lack of protective policies in place by the governments in countries involved (Cubitt, 2017). The way that digital media requires perpetual discarding of models of technology to make way for newer, supposedly more innovative ones is not sustainable (LeBel, 2016). Digital media are engineered to be discarded; they only perform for a few years and need to be updated on cyclical (and unsustainable) timelines. The networks that are required for digital media to function are not sustainable. The very ways that media sustain themselves and store information are not sustainable. Herein lies the true irony of messages of green initiatives and public-facing sustainability missions: they are often commissioned and perpetuated by connecting to the Internet, which is itself not sustainable. It is far easier for consumers to understand sustainability in tangible ways, like carpooling to work to reduce a carbon footprint, eliminating straw usage to save the sea turtles, or to clean up trash in the ocean and beaches. It is much more difficult to discuss sustainability of "the cloud," especially when very few even understand how cloud computing works or what happens behind-the-scenes to make it possible for the functionalities they rely on to occur. Because of the ethereality of their production and of the ways they work beyond basic commands or connections to WiFi, the ecological ramifications of their existence largely cease to be questioned or understood. The specific irony of not understanding something like data centers is especially striking because they make possible online sustainability messaging, and yet, public scrutiny of the massive energy and water consumption required, let alone the finite minerals and materials needed for the servers, is minimal by comparison.

The ecological issues specifically related to data centers hinge on many assemblages. Energy consumption of data centers is the most notable. As a country in 2017, the United States ranked second highest in total energy consumption at 3,808 terra-watt hours (TWh), trailing behind first ranked China at 5,683 TWh (Enerdata, 2018). In 2012, a yearlong investigation revealed that globally, data centers were consuming nearly 30 billion watts of electricity, or enough energy produced by 30 nuclear power plants (Glanz, 2012). In 2017, it was reported that Alphabet alone ingested "5.7 terawatt-hours of electricity, about as much as the city of San Francisco uses in a year" (Irfran, 2017). Additionally, it is estimated that data centers on their own consume up to 3 percent of the overall national energy consumption, which on surface level may not seem that much, but is truly enormous when one considers 3 percent of 3,808 TWh (Irfran, 2017).

In addition to electricity consumption, one must not overlook another critical aspect of keeping data centers functioning: water. In order to cool and power their infrastructures, data centers guzzle water. In more technical terms, data centers used 626 billion liters of water in 2016 and are anticipated to consume 660 billion liters by 2020 (Keisling, 2016). In 2017, Facebook reported that its data centers used approximately 300,891,967.6 gallons of water (Facebook Sustainability, 2018). In 2015, data centers in California alone were estimated to have used 250,000 gallons per day (Kassner, 2015). While data centers are cooled by around 165,371,703,299 gallons of water, 2.1 billion people lacked access to safe drinking water in 2017 (United Nations, 2018). Additionally, sometimes water infrastructures involved with corporations fail the humans in the regions they operate in, as evidenced by the current water crisis in Flint, Michigan. In April 2014, the heavy metals of chemical additives from the industry-used water in the Flint River corroded plumbing infrastructure, resulting in widespread lead poisoning and heavy metal leaching, severely and damagingly impacting the locals living in Flint (Anand, Gupta, & Appel, 2018). Therefore, in addition to massive need or inaccessibility to water, the regional water supply can be negatively impacted by industry and infrastructure can fail.

Technology companies have separate websites or blogs dedicated to their data centers that populate search engine results rather than being located on their main company pages. Additionally, companies are reactive rather than proactive about their "sustainability" of data centers. By their design, data centers are wasteful. The servers in data centers performing actual computations were reported in 2012 as only 6-12 percent of the energy users in data centers; this means that nearly 90 percent of the energy used by servers in data centers is not even being used for functions other than idling in case of surges that could impact the servers in use (Glanz, 2012).

Renewable Energy

Renewable Energy involves resources that natural lifeforms inhabiting the earth also require. Panels that use sunlight are modeled after the photosynthesis process in the plants that inhabit the same fields as the solar panels themselves. The end goal of renewable energy is to reduce overall emission totals, in turn helping to limit pollution that is associated with climate change (Wilberforce et. al, 2019). Renewable energy is considered more environmentally friendly because it involves technologies designed to convert the naturally occurring energy as part of the ecosystem to power and produce the energy that is necessary to power other technologies and infrastructures. The newer emerging sources of renewable energy include "marine energy, artificial photosynthesis, cellulosic ethanol, concentrated solar power," and "enhanced geothermal energy" (Wilberforce et. al, 2019, p. 852). Various solar panel fields are likened to an animal or agricultural farm, even down to the official verbiage used to describe them: solar farms, "concentrating solar power plants," or fields of "photovoltaic technologies" (Solar Energy Industries Association, 2018, pp. 1-2).

Technology companies are investing in renewable energy because they are becoming more aware of their ecological ramifications and 'footprints.' Though companies, especially Facebook, disclose many overall facts and figures for their data centers on their public-facing websites, they still leave things out. Facebook, Microsoft, and Amazon Web Services all publicize various levels of their plans or initiatives regarding renewable energy. Most notably, in an October 2018 blog post, Michael Terrell, Google's Head of Energy Market Development, reported that Google had become the “world’s largest corporate buyer of renewable energy” and they matched “100 percent of annual energy consumption with renewable energy purchases” in 2017 (Terrell, 2018, para. 3). On their website and all their public-facing materials, Google appears absolutely committed to the overall sustainability mission of the importance of renewable energy. Renewable energy can be described by companies in terms of “matching” versus “converting.” However, it is also important to understand that difference. Both of these concepts will be examined in further sections of this thesis as they relate to Google specifically. Technology companies, like Google, are discursively situating themselves with renewable energy, especially with renewable energy acquisitions.

“Buying” renewable energy

Energy regulations at the state and national level vary, meaning that depending on the locations or regions different companies and their infrastructures are located, they may have different requirements on how they handle their energy consumption. As such, energy is often one of the upwards of 50 different factors for Facebook and around 43 factors for companies like Microsoft when considering where to build their data centers (Fehrenbacher, 2012). North Carolina is one of the bigger hubs for data centers, with Google owning one in both of the Carolinas, because it includes access to reliable power at a low cost, enough rural areas to prevent outcries from populated areas who do not want to intersect, state tax incentives and tax breaks, water access, quick startup timeframes, non-problematic traffic and airport access, and a climate that promotes open-air cooling versus reliance on water all year (Fehrenbacher, 2015). Once a big company decides to build a data center in a certain region it is not uncommon for other companies to follow-suit; pitching a new location idea is much easier if a competitor has already successfully built and began operating (Fehrenbacher, 2015). All these factors, especially energy for the focus of this project, are important because, just as Google states, it is helpful to understand where users' "computers have already been" and "what keeps the Internet up and running" (Google Data Centers, 2018, para. 6).

On their website and all their public-facing materials, Google appears absolutely committed to the overall sustainability mission of the importance of renewable energy. In 2017, however, it was reported that Google began buying renewable energy credits that matched their energy consumption rates, meaning they invested in renewable energy sources that match the energy while not directly powering their technology with it (Irfan, 2017). Over a decade ago, economics journals featured publications describing the process of how a company could "meet its [energy] portfolio standard requirement" (Berry, 2002). There are, according to this literature, three options for utility or retail loads that can ensure the requirement is met: (1) a company can generate their kWh from the eligible resources and then sell those exact kWh at its retail price to its customers, (2) a company can purchase kWh from another party that already generated them from the eligible resources, transmitting or converting those kWh for delivery to the company's distribution system, or (3) a company can purchase the tradable credits that come from generation of the eligible resources from the owner of the credits without actually needing to transmit the associated energy to the company, a type of matching process (Berry, 2002). In short, companies can generate their own renewable energy, or they can purchase and convert renewable energy from elsewhere, and lastly, they could simply own the tradable renewable energy without converting their consumption. In the last option, companies are still producing energy from fossil fuels or non-renewable sources. In the following discourse analysis, this thesis analyzes what Google's amassing of renewable energy purchases means to them in how they disclose information about "matching" as opposed to directly converting to sources on site for renewable energy.

However, in 2012, Greenpeace — an independently funded and operated international organization focused on saving the planet — found that, while Microsoft adopted their internal carbon tax, they were buying "renewable energy credits (RECs) and carbon offsets" (Pomerantz, 2012). Microsoft was still relying on energy produced by coal while purchasing these credits to pay other companies who are making renewable energy without truly converting or powering their data centers with renewable energy (Pomerantz, 2012). In turn, despite their bold claims of clean energy conversion, they were not producing or using clean energy after all. Rather, it appears they opted for the third option of Renewable Energy Credits to meet their energy consumption portfolio (Berry, 2002). Google, like Microsoft, currently uses the "matching" verbiage, indicating they too are participating in the third option of Renewable Energy Credits. For publics who are unaware of what this means, it can be incredibly misleading to believe companies are attempting to convert their energy consumption. The analysis section of this thesis reveals arguments about how Google positions themselves, how they describe their role in renewable energy, and the corporate value claims they seek to make for consumers.

Stakes of research

Just as media infrastructures are often embedded in locations out of public attention or view, the environmental ramifications of technological infrastructure like data centers can go unnoticed. Government reports and agencies and news headlines are filled with warnings about an imminent climate catastrophe that is quickly approaching unless rapid and immense countermeasures are taken. However, advocating for corporate responsibility, especially in the technology area, seems unlikely when relatively few people are aware of the immense amounts of finite resources necessary for and consumed by technologies and infrastructures. Researchers, especially in Communication, should care about the environmental impact of data centers because they often partner with advocates; having conversations in both academia and the public are crucial. Researchers should care about the environmental impact of data centers because they communicate a larger issue themselves; their lack of perceived visibility and knowledge creates limits on the public's consideration or opportunities for political engagement (Starosielski, 2015). As Starosielski (2015) asserts, the insular complexities of communication media infrastructures are more often interlaced with a "privatized and competitive environment that values reliability" rather than "a product of national interests" (p. 92).

Likewise, capitalist economies are interested in creating revenue. In order to power such an economy, technology must meet the demands and innovation needed to drive growth. Data centers, a crucial infrastructure of a global economy, are the sustaining force while they themselves are not sustainable. Data centers have ecological ramifications and repercussions. When corporations fail to act responsibly with resources they are dependent upon in local communities, there are often dangerous ramifications. In his 2013 book, *Tom's River*, author Dan Fagin wrote about Tom's River in New Jersey, carefully telling the story of a chemical plant operating on the river (Fagin, 2013). The chemical plant caused a public health crisis after polluting the waters that the community depended on, with reports of it initially being "easier for managers to ignore or at least downplay signs that the factory was polluting groundwater and the river"(Fagin, 2013, p. 49). Over time, government and regulatory standards even allowed for harmful negligence in this case example, also reinforcing the notion that infrastructure and corporations are articulated to resources, public policy, and power. Earlier examples of the fashion industry, Flint, Michigan crisis, and Tom's River remind us that corporations rely on infrastructure, and infrastructure is inextricably reliant on material resources. These are complex relationships.

Data centers encapsulate the "surface manifestation of a deep structure of materials and their movements," and it would be incredibly impoverishing to only consider the tangible or geological layers which data centers comprise (Acland, 2014, p. 9). This research builds on current conversations surrounding data centers in media, technology, and cultural studies. Data centers impact the sustainment of the technology culture, the social media platforms and anything scholars study that involves the Internet. As this thesis began, the ongoing climate crisis requires corporate action towards sustainability. In addition, as this thesis argues, the ongoing climate crisis could be capitalized on by corporations like Google as they mask retroactivity as activism.

CHAPTER THREE

METHOD

Understanding how a company both promotes and maintains its image, values, or stances on issues can be accomplished through discourse analysis. For this thesis, I accessed Google's documents that any person with Internet access and interest would also be able to find related to data centers, sustainability, and renewable energy. These materials are presented on separate company websites and blogs, available through web links and attachments on these sites. In this thesis, the 'public' in public-facing materials exists because, like Warner (2002) asserts, people are addressed through discourse. For the purposes of this thesis, it is worth noting that Google presents its sustainability measures in a manner that does not require advanced experience with the topics, though those with insights into topics may better understand what is described.

This thesis articulates Google's data centers to energy and purported sustainability policies as the result of analysis of the discourse the company has issued through their dedicated public-facing materials, the policy documents the EPA has written, and the environmental reports that Google has published independently and through collaborative efforts with other agencies. To accomplish this, I analyzed 26 different Google webpages, two EPA reports, and five joint publications of external agencies including Oxford Economics, Lawrence Berkeley National Laboratory, The World Resources Institute, The Renewable Energy Buyers Association, and the Ellen McArthur Foundation that analyze Google and their data centers. The analysis in this thesis draws from the frameworks about critical discourse analysis (CDA) developed by scholars like Raymond Williams

(1959; 1977), André Brock (2018), Michel Foucault (1992b), and Norman Fairclough (1992a; 1992b; 2001). Critical discourse analysis builds articulations, or relationships, between items because it allows for contextualization beyond face-value of these documents. Understanding that Google is a company that relies on the physical environment to power and cool their machines that enable search engine functionality goes beyond the claims that are explicitly made in these documents. Relationships between Google, regional power grids, and renewable energy are revealed once one works to review what is or is not publicly said about those things. By evaluating the discourse they provide, matching it further with documents they provide through partnerships with outside sources, and by analyzing government materials related to data centers, I am able to contextualize and evaluate the claims, key terms, and to understand more holistically how Google situates and promotes itself through their disclosure.

Discourse, as Fairclough (1992a) argues, "is socially constructive, constituting social subjects, social relations, and systems of knowledge and belief, and the study of discourse focuses upon its constructive ideological effects (p. 36)." Discourse is "socially constructive" because it consists of language, social values, and social ideologies. Language comprises discourse, and language appears through "signification;" Williams argues that "signification" is "the social creation of meanings through the use of formal signs, is then a practical, material activity; it is indeed, literally, a means of production" (Williams, 1977, p. 38). Signs are created and arranged through human interpretation into meaning, which is a means of production because it requires labor in presentation, maintenance, and through reproduction. It is through the interpretation of signs, or the words, letters, grammar, etc., that we use that we construct our thoughts, ideas, and understandings of the world around us. In this way, interpretation is both subjective and socially constructed and maintained, portrayed materially through mediation, whether via paper, computers, devices, etc. In this thesis, discourse through the publicly available language used on Google's websites, blogs, and reports reveals overall stances, beliefs, and values of the company related to the topics like energy, infrastructure, resources, and revenue. Fairclough (2001) asserted that CDA builds from Williams' view, where it utilizes the view of "semiosis as an irreducible element of all material social processes" (p. 1). Here, "semiosis" refers to the idea of meaning making, where words, letters, and their formations constitute understanding of the world. Fairclough further argued that "analysis of discourse attends to its functioning in the creative transformation of ideologies and practices as well as its functioning in securing their reproduction" (Fairclough, 1992a, p. 36). When studying discourse, researchers can make informed discoveries about cultural values, understandings, positionality, power dynamics, and more because of the semiotic nature of language. Critical discourse analyses "offer interpretations of how a text can become polysemous and effective when placed in the public domain of cyberspace" (Mitra & Cohen, 1999). Brock (2018) further asserts that CDA appreciates "hermeneutics," reminding readers that CDA relies on interpretation as an analytical tool (p. 1019). For my thesis, I use CDA to interpret the materials, looking specifically for keywords, repeated phrases, or explicit mentions of values to draw commonalities between the documents, to track the ways they changed over time if possible, to interpret how Google positions themselves to the resources they consume.

One key aspect of conducting CDA also involves understanding what discourse is or what constitutes discourse. Michel Foucault is lauded as one of the key scholars in discourse and the methodology of discourse analysis. Michael Arribas-Ayllon and Valerie Walkerdine (2011) summarize Foucault's approach as one concerned with "genealogy" or "mechanisms of historic inquiry; "the archeology of "the mechanisms of power and offers a description of their functioning" (p. 92). Fairclough (1992b) summarizes Foucault's understanding of "discourse" as "concerned with analysing 'statements'" and these are concerned with "specifying sociohistorically variable 'discursive formations' (sometimes referred to as 'discourses'), systems of rule which make it possible for certain statements but not others to occur at particular times, places, and institutional locations" (p. 40). Essentially, Fairclough (1992b) summarizes how Foucault's understanding of discourse is closely tied to power, systems of power, and power in society. Discourse can be interpreted to reveal positions and systems of power, to contextualize some of the social values and ideologies.

CDA has been used in other ways by critical scholars, including Michelle Lazar (2005) in her works on feminist critical discourse analysis. Lazar (2005) asserts that "CDA is known for its overtly political stance and is concerned with all forms of social inequality and injustice" (p. 2). I draw inspiration from Lazar, in that understanding Google's position and stance with the ongoing climate crisis matters to me, and I believe corporations should be held responsible for the impacts they make on the environment. Further, Cubitt (2017) also reminds readers that environmental regulations are political, that "media are not only passive channels of communication: Parts of no part excluded from their own governance, they seek to speak for themselves" (p. 182). Energy regulations will impact Google's data centers. André Brock (2018), advances the CDA framework to conduct his research on "technocultural" matters: critical technocultural discourse analysis (CTDA). In his work, Brock (2018) asserts that CDTA uses CDA to isolate and examines "site-based online discourses" (p. 1025). Though this thesis does not utilize CDTA, an understanding of CDA's inspiration and applicability for online discourses is helpful in understanding the framework I used during my analysis of websites, linked materials, and web-based reports. Brock's (2018) work, though specifically pertaining to Black Twitter, provides inspiration for conducting critical discourse analysis via these online, mediated sources.

I also use lenses of inquiry from other communication infrastructure and technology scholars like Sean Cubitt (2017), John Durham Peters (2015), Nicole Starosielski (2015), and Harold Innis (Young, 2017). Cubitt (2017) theorizes the way technology in its current model is unsustainable, depleting earth's finite resources, and how technology is unsustainable with its cyclical obsolescence. Peters (2015) urges for a material understanding of media; "to understand media we need to understand fire, aqueducts, power grids, sewage systems, DNA, mathematics, sex, music, daydreams, and insulation" (p.29) because all of these things coexist to make media possible. Peters (2015) argues, "the digital changes of our times are impossible without mines and minerals, clouds and electrical grids, habits of human want and labor, and global patters of human inequality and abuse" (p. 377). This viewpoint is particularly salient for this thesis, as I am interested in understanding the energy and resources that enables Google, through its data centers, to meet its enormous demands. Starosielski (2015) asks questions about the invisibility of essential infrastructures, specifically undersea cables that are the “backbone of the global Internet” (p. 3). The question of “why have undersea cables, as the backbone of the global Internet, remained largely invisible to the publics that used them?” (p. 3) inspired this research altogether; Starosielski (2015) posed a question I applied to data centers and their energy consumption, since I had not heard about these infrastructures or been exposed to the figures of energy usage ever before, despite relying on servers most of my life growing up in a digital age.

To compile the archive of websites, reports, blog posts, and linked attachments, I conducted a search on Google Chrome using “data centers,” “sustainability,” and “renewable energy” as search terms. I chose these terms because I felt they best captured the questions I am asking, while also being broad enough to generate many results. The results of these searches revealed entirely separate websites dedicated to these search terms; Google does not include this information on their company webpage and instead redirects interested parties to these other websites/blogs on which all of their information is housed. For example, Google has separate sites for Sustainability and data centers, though the two redirect to one another frequently. These accessible materials featured everything from power usage graphics, images of Google data centers around the world, real-time updates about energy usage at specific locations, and easily navigable extensions to other pertinent materials. Blog posts were typically given authorship by high-ranking Google employees. The most common authors include Urs Hölzle, Google’s Senior Vice President of Technical Infrastructure; Michael Terrell, Google’s

Head of Energy Market Development; Kate Brandt, Google's Chief Sustainability Officer; and Ruth Porat, Google's Senior Vice President & Chief Financial Officer. I decided to analyze these materials because I wanted to critically analyze the language, discourse, as well as the relationships between such discourse, the environment, and the positions of corporate power that Google asserts through these public-facing materials. These materials were assessed using the method of critical discourse analysis to reveal keywords in the following findings section and some resulting arguments about public relations serving as policy for Google, which are explored in the analysis section.

To do such critical analysis, I read through each of the documents. After doing an initial reading of multiple items, I reread the documents and pulled quotes that I found were similar or repetitive, offered any key phrases, or explained Google's values explicitly or inexplicitly. After doing this with each material in the archive I constructed, I then went back through and analyzed the quotes I pulled and began synthesizing the findings. From there, I did some secondary research to learn more about some of the technicalities of the power grid, renewable energy credits and buying, matching versus converting energy consumption, and referenced the reports through other agencies. From there I completed the Findings and Results arguments that follow.

It is worth noting that my work is not a study in public relations. The method of CDA allows me to focus on and contribute to infrastructure studies, as the documents analyzed would not exist or be necessary without infrastructure. The CDA process allowed me to establish an understanding of Google's discourse, how they situate themselves to the public and the climate crisis, and to make some arguments about

Google's purported values within the world by way of their infrastructure. That is the critical nature of my work; to use discourse as a means to building the articulations of Google, the environment, and their data centers; to bring in the context of all of their documents, filled with the language of their values, and situate these things against the climate crisis, in context.

CHAPTER FOUR

FINDINGS

Google's Energy Terminology

My examination of Google's public-facing documents and materials revealed explicit discourse related to *energy buying and matching*, *power purchase agreements* (PPAs), *green tariffs*, *renewable energy credits* (RECs), *power usage effectiveness* (PUE), and *carbon neutrality*. An important step in critical discourse analysis is to also contextualize such discourse, which involves analysis of documents from others, including government agencies. In 2007, the Environmental Protection Agency (EPA) released a report about energy use in the country's data centers, a "vision for achieving energy efficiency in U.S. data centers" (p. 13). The EPA's report also states that, "Although the growing energy use of servers and data centers makes this a challenging goal, there are large opportunities for savings. These savings will not be easy to achieve, given the barriers outlined in this report, but there are many policies available to overcome the barriers" (EPA, 2007, p. 13). The documents analyzed contain Google's explanations about such barriers they face as a company.

It is important to note that Google is not the only one promoting their core values, goals, and commitments to clean energy. In 2019, for example, The Environmental Protection Agency (EPA) selected Google as their "Green Power Partner of the Year" Award, which is a category that "is the highest organizational honor in EPA's Green Power Leadership Awards and the activities are commensurate with this level of recognition" and "recognizes Partners that distinguish themselves through their green power use, leadership, overall strategy, and impact on the green power market" (EPA, 2019). The EPA continues, stating that the winners of this award "represent a beacon for other organizations to follow, represent best in class in terms of market impact, and have a compelling story that is both unique and replicable to a wider set of market participants" (EPA, 2019). Google is also a founding member of the Renewable Energy Buyers Association (REBA), whose "goal is to catalyze 60 gigawatts (GW) of new renewable energy projects by 2025 and to unlock the energy market for all large-scale energy buyers by creating viable pathways to procurement" (REBA, 2020). Google leadership, including Mitchell Terrell, Google's Head of Market Energy Development, are members on the REBA board, alongside company executives from Amazon, Salesforce, Facebook, General Motors, and more. Such context bolsters the following claims and positions Google promotes, also situating the company as one of the leaders in the renewable energy marketplace. Such alliances, like REBA, matter to Google because, as Ruth Porat, the Senior Vice President and Chief Financial Officer at Google, wrote: "We firmly believe that every business has the opportunity and obligation to protect our planet" (Porat, 2019).

Sustainability as Value

Google has positioned itself as both invested in and conscious of the relationships they have with the resources required to make their operations function: "At Google, we care about energy for many reasons, but fundamentally it's because our business depends on it" (Google, 2016a, p. 2); and "creating a carbon-free future will be no easy feat, but the urgency of climate change demands bold solutions"(Terrell, 2018, para. 6). Google's documents express how the company views these relationships as "commitments." These commitments matter to Google because, "electricity is the fuel that allows our data centers to deliver billions of Google searches, YouTube views, and much more—every single day, around the clock. Our commitment to carbon-free energy should be around the clock too" (Terrell, 2018, para. 1). Beyond their business, "Google is committed to being part of the solution to solving global climate change, both through purchasing renewable energy to match the energy use of our own operations and by helping to create pathways for others to purchase clean energy themselves" (Google, 2016a, p. 3). This disclosed commitment to being part of the climate change solution goes back to Google's foundational, core values:

> "Operating our business in an environmentally sustainable way has been a core value from the beginning, and we're always working on new ideas to make sustainability a reality — like enabling the building of healthy workplaces and creating a living, breathing dashboard for the planet. We've reported our carbon footprint and published information on our sustainability programs for many years in white papers, blog posts, and on our website" (Hölzle, 2016, para. 7).

Again, other documents included explicit discourse, reiterating such business commitments: "At Google, our values reflect the fundamental importance of inclusion, openness, science, and commitment to the environment. Operating our business in an environmentally sustainable way has been a core value from the beginning," (Google, 2016b, p. 1); "Google has a longstanding commitment to climate action and environmental stewardship. Sustainability has been a core value since Google's founding, and we strive to build sustainability into everything we do" (Google, 2019, p. 2).

Other documents indicated when Google made strides towards accomplishing their goals: "In 2017, Google achieved a major milestone: purchasing 100% renewable energy to match our annual electricity consumption for global operations, including our data centers and offices. We did it again in 2018" (Google Data Centers, n.d., para. 1). Such explicit mentions related to commitments continued across the documents in this project and appear as another exemplification of Google's purported pioneering on the sustainability front. Through each of the quotations pulled, Google articulated their relationships to sustainability and carbon neutrality as a "commitment" or "value."

Sustainability as Commitment

In 2016, Google released an Environmental Report that comprehensively outlined the steps the company has taken and plans to take to be more sustainable in operations. Urs Hölzle, Google's Senior Vice President of Technical Infrastructure, opened the document expressing how "our values reflect the fundamental importance of inclusion, openness, science, and commitment to the environment" (Google, 2016b, p. 01). The word "commitment" appeared 18 times in this document alone, with each use referring to a form of financial or contractual agreement that builds off the promise to better the environment through Google's practices (Google, 2016b). Nearly 3 years later, the 2019 Environmental Report began with Urs Hölzle and Ruth Porat, Google's Senior Vice President and Chief Financial Officer, expressing that "Google has a longstanding commitment to climate action and environmental stewardship" and "Sustainability has been a core value since Google's founding, and we strive to build sustainability into everything we do" (Google, 2019, p. 2). In the 2019 report, the word "commitment" appeared 22 times and implies promises, financial agreements, and company stances (Google, 2019). As my analysis continued, commitment remained a key term with such implied meanings, often reiterated by company leadership, and I believe it is worth noting here because it is central to how they frame their corporate role in the climate crisis. A commitment can be a value, a financial business agreement, and a stance.

Google and Renewable Energy

To further understand what it means for a company like Google to have an obligation or commitment to "build sustainability into everything" they do (Google, 2019, p. 6), Google posed a question: "Let's say it's 2009. You're a global technology company, and you need very large amounts of renewable energy. How do you get it?" (Google Sustainability, n.d., para. 1). Documents announced how Google's "large-scale procurement of wind and solar power is a cornerstone of our sustainability efforts, and has made Google the world's largest corporate buyer of renewable energy" (Google Data Centers, n.d.-b, para.1). In the last few years, Google, somewhat redundantly, touts big accomplishments in execution of their commitments: "In 2017, we became the first company of our size to match our entire annual electricity consumption with renewable energy (and then we did it again in 2018). As a result, we became the largest corporate buyer of renewable energy in the world." (Pichai, 2019, para. 2). Documents indicated that such accomplishments occurred through their purchasing prowess:

> In 2012, Google made a commitment to purchase enough renewable energy to match 100% of our operations, and we are excited to announce that we will reach that goal in 2017. Reaching our 100% renewable purchasing goal means that Google will buy on an annual basis the same amount of megawatt-hours (MWh) of renewable energy—both the physical energy and its corresponding renewable energy certificates (REC)—as the amount of MWh of electricity that we consume for our operations around the world. (Google, 2016a, p. 1)

In a 2017 report from Alphabet, Google's parent company, climate change is described as integrated into business strategy through renewable energy. Namely, Alphabet disclosed that in order to "mitigate future price rises in electricity costs" they "seek long-term contracts for renewable electricity" and are "relentlessly focused on improving energy efficiency in our facilities, including data centers and office spaces" (Alphabet, 2017, p. 8). Renewable energy is important to Google's corporate climate change strategy.

Not only do the documents repeat one another reiterating the company's commitments and the purchases they have made to reach them, they sometimes break down the process. For example, in 2010, a post on Google's official blog by Urs Hölzle, Senior Vice President of Technical Infrastructure, detailed the company's step-by-step processes: "First, we minimize our energy consumption; in fact, we've built some of the world's most energy efficient data centers. Second, we seek to power our facilities with renewable energy, like we did in Mountain View, CA with one of the largest corporate solar installations. Finally, we purchase carbon offsets for the emissions we cannot directly eliminate" (Hölzle, 2010, para. 1). In 2016, Google representatives gave more details related to their processes: "We have aggressively employed a variety of purchasing tactics, some of which are closer than others to our ultimate goal to supply our operations with 24-7 clean energy. We use four primary tactics: 1. "Direct" renewable purchasing, 2. "Offsetting" renewable PPAs (aka "fixed-floating swaps"), 3. Utility renewable energy tariffs, 4. Grid-mix renewable content" (Google, 2016a, p. 5). Throughout these documents, multiple, perhaps unfamiliar, terms have been presented and will be explored to understand how the company explains their accomplishments. The following sections analyze the discourse related to explaining the purpose and process of renewable energy acquisitions.

Carbon Neutrality

Google needs energy, wants to buy renewable energy, and plans to minimize their carbon footprint on a level and rate they claim to be unmatched by their fellow competitors and colleagues. Carbon neutrality, or essentially claims that the carbon added into the atmosphere is matched by carbon detracted from the atmosphere, is something Google boasts about: "Google's cloud services are all carbon neutral—dating back to 2007" (Google, 2011, p.1). Google understands carbon neutrality and greener operations are not isolated to energy though that is a very important, prominent facet of their work. Instead, documents also reveal how Google hopes to "maximize the reuse of finite resources across our operations, products and supply chains and enable others to do the same" (Brandt, 2019, para. 8). Google uses the term "carbon neutrality" alongside mentions of renewable energy; "We depend upon large quantities of electricity to power

Google services and want to make large actions to support renewable energy. As we continue operating with the most energy efficient data centers and working to be carbon neutral, we're happy to also be directly purchasing energy from renewable resources" (Hölzle, 2010, para. 4). Google's support for renewable energy comes through adding renewable energy projects to their portfolio with big implications; "Once all these projects come online, our carbon-free energy portfolio will produce more electricity than places like Washington D.C. or entire countries like Lithuania or Uruguay use each year" (Pichai, 2019, para. 3).

Buying Energy

To acquire renewable energy, Google representatives wrote that, "Ideally you would just buy it from your local utility. But you can't, at least not yet: Most utilities are still heavily regulated entities whose business model — keep the lights on and prices reasonable — lacks both mechanisms and incentives to respond to customer requests for renewable energy" (Google Sustainability, n.d., para. 2). To overcome this and when discussing such renewable acquisitions, a popular term Google uses throughout their materials is Power Purchase Agreements (PPAs). They describe a PPA as "a contract to buy power over a period of time at a negotiated price from a particular facility" (Google, 2013, p. 3). The company became interested in PPAs over a decade ago and described the process: "In 2009, our data center energy team began to study power purchase agreements (PPAs): large-scale, long-term contracts to buy renewable energy in volumes that would meet the needs of our business (Google Sustainability, n.d., para. 5)." Google explains that they cannot buy enough "clean energy" from the utility companies on the grids of their infrastructure, and due to geographical limitations, they are unable to produce enough of their own green energy on site (Google Sustainability, n.d.). Instead, they say that, through wholesale agreements, they can purchase green energy from developers who operate on the same power grids as their data centers (Google Sustainability, n.d.). Essentially, Google has contracts with renewable projects that are specifically located on the same power grids as their data centers so that, since they cannot "legally or physically" transfer that power directly to their centers, they can access that energy through the grid (Google, 2013, p. 3). It is important to understand that energy, or the individual comprising electrons, exist in ways that make it impossible to differentiate between which were created via green or "brown" sources. Hypothetically, PPAs could also be thought of as adding drops of water into a pool; the particles in the pool will be changed with each addition, making it possible to extract water droplets with varying concentrations of whatever was added. One may not know where such additions began or end, but the entire body of water is changing in composition. Because of this, when Google adds their green electrons to the grids through PPAs, the result is a process that also helps to green the regional power grids overall. Google representatives stated that, "while the renewable facility output is not being used directly to power a Google data center, the PPA arrangement assures that additional renewable generation sufficient to power the data center came on line in the area" (Demasi, 2013, p. 2). This is how PPAs work- Google purchases green electrons and adds them to the local power grids, making them available for use and in essence, changing the composition of the entire pool of energy generated to something purportedly "greener." Legally, such dilutions count towards the greenness of the energy used by the organization who owns the purchases.

Though Google does hope to buy renewable energy from projects located within the same power grids as their data centers, sometimes this is not always possible. There is a difference between buying energy and "matching" the energy used all hours of the day. In fact, one document acknowledged this difference, explaining how Google matches their "annual electricity consumption," which does "not mean that our facilities are matched with renewable energy every hour" of the day (Google Data Centers, n.d.-b, para. 2). The same document also expresses the impossibility and the ways they overcome sourcing enough green energy on their properties: "to compensate for times and places in which the wind slows or sunlight fades, we currently buy a surplus of renewable energy at other times and in other places" to accomplish their 24/7 carbon neutrality (Google Data Centers, n.d.-b, para. 2). Google's discourse explained how, ultimately, they are interested in ensuring their renewable energy buying is at least equal to their energy consumption, ending at a net zero or neutralizing their energy requirements. While, as discussed earlier, it is impossible to guarantee if the energy they are using is green or "brown," Google can measure if they are matching their energy consumption with energy from renewable sources across the globe. Such measures are defined as the metric of Power Usage Effectiveness (PUE), an industry metric that will be further explored.

Renewable Energy Credits

In addition to PPAs, another common term Google uses in their documents is Renewable Energy Credits (RECs). In a 2013 document, Google representatives offered a definition of RECs: "A common way that companies seek to support renewable generation is through the purchase of RECs. RECs are a tradable commodity that represent a claim to the environmental benefits associated with renewable power generation -- they are not tied to the physical delivery of electrons. RECs are sold either "bundled" with the underlying electricity generated, or 'unbundled' as a separate commodity from the energy itself" (Demasi, 2013, p. 2). After Google purchases a renewable energy project contract, they sell that acquired energy to the local energy grid at a "wholesale" price (Google, 2013, p. 3). Once this transaction occurs, Google acquires a "net-loss" since wholesale selling is often less than the renewable acquisition costs. At this point, however, Google states they "strip" the RECs and then "keep them so no one else can claim credit for the green aspect of our purchase" (Google, 2013, p. 3). Another Google document explains that REC purchases are "issued by the renewables industry to record every unit of energy that's produced by renewable means" (Google Sustainability, n.d., para. 8). With such purchases, Google gets the "credit" for the renewable energy being sold into the power grids. This means that they will "run our facilities with ordinary power purchased from the local utilities and permanently 'retire' the RECs against our actual energy consumption, thus reducing our carbon footprint" (Google Sustainability, n.d., para. 8). RECs go beyond PPAs in that Google can sometimes add green energy to local power grids but then get the legal credit for such additions.

Another way Google describes this process includes striping RECs to "keep them so that no one else can claim credit for the green aspect of our purchase" (Google, 2013, p.3). Another document elaborated, stating that "we strip off the newly created RECs from our PPAs (in step 1) and match them to the retail electricity that we purchase at the data center. Over a year, the total number of RECs we apply equals the total consumption at our data center" (Google, 2016, p. 7). So, while PPAs are concerned with adding green electrons from renewable energy projects into the power grid, RECs are the next step in the process, allowing companies to get credit for the amount of renewable energy generated at a project and for no one else to get that credit. Then, since Google knows how much energy it requires to operate, they can know how many PPAs and RECs they need to ensure they can operate neutrally.

Green Tariffs

In addition to PPAs and RECs, another aspect of Google's energy portfolio includes green tariffs**.** Green tariffs, according to Celenia Benguli (2019) of the World Resources Institute, are used by companies like Google because "such customers want more than just the Renewable Energy Certifications (RECs) that allow them to claim credibly that they are using green power—they also want access to the long-term, fixed-price structure of renewable energy" (para. 2). Benguli (2019) continues by explaining how Green tariffs "cater to customers' preference for a more direct financial connection to nearby renewable energy projects" and that "they can also offer greater economic value to customers than unbundled RECs alone" (para. 2). Green tariffs allow energy companies like Duke Energy or Georgia Power to offer customers access to energy from renewable projects located in that region. In regions where energy is regulated, meaning customers have only one choice of company to use to provide their power, green tariffs offer the opportunity for these customers to access renewable energy. Benguli (2019) further explained:

> Green tariffs, or riders, emerged as an option for customers in traditional, regulated markets, and have expanded rapidly in recent years. Offered by local utilities and approved by state public utility commissions (PUCs), these programs allow eligible customers to buy both the energy from a renewable energy project and the Renewable Energy Certificates (RECs) at a more favorable price. Green tariffs were originally designed for large-scale energy customers but may include small customers as well. (Benguli, 2019, p. 3)

With all of this in mind, Google's documents explained green tariffs as "utilities [which] would offer companies like Google the choice to buy renewable energy through a new class of service" however, this voluntary service would only be available to those to "meet basic criteria" (Benguli, 2019, p. 3). If Google spends the money to procure the renewable energy, any customer who then wishes to access the energy would have to pay for the option, which avoids the "impact on other ratepayers" (Demasi, 2013, p. 3). In other words, for those who do not wish to have access to renewables, they would not have to pay for the added projects on the grid they use. For those who want to opt-in, the 2013 Google report lists out a "proposed structure" that includes definitions of "eligibility," "integrated service," "renewable generation sources," "green attributes," and "pricing" (Demasi, 2013, p. 4). So, while they say that "the concept of a renewable energy tariff" is simple," Google's structure reveals the complexity of the process (Demasi, 2013, p. 3).

It is through these renewable options and relationships that Gary Demasi, Google's Director of Global Infrastructure, discloses their hopes:

> We'll continue to find creative ways to supply our facilities with renewable energy, but we think this solution can provide an important new way to increase the use of renewable energy nationwide. We look forward to working with utilities, state utility commissions, companies and other stakeholders to make it a reality. (Demasi, 2013, para. 5).

By 2018, Demasi echoed similar language about partnerships with utilities companies, concluding with announcing a "public pledge to triple our renewable energy purchases for our data centers by 2025" because "we know we have a lot more work to do" (para. 5). Also in 2018, Michael Terrell, Google's Head of Energy Market Development, provided an example of how Google is accomplishing their solutions, citing a recent partnership between their Lenoir, North Carolina data center and "local electricity supplier" to establish one of the first utility solar purchase programs in the U.S. (Terrell, 2018, para. 4). Google continually positions itself as a leader in renewable energy, as uniquely positioned for efficiency, and as a developer of partnerships that will be transformative across the world.

"Additionality"

Google, not surprisingly, also discloses how they are strategic when considering which renewable energy purchases they make, beyond ensuring they are located on the same energy grids as their facilities. In 2019, Google's CEO Sundar Pichai wrote that the most recent renewable energy purchases they made both increased Google's energy portfolio by more than 40%, but the purchases also met the "rigorous 'additionality' criteria we set out long ago for our energy purchases" (Pichai, 2019). As part of their corporate strategy to "ensure that Google is the driver for bringing new clean energy onto the grid," Google requires any renewable energy projects they purchase to be "additional" (Google, 2016, p. 6). Rather than buying renewable energy from projects that are already inputting power into the local grid, Google mandates their purchases must come by adding brand new projects. Specifically, they state 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 (like state renewable energy standards)" (Google, 2016, p. 6). Ultimately, through this requirement of additionality, Google wants to further the economic growth and technological advancements of the regions in which they operate (2016, p. 6). In 2019, this additionality standard reportedly spurred "the construction of more than $2 billion in new energy infrastructure, including millions of solar panels and hundreds of wind turbines spread across three continents" and "our renewable energy fleet now stands at 52 projects, driving more than $7 billion in new construction and thousands of related jobs" (Pichai, 2019, para. 4). These documents explaining additionality again reiterate Google's stance as an industry leader and economic driver in economies across the globe, spanning beyond the United States.

Measuring Energy Usage- PUE

Beyond matching their energy consumption, Google is concerned with ensuring their internal operations are energy efficient to reduce consumption needs. To do so, Google documents indicate PUE as a metric that involves measuring energy usage "every 30 seconds" in a standardized way across the industry (Kava, 2014). For Google, this means they benchmark their own PUE of their facilities against other competitors, calculating their performance and needs and contrasting their progress. Globally, cloud computing involves data servers, cooling infrastructures, and the warehouses and materials that enable connection on Google's properties. Energy is required for the functionality of all of these components and efficiency is important to Google, and Google is sure to include "all sources of overhead in our efficiency metric" (Google Data Centers, n.d.-a, para. 8).

The process of measuring energy usage across Google operations is not dissimilar to the energy companies coming to customers' homes and viewing the meter numbers. In fact, Google describes getting their PUE measurements by using "multiple on-line power meters in our data centers to measure power consumption over time" (Google Data Centers, n.d.-a, para.11). Google notes that "the data center industry uses the measurement 'PUE,' or power usage effectiveness, to calculate the energy costs of housing and cooling servers" and that "PUE measures how much overhead energy is required to house and cool the computers inside a building relative to the amount the computers consume themselves" (Google, 2011, p.3). Additionally, Google attempts to ensure they use a more holistic standard than often used in the industry by reporting a more "comprehensive" year-long PUE in all seasons with "all sources of overhead" included in the measure (Google Data Centers, n.d.-a, para. 8). In the document, Google gives access to their comprehensive PUE reports across the years, including the scores from each of their data centers around the globe, spanning from 2008 to 2019 (Google Data Centers, n.d.-a). Though the PUE calculations are advanced mathematical equations, it is worth noting that Google touted an average 2019 PUE score across all data centers as 1.11, "making our data centers among the most efficient in the world" (Google Data Centers, n.d.-a, para. 9). Further in the document, Google disclosed that the largest industry respondents to the Uptime Institute's 2019 Data Center Survey had a PUE score of approximately 1.67 (Google Data Centers, n.d.-a). The lower the PUE score, the more efficient the operation.

To explain how Google manages to have a lower PUE score, the company discloses how they have managed to find ways to utilize their infrastructure and systems more consciously. One example they report is raising the temperature of their data centers to "80°F," also "using outside air for cooling" and building their own "custom servers" (Google Data Centers, n.d.-a, para. 5). In doing this, Google can capitalize on some of the regional temperatures for their data centers, as well as perfecting efficiency within their machines by engineering them internally. Additionally, a Google report offers figures that compare their cloud against the in-house servers that companies use, making a case for why they are the most efficient cloud computing option.

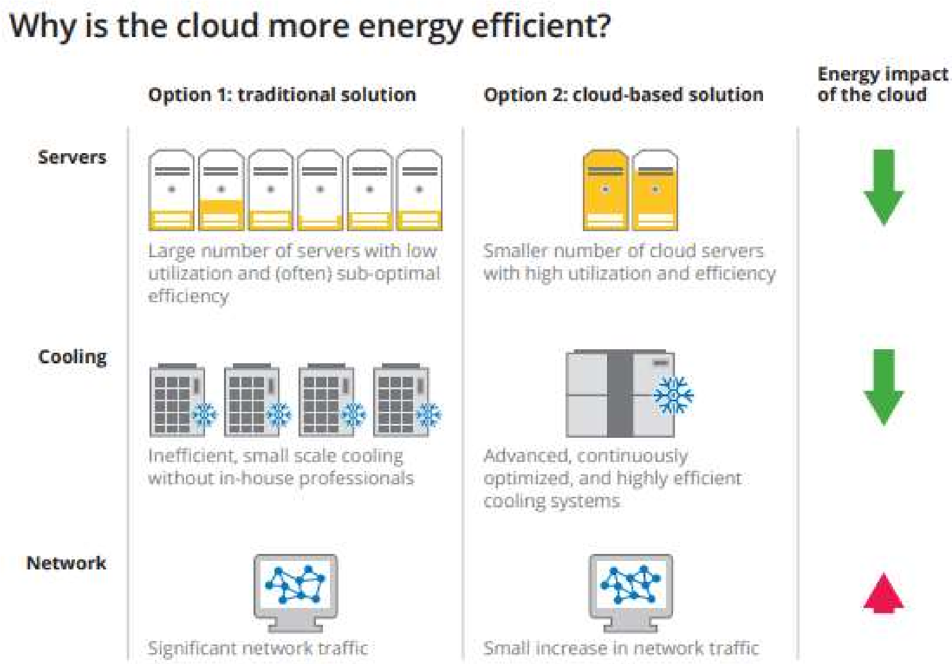

Fig. 1: Google's Energy Efficient Cloud, (Google, 2012, p. 2)

In Fig.1, Google's 2012 report explains how their cloud solution is more energy efficient versus those using private, in-house data centers. In Option 1, Google highlights how in-house data servers are often more numerous, the cooling of the servers as being "inefficient" and more numerous in terms of equipment to power the "significant network traffic" (Google, 2012, p. 2). Contrast this to Option 2, the image demonstrates how Google has mastered energy efficiency of their data servers, the cooling required, and how ultimately despite a small increase in the amount of energy needed to meet the server network traffic demand, their cloud is the best option (Google, 2012, p. 2). Google's (2012) report concludes with a staggering statistic: "According to a recent study by the Carbon Disclosure Project, by migrating to cloud computing, large U.S. companies could achieve annual energy savings of $12.3 billion and carbon reductions of 85.7 million metric tonnes by 2020—equivalent to the annual emissions of over 16.8 million passenger vehicles" (Google, 2012, p. 4). Since Google simultaneously positions themselves as an industry leader in operations efficiency, transitions to their cloud services would be the most effective, explicitly stating so in the following: "Because of our energy efficiency efforts, our cloud is better for the environment. This means businesses that use our cloud-based products are greener too" (Google Data Centers, n.d.-a, para. 4).

Another Google report argues that Google's cloud services capitalize on the scale of their operation, arguing that "cloud providers take advantage of this efficiency in scale by providing servers for millions of users—maximizing the utilization of machines while cutting down on the total number of servers required. The result is fewer machines and less energy over all" (Google, 2011, p. 4). Google's size and scale of global operations means they can maximize to meet the demands of millions of consumers while being more efficient through strategic engineering. Thus, efficiency means reducing the amount of energy needed to complete a search, streaming a video, sending an email, etc. For example, Google explains how checking an email consumes energy from the client's device, the network of wireless routers, and the server that sends and stores the emails (Google, 2011, p. 1). A "cloud-based email system" is described by Google as "more efficient" because it "saves considerable amounts of per-user energy costs once provisioning email servers, providing redundancy, and cooling costs are taken into account" (Google, 2011, p. 1). Again, Google reiterates how the scale of their operations offers more efficient options for users.

Google takes their PUE seriously while explicitly promoting how much more efficient it is for other businesses to use their data centers for their cloud storage needs. In the same document that explains their PUE, Google includes a study that "has shown that businesses that use Gmail have decreased the environmental impact of their email service by up to 98% compared to those that run email on local servers" (Google Data Centers, n.d.-a, para. 3). Since Google has mastered their own efficiency, they, by default, also explicitly position themselves as the answer for efficiency for other companies. For example, a 2012 Google report gave an example of the U. S. General Services Association (USGSA) using their services. The U.S. General Services Association is a government organization which contracts, leases, and manages government buildings, as well as offering private sector IT, supplies and equipment, and services to the military (USGSA, 2020). Additionally, the USGSA touts itself as promoting "management best practices and efficient government operations through the development of governmentwide policies" (USGSA, 2020). In 2012, a Google PUE report used the USGSA as a case example, stating that its approximately 17,000 users switched to using Google's cloud services and saved "$285,000 annually" in energy costs, while also reducing "server energy consumption by nearly 90%," and "carbon emissions by 85%" (Google, 2012, p. 1). The inclusion of this government organization is important because, as Google makes the claim that they offer the most energy efficient business operations among their competitors, they also give an example of an organization saving with their services that promotes itself as efficient in operations across the government (USGSA, 2020).

Artificial Intelligence/Machine Learning for Efficiency

Google can generate their PUE metrics because of their ability to track their usage data and then optimize their processes. In 2014, an official blog post revealed that one of Google's data center engineers, Jim Gao, used machine learning to create a system in which a computer could learn from large amounts of data to identify patterns and then "learn" from them to optimize energy usage (Kava, 2014). Gao's report revealed that "Machine learning is well suited for the DC environment given the complexity of plant operations and the abundance of existing monitoring data" and that "The interactions between these systems and various feedback loops make it difficult to accurately predict DC efficiency using traditional engineering formulas" (Gao, 2014, p. 2). To overcome such challenges, Gao employed "neural networks;" these are complex mathematical equations which access multiple data points simultaneously and configure the rates, in this case, of optimum energy efficiency across operations (Gao, 2014, p. 3). Ultimately, Google can use their machine learning to leverage "the plethora of existing sensor data to develop a mathematical model that understands the relationships between operational parameters and the holistic energy efficiency" in attempts to ultimately reduce their overall PUE across operations (Gao, 2014, p. 7). Gao's machine learning discoveries have again positioned Google as a leader in energy efficiency for their data centers, promising future efficiency at PUE levels well below the industry standards.

In addition to disclosing information through scientific reports that are linked from Google's blog, the company also released documents that are more user-friendly to further explain how they are using machine learning to become more energy efficient. On their “Environment Projects” tab through their sustainability website, Google explained how “Machine learning gives computers the ability to learn things without being explicitly programmed, by teaching themselves through repetition how to interpret large amounts of data” (Google, n.d. -d, para. 5). Google also reiterates how such machine learning is already used by the company in search engine capacities: “Google already uses it to improve features like translation and image recognition. When you ask Google Photos for pictures of people hugging, it’s machine learning that finds the photos you’re after” (Google, n.d. -d, para. 5). Because machine learning can analyze so many different, complex data points across the enterprise simultaneously and then configure options for more efficiency, Google describes the future potential: “Google’s environmental team wants our operations to emit less carbon. Hardware ops aspires to fewer component failures. The platforms people care about server energy consumption. Machine learning can help them all achieve their efficiency dreams” (Google, n.d. -d, para. 10).

As an industry leader in the renewable energy acquisition and PUE metrics, Google also positions itself as a leader in artificial intelligence and machine learning in other documents, stating that they are “using AI to build a more sustainable world” (Porat, 2019, para. 15). Ruth Porat, Google’s SVP and CFO, wrote that “We built an AI-powered efficiency recommendation system that directly controls data center cooling” and “this first-of-its-kind cloud-based system is delivering energy savings of roughly 30 percent” (Porat, 2019, para. 16). Porat further asserted that, “After DeepMind and Google started applying machine learning algorithms to 700 megawatts of wind power in the central U.S., the value of that wind energy has been boosted by roughly 20 percent”

(Porat, 2019, para. 17). Beyond added benefit to wind energy and AI-powered efficiency and in similar themes to creating greener options for all, Gao also argues that their machine learning can "help other companies and industries get a lot greener, in both senses of the word" and plan to release another paper with more details about their developments in the near future (Google, n.d. -d, para. 11). In a collaborative report in 2013 referenced on Google documents, the Lawrence Berkeley National Laboratory research team investigated data centers, and they found that "cloud computing holds great potential to reduce data center energy demand moving forward, due to both large reductions in total servers through consolidation and large increases in facility efficiencies compared to traditional local data centers" (Masanet et al., 2013, p. 1). Through their partnerships with outside research teams and their own internal developments with artificial intelligence to improve their PUE and overall efficiency, Google positions itself as an incredibly viable option for customers and a leader over competitors.

Google's Circular Economy

My analysis also revealed mentions of "a circular Google" and the "circular economy" while positioning itself within the climate crisis (Brandt, 2019, para. 3). In 2019, Kate Brandt, Google's Chief Sustainability Officer, published an article on the "Outreach & Initiatives" section of Google's website, introducing the "circular economy" model and outlining why it is an essential part of Google's current and future practices as a company (Brandt, 2019, para. 3). Brandt (2019) begins by introducing how the consumer economy "demands" more than can reasonably be produced by the Earth- "just last year, humanity's consumption of resources-- such as metals, timber, and even land-- required 1.7 planet Earths to sustain"(para. 1). After another paragraph dedicated to explaining waste from plastic straws to plastic dumped into the oceans, Brandt explains how "for too long, the damaging environmental consequences of these linear systems remained relatively invisible," but now, "the impact cannot be ignored" (Brandt, 2019, para. 2). After discussing the current issues related to resource consumption, the post continues by introducing Google's new "circular strategy" that "is part of our wider effort to build sustainability into everything we do" (Brandt, 2019, para. 4).

Another document argued that "today's economy is linear: it has a beginning and an end" and this means that "companies dig up materials, turn those materials into a product, and then ship that product to an end user who eventually tosses it in the trash" (Google, n.d. -c, para. 3). In light of the climate crisis, Google promotes an understanding of how such linearity is not only damaging, but the "system has to change" (Google, n.d.-c, para. 3). Focusing on their data center operations specifically, Google partnered with the Ellen MacArthur Foundation in 2016 to perform a case study of data centers and the circular economy model (Brandt & Rana, 2016). Google described choosing the partnership with the Ellen MacArthur Foundation because it is "a nonprofit that helps companies around the world adopt circular economy practices and experience the enormous benefits" (Google, n.d.-c, para. 5). Google also explained they chose to do a case study of their data centers specifically "because data centers generally tend to be material intensive," and "they are like small cities filled with servers, drives, routers and other components" (Google, n.d. -c, para. 6).

The 2016 case study revealed Google's three principles for their circular economy: "preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows," "optimise resource yields by circulating products, components, and materials," and "foster system effectiveness" through design (Brandt & Rana, 2016, p. 7). As illustrated in Fig. 2 below, the circular economy model has four elements that include maintenance/prolonging, refurbishing/remanufacturing, reusing/redistributing, and recycling (Brandt, 2019). The 2016 case study explained each of these elements. The maintenance step involves data center repairs programs that "replaces failed components using a mix of new and refurbished parts" (Brandt & Rana, 2016, p. 4). The refurbish step involves the custom building of their own servers, evaluating which parts can be refurbished (Brandt & Rana, 2016, p. 4). The reuse step involves reselling components to "selected remarketing partners," and in 2015 alone, Google "resold nearly 2 million units into the secondary market for reuse by other organizations" (Brandt & Rana, 2016, p. 5). Finally, the recycle step involves crushing and shredding the "electronic equipment" like storage tapes and hard drives that cannot be resold (Brandt & Rana, 2016, p. 6). After the crushing and shredding occurs, the remains are "sent to a recycling partner for secure processing" and creation of reusable materials (Brandt & Rana, 2016, p. 6). In 2019, Brandt explained how implementing this circular economic model "could generate $4.5 trillion in new economic output by 2030," further expressing how "abundance" and "progress" are not mutually exclusive from "improving human and environmental systems" (Brandt, 2019, para. 7).

Fig. 2: Google's Model of a Circular Economy (Brandt, 2019)

Though much of the analysis in this thesis oscillates around energy consumption and Google's renewable energy acquisitions and requirements, it is worth including this section on the circular economy because again, it contextualizes the choices and operations Google makes and expresses how they understand their corporate responsibility. The first principle of the circular economy model explicates renewable resources (Brandt & Rana, 2016, p. 7). Additionally, through such careful explanation of their circular economy processes, Google can again position themselves as a leader over competitors in keeping their core commitments to sustainability in everything they do. In fact, the 2016 case study concluded with "it is Google's belief that doing so will yield additional value for business, partners and users" (Brant & Rana, 2016, p. 8). Brandt reinforced the circular economy as something essential: "our goal is to embed circular economic principles into the fabric of Google's infrastructure, operations, and culture" (Google, n.d. -c, para. 15). A circular economy is positioned as the most reasonable move, both sustainably and financially, for a corporation of Google's caliber. In 2019, Brandt stated that the information they collect and data they gather within their facilities informs how to be more efficient in operations is useful so "we can leverage our scale, resources, and technological expertise to help the world meet resources needs" (Brandt, 2019, para. 6). Again, the circular economy appears to be one way Google explicates their role as a corporate leader that is the most environmentally sustainable option for consumers.

This chapter provided an overview of the key emerging themes throughout Google's public-facing documents related to their environmental sustainability, their requirements for renewable energy acquisitions, their vast renewable portfolio, and the various company initiatives like the "circular economy" (Brandt, 2019). Such findings were important because they demonstrate the discourse the company has used and is currently using as they address their role in the climate crisis for the public. These findings also reveal the common terms Google uses while describing their efforts in sustainability and how they understand themselves as a benevolent, corporate answer. Having done this work, I now turn to an analysis of this material foregrounding of what Google hopes to gain or accomplish by positioning themselves in this way.

CHAPTER FIVE

ANALYSIS

After analyzing Google's public-facing documents outlining their sustainability commitments, energy portfolios, and circular economy, a few other contextual themes emerged. As a company, Google positions itself as a leader in the industry, especially with renewable energy acquisitions. This chapter further analyzes the themes from the Findings, arguing that Google positions itself as the benevolent answer in the industry for climate crisis. I also explain the justifications the company makes for what they do, and the way Google operates retroactively. This position bears numerous consequences because the commercialized essence of climate activism disguises retroactive responses, corporate benefit, and Google's financial ownership in the renewable energy market. Analyzing the discourse has revealed such consequences, which can influence the way the public understands what company commitments entail. Chiefly, I argue Google positions themselves as benevolent, as capable of helping solve global crises and always in the public good. Such a position, I argue, hinders individuals from understanding the complexity of energy policy and portfolios and Google's often muddy role in facilitating the ongoing climate crisis.

One of the overarching discursive pictures Google paints across the documents analyzed is being the best option for efficiency and saving the environment. Because of their size, their commitments and values, and their processes, Google argues they are best suited for the needs of the industry, making them the most viable option for those seeking their services. In the 2019 Environmental Report, Google states that "Our efforts have paid off: On average, a Google data center is twice as energy efficient as a typical enterprise data center" (Google, 2019, p.19). The most recent report also emphasized, in technical terms, how "In 2018, the average annual power usage effectiveness (PUE)[16] for our global fleet of data centers was 1.11, compared with the industry average of 1.67—meaning that Google data centers use about six times less overhead energy (11%) for every unit of IT equipment energy" (p. 20). Google's efficiency is one part of their overall benevolence. Historically, corporate benevolence has existed as the result of how "a company's socially responsible behavior can actually change consumers' perceptions of how the company's products perform, such that products created by socially responsible companies are experienced as performing better" (Chernev & Blair, 2015, p. 1421). Analysis of Google's documents show an evolved definition of corporate benevolence, as Google promotes socially responsible behavior and as a result, their data centers operate more efficiently through PUE metrics, making them the best choice for consumers. This definitional change matters because Google's product, their data centers for cloud services, are simultaneously posited as a reason why Google is so committed to climate change while also one of the infrastructural resources that have impacted the climate crisis.

In addition to the technical efficiency that positions them as the best option compared to their competitors, Google also emphasizes how their commitments to renewable energy reach beyond exclusively benefiting themselves. Even more clearly, Google posits, "We're investing in a brighter future for everyone" (Google Data Centers, n.d.-b, para. 6). A decade ago a company post revealed that they were doing this as "We are making RE available for all through transformation of the power grid" (Hölzle, 2010). Google's aggressive renewable energy purchasing and "additionality" requirements also impact the overall marketplace for renewable energy (Pichai, 2019, para. 5). Before investing in a project, Google prioritizes ensuring they are funding new projects in an attempt to add new projects to the local grid, to further increase labor and economic growth in the regions they operate. Google also wrote that, “by contracting to purchase so much energy for so long, we’re giving the developer of the wind farm financial certainty to build additional clean energy projects" and “the inability of renewable energy developers to obtain financing has been a significant inhibitor to the expansion of renewable energy” (Hölzle, 2010, para. 3). Google’s financial earnings uniquely position them to sustainability invest in new projects, to contractually guarantee financial support for projects in ways that the projects needed (as funding is cited as one of the greatest obstacles), and to require these projects are “additional” (Google, 2013, p. 3). In this way, Google describes their ability to be benevolent as they can fund projects that would add more green energy to the power grid.

In 2019, Ruth Porat, Google’s SVP and CFO, wrote that Google’s energy investments also have a greater mission: “But our goal is much bigger: to enable everyone—businesses, policy makers and consumers—to create and live in a more sustainable world” (Porat, 2019, para. 2). The company discourse in their materials emphasizes how they operate efficiently, how they are constantly investing in their energy portfolios and have been carbon neutral, and how they thus enable all *users* of their services to have the opportunity to be efficient. Efficiency is also accomplished through collaborative innovation with artificial intelligence — DeepMind AI in Google’s data centers, a partnership not done elsewhere in the industry, has enabled reducing energy used for cooling, for example, by "up to 40 percent" (Evans & Gaio, 2016, para. 9). In this way, Google's AI developments serve as an extension for the company's benevolence, as they engineer responsible options for their efficiency and ultimately, their clients' efficiency. The fundamental idea is further evidenced in the joint report through the Lawrence Berkeley National Institute, which projected that U.S. companies who used Google's data centers for their cloud needs would lead to enormous energy savings:

> If all U.S. business users shifted their email, productivity software, and CRM software to the cloud, the primary energy footprint of these software applications might be reduced by as much as 87% or 326 Petajoules. That's enough primary energy to generate the electricity used by the City of Los Angeles each year (23 billion kilowattWhours). (Lawrence Berkeley National Laboratory, 2013, p.1)

In 2011, a Google report explicitly outlined how the company's services could help businesses reduce their environmental impact. The report noted the ways businesses save energy using Google's cloud services, differentiating between in-house server operation and Google's efficient servers (Google, 2011). The conclusion of the server case study ended with Google arguing that "cloud-based services like Gmail allow organizations of all sizes to reap these scale advantages of increased efficiency, reduced overhead costs, and smaller carbon footprint without needing the expertise of an army of software developers, hardware designers and data center technicians" (Google, 2011, p. 6). Again, through reports and documents like this, Google positions itself as an answer in the midst of the climate crisis from their energy buying, internal efficiency and PUE metrics, investments in non-profits, and awards and accolades.

Since many companies currently rely on cloud computing technology, such corporate commitments are an attractive proposition. Google's claims and reports throughout their documents also express a form of corporate benevolence in the form of consumer activism. If clients choose Google's services, so the logic goes, they can also support the fight against climate change because of the company's efficiency and renewable energy commitments. In 2020, as the effects of climate crisis become increasingly dire, consumers want these options and now more than ever, it is in the best interest of corporations to be transparent and make climate change commitments. In January 2020, Larry Fink, the Chairman and CEO of BlackRock, which is the largest money management company in the world, issued a release that urged companies to take their environmental impacts seriously, leading to multiple companies announcing their plans for greener operation in recent weeks (Fink, 2020). Fink also wrote that "Disclosure should be a means to achieving a more sustainable and inclusive capitalism" (Fink, 2020, para. 23). Since Google has been positioning itself as the best option for numerous years, they have also inadvertently already beat competitors who are just beginning to take steps. With announcements from investment and management firms like BlackRock, Google becomes positioned as an attractive candidate for investment. With Fink's (2020) announcement, sustainability as practical capitalism appears to be appearing on a national level in 2020 more than ever before. All actions companies take are now retroactive, as capitalism has played a big role in creating the climate crisis. While these are good steps in the right direction, the analysis in this thesis demonstrates how all of these steps are also part of how a technology company defines its brand and image. However, the disclosure Fink describes could be depicted by Google, and I argue that it is lacking and even problematic because such disclosures can mask retroactive behaviors as something worth rewarding.

Thus, I also argue that Google's discourse exemplifies "soft law" practices for energy in developing markets (Nwete, 2007, p. 335). Nwete differentiates between "hard law" and "soft law" practices, noting how rather than governments requiring greener practices, soft law practices seek to "involve business in social responsibility voluntarily and by mutual understanding," where the corporation "sees business as a private enterprise that has as its aim profit maximization with or without voluntary social responsibility" (Nwete, 2007, p. 335). Though Fink and capital management firms are in no way government agencies, explicit requirements for funding will impact the soft law practices that companies take and further positions Google's discourse as timely and necessary. Google uses "soft law" as they position themselves as environmentally responsible, which is not as radical as they may try to make it appear throughout their documents.

Limits of Google's Activism & Benevolence

Google positions environmental and economic benefits as simultaneously occurring. By positioning environment and economic benefits as simultaneous, Google embraces sustainability as practical capitalism. On the Google Data Centers website, a large subheading reads "we're investing in a brighter future for everyone" (Google Data

Centers, n.d.-b, para. 6). Such investments include the wind and solar projects they have acquired that include the PPAs, RECs, green tariffs, and clauses of "additionality." Directly beneath the subheading, Google also promotes they are "going beyond investing in renewables for our own operations- we want to make carbon-free power more accessible for consumers of all types and sizes" and that "we share technology and insights to help others learn about the potential of renewable energy for solving environmental challenges" (Google Data Centers, n.d.-b, para. 6). As detailed in the Findings section, Google posits they add new renewable energy to the local and regional grids, and in regions they cannot, they purchase enough RECs to match their consumption in other regions (Google Sustainability, n.d.; Google, 2013). Google engineers work on reports to share with other competitors about how to make electronics more energy-efficient, and uses collaborative projects with artificial intelligence to ensure the lowest possible PUE (Google Data Centers, n.d.-a; Google, 2011; Porat, 2019; Gao, 2014). The company positions themselves as responsible in a marketplace that is more commonly endorsing or rewarding such actions. Sustainability as practical capitalism also exhibits aspects of corporate benevolence, a concept that is not novel.

In the 1960s, a legal scholar, Louis Kelso, noted the change from understanding the United States corporation as a "purely economic organization" (p. 260), to one of "corporate charity," in which there is transformation of the business corporation "into an arm of the body politic, one more step in the unification of political and economic power in the administrators of government, one further victory for those who would substitute the distribution of wealth by power for the just distribution" (Kelso, 1960, p. 260).

Google, a company that is an economic organization that positions itself as a champion for climate change and efficiency, unifies their political and economic powers as they make claims for themselves and their shareholders. Even in the 1960s, this was not a new concept, as "the corporation is being transformed from an economic entity into a political entity because we have ignored the nature of a capitalist economy" (Kelso, 1960, p. 260). In the 2000s, Chernev and Blair argued that corporate social responsibility in the forms of "charitable giving" and "promotion of various social causes unrelated to the company's core business" have been viewed as "a tool for enhancing reputations and engendering goodwill among customers" (2015, p. 1412).

Google has exhibited such reputation enhancement through their involvement in REBA, their energy awards from the EPA, and the way they invest in green causes (REBA, 2020; EPA, 2019). For example, In Alphabet's 2019 Climate Report, they argued that "Google's tools help further the dissemination of climate information through the Google for Nonprofits program" (Alphabet, 2019, CDP, p. 73). Alphabet continued that "Google's highly efficient products and services" including "Gmail, Google Calendar, Google Drive, Google Ad Grants, YouTube for Nonprofits" are made available "at no charge" to organizations that are taking action on climate change topics (Alphabet, 2019, p. 73). Such investments or accessibility offers reflect aspects of Google's benevolence, using climate change as an extension of how they accomplish their goals and use sustainability as practical capitalism.

In contrast, however, while Alphabet and Google make claims about facilitating access for climate change nonprofits, a 2019 article published in *The Guardian* described

Google's financial contributions to climate crisis deniers in Washington D.C. (Kirchgaessner, 2019). In addition to financial contributions to such organizations, *Fortune* reported that Google employees also participated in the 2019 technology companies climate strike, alongside employees from Amazon and Microsoft (Newcomb, 2018). Google employees were angry with the company's decisions to continue working with fossil fuel producing businesses, especially big oil companies, within their clientele portfolio (Newcomb, 2018). After the strike, Google made headlines again after firing four employees who participated in the walk out as a means of retaliation to "crush labor organizing" (Lutz, 2019, para. 1). An article in *Vanity Fair* reported the firing was made permissible after the company "redrafted its policies" with an anti-union organization "to retaliate against organizers, allowing the company a pretext for picking and choosing who to target" (Lutz, 2019, para 3). A month later, Google fired a fifth activist employee, who claimed she was fired in "retaliation" after she engineered a pop-up browser for her coworkers to be reminded of their rights to participate in matters that concern them (Lutz, Dec. 2019, para 2). With all of this in mind, it appears that while the company positions itself as an environmental activist and savior, the everyday operations reveal dissonant tensions. Google claims to be a champion of sustainability, but retaliates against workers who urge them to do better. At the end of the day, Google is a technology corporation that depends on generating revenue to appease and attract shareholders and investors. Despite their widespread claims about their commitments and values, it appears that income outweighs selectivity with clientele and with race to acquire renewable energy in their corporate portfolio. Additionally, by offering themselves as the best solution for those hoping to reduce their environmental footprint, they also simultaneously have retaliated against internal activist employees who sought to challenge their business practices. While Google positions itself as an activist for sustainable energy and practices, these anti-activist actions reveal the discursive limits of their benevolence.

Though this thesis did not explicitly examine particular finite resources required to build the servers and various devices in Google's infrastructure (Brandt, 2019), it is worth noting that despite the company's discourse and "circular economy" (Brandt, 2019), they address material compositions with vague goals to "Maximize the reuse of finite resources across our operations, products and supply chains and enable others to do the same" (Brandt, 2019, para. 9). Google does not state anything about where they buy their server materials from, whether they require mining projects in countries to abide by their sustainable practices, or how they address obsolescence beyond trying to reuse parts, shredding components within data centers. Such exclusions are important because, when understanding the materiality of media, everything requires resources and it is not enough to talk about the life cycle of infrastructure while neglecting the beginning. A company like Google who prides itself on being able to make impact from financial and scale standpoints should also be transparent about this too.

Google's Renewable Energy Market

As discussed in the Findings, the 2019 Environmental report revealed that Google, in addition to being one of the "world's largest corporate investors in renewable energy," is also "the world's largest corporate purchaser of renewable energy" which has enabled the costs of renewable power to "drop precipitously while its scale has grown dramatically" (Google, 2019, p. 30). Google also disclosed making investments in renewable energy as a way to make renewable energy prices more accessible (Pichai, 2019). Google documents also reveal how it was more costly to invest in renewable energy until recently, and in the future additional projects will continue to make such investments more affordable and better for the bottom line (Hölzle, 2016). In this way, Google again exemplifies "soft law" practices. Practices in "soft law" include "increases the social cost of investment when implemented by energy and mining companies but also improves business bottom line" (Nwete, 2007, p. 335). Even despite initial increases in expenses, "soft law" purports that the long-term bottom line also benefits.

After analyzing documents to understand more about PPAs, RECs, green tariffs, and the company's "additionality" requirement, it becomes clear that Google, as the self-proclaimed largest corporate buyer of renewable energy, has also become the company who owns the most of the renewable energy market. When the company acquires an REC, they explicitly disclose how they "retire" the credit, which means they reserve the right to own that project and the energy produced by it. If others hope to access the energy, they would have to pay Google for such access. When a company is investing in renewable energy, it has the potential to stifle competition and even cooperation from others who cannot gain a foothold in this marketplace. Google's fierce acquisition process is setting them up to own a majority share of the renewable energy in this country. As more companies begin investing in renewable energy market, Google's ownership of the energy within the power grid allows them to set the terms of who can access their green energy while retaining the rights to the green aspects of the projects they acquired (Google, 2013, p. 3). This is concerning because Google could potentially rule the renewable energy marketplace in the United States. Additionally, “in a PPA, Google is agreeing to buy all the power from a project for many years,” ultimately reinforcing how Google will profit, own most renewable projects and they continue outpacing competitors in RECs, and set the conditions of energy access within power grids (Google, 2013, p. 4).

Google, has masked retroactivity under the guise of activism. Google proudly remarks throughout the materials analyzed that they have been “carbon neutral since 2007,” with all the green energy developments more recently taking off. Google, like other corporations, takes significant steps towards operating more sustainably, but they did not in the beginning. The damage has been done for years, and yet the company’s policies position Google as a champion for the green energy and sustainability cause. For example, Google’s CEO stated that, “Sustainability has been one of Google’s core values from our earliest days” and "A cornerstone of our sustainability efforts is our commitment to clean energy" (Pichai, 2019, para. 1). Urs Hölzle, Google’s SVP of Technical Infrastructure, stated that “operating our business in an environmentally sustainable way has been a core value from the beginning,” and “We’ve reported our carbon footprint and published information on our sustainability programs for many years in white papers, blog posts, and on our website” (Hölzle, n.d., para. 7). In 2018, Google’s CEO stated that,

> Our data centers also have a strong impact on the economies around them. People often discuss “the cloud” as if it’s built out of air. But it’s actually

> made up of buildings, machinery, and people who construct and manage it all. Today we employ an estimated 1,900 people directly on our data center campuses. We've created thousands of construction jobs—both for our data centers themselves, and for renewable energy generation. And our renewable energy purchasing commitments to date will result in energy infrastructure investments of more than $3.5 billion globally, about two-thirds of that in the United States. (Pichai, 2018, para. 4)

. There are non-disclosed limits to the company's ability to save the world. Even this quote demonstrates a lack of acknowledgement of the finite resources that comprise "the cloud." Rather than focusing on resources, Google highlights the economic and labor generation their existence creates within the communities of operation. This is common, as a 2018 report through Oxford Economics analyzing Google's data centers concluded that "Google data centers make significant contributions to jobs, incomes, and economic growth at the national, state, and community levels" and "Nationwide, the six data center campuses support more than 11,000 jobs and $1.3 billion in economic activity" (Oxford Economics, 2018, p. 25). However, in this report, the authors recognized that they did not "consider the manufacturing impacts associated with the equipment placed into service at the data centers," instead focusing on Google's economic generation for the community and state of operation, the employment rates, and philanthropic work (Oxford Economics, 2018, p. 25). In both the CEO's quote and Oxford Economics' report, Google documents do not assess finite resources beyond what is required to operate or mention the real ramifications of the data centers on local community resources.

Other points of contention arise when one considers the company's commitments to renewable energy buying and the discrepancies within the green energy they acquire. For example, one document revealed how, "From the time we sign a contract, it takes one to two years to build the wind farm or solar field before it begins producing energy" (Hölzle, 2018, para. 2). However, they do not further elaborate about whether they count the renewable energy that will one day be generated from their contract acquisitions towards their overall "matching" when the energy has not actually been generated at that point. Does Google's green operation do enough to truly neutralize their impacts, or are they masked as the PPA and RECs for projects that may not even be producing energy but will one day? The documents analyzed indicate that the company believes they provide enough transparency for consumers who do not understand the complexities of energy electrons and math equations for PUE and efficiency, Google does seem to have the answers. However, if consumers are not aware of the true implications of the company's action, they could blindly reduce their consumer activism, leaving the company responsible for their sustainability efforts and believing that Google's efforts are enough. Consumers rely on Google to enable their everyday lives, and what Google does or does not do matters.

Sustainability as practical capitalism, while it may make some necessary steps, does not guarantee resource consumption is being reduced. For example, consider Google's Berkeley County South Carolina data center and local aquifer. Google won the right to increase extraction rights from this aquifer after a three-year battle, despite protests from journalists and local government agencies over concerns about long-term environmental impact (Gilmore & Troutman, 2020). Google is a corporation that positions themselves as sustainable. However, this sustainability is limited and in many ways emerges retroactively. A company operating sustainably positions them as a leader, attracts stakeholders and investors, and offers timely image enhancement. It appears capitalism, especially in 2020, is shifting towards corporate responsibility in relation to the climate crisis, a process which rewards the responsible as revolutionary or groundbreaking, while overlooking how many of those same companies fueled this crisis for decades.

CHAPTER SIX

CONCLUSION

The 2018 report from the IPCC warned everyone that if serious steps are not taken in the ongoing climate crisis, issues of land mass reduction and warming rates will only continue becoming extreme problems (IPCC, 2018). The time to act with "dire urgency," to take serious steps in reducing carbon emissions and being mindful of consumption, is now (IPCC, 2018). For corporations, it becomes increasingly important to understand how the companies discursively construct their sustainability. Google has been disclosing their commitments and values for many years now and I chose Google as the company of study in this thesis because they are outpacing their competitors in renewable energy acquisitions. This thesis analyzed Google's public-facing documents using critical discourse analysis as a framework to understand how the company positions itself and expresses the relationships between their infrastructures, data centers, and finite resources in the ongoing climate crisis. I chose to use critical discourse analysis of public-facing documents, including relevant EPA and joint reports with outside agencies, because I wanted to build articulations between energy, various policies, and how the company positions itself to their role in the climate crisis. In particular, I wanted to analyze definitions of 'renewable energy,' specifically related to their data centers.

This analysis revealed that the company acknowledges that the climate crisis is a problem for which they do need to act, and they have dedicated multiple spaces to delivering transparent reports and plans through which they express their goals, commitments, innovation, and efficiency that is, according to them, unmatched across the industry. Google positions itself as committed to sustainability from the beginning, as benevolent, as committed to efficiency, and as a hero for the climate crisis. They discursively pride themselves in being the best option for consumers because of their innovation, scale, and financial portfolio. At the same time, however, recent events (Lutz, Dec. 2019; Newcomb, 2018; Lutz, 2019; Lutz, Dec. 2019) indicate there are limits to their benevolence and activism, especially with financial donations to climate change denying organizations, the recent firings of activist employees who demanded more and that company stopped serving clientele in the fossil fuel industry. Google remains committed to the bottom line in an economy that praises sustainability as practical capitalism, masking retroactivity under the guise of activism. There are limits and dangers to such notions; however, Google does not seem to address them in their materials and consumers may not be aware of them.

Limitations and Directions for Future Research

Google is a global corporation, and the scope of this project was limited to the United States, so policies, public materials related to European data centers, for example, were not explored. This thesis chose to emphasize US policy and sites because the sheer number of documents would have fallen outside the confines of the project. Additionally, this analysis did not specifically focus on any particular data centers, and there are differences between them, especially between the newer projects and older ones and the locations of the data centers across the United States. Additional limitations in this project include not visiting the data center sites, not interviewing employees or personnel in renewable energy or of affiliation with Google to understand their experiences or beliefs about the company's commitments. Even more broadly, limitations in scope meant also not comparatively analyzing Google's discourse to the discourse of their competitors. In the future, research projects should consider addressing the items not included in this thesis because they would continue helping to understand how Google uses sustainability as a complex, discursive value in a variety of ways. These areas include whether or not they are as progressive in sustainability as they promote themselves to be, if competitors are looking to Google for guidance, what Google is doing well, gaps in energy policy between the United States and countries around the world, or perhaps other economic incentives for sustainability across the industry. There are many more pieces to the puzzle and these are important current discourses to articulate because of the pressing nature of the climate crisis.

Since energy and power grids are complex and challenging to understand as an outsider, I have many unanswered and related questions which can serve as the baseline for carrying out such future projects. How does matching the energy Google consumes by adding additional renewable projects to the power grid account for the physical resources like water required to cool their servers? Water is an incredibly essential resource, and it was interesting how it was not present in many of the documents analyzed, and instead briefly mentioned it as "cooling" that is part of the "overhead energy" calculation (Google Data Centers, n.d.-a). How does the existence of obsolescence in technology impact the finite materials required to build the very servers Google relies on and innovates for efficiency (Google, n.d. -c)? How can the company be truly sure of the renewable energy particles they acquire are truly "matching" the energy they require to function in all locations, and how can they ensure those projects they invest in are actually manifesting tangible results? Additionally, while Google certainly appeared to be committed through their partnerships and organization memberships like REBA for government regulation, there were no mentions of explicit desires for national regulation of energy practices. If the U.S. government did require certain regulatory energy standards for technology companies like Google, would this lessen the company's ability to describe themselves as an environmental champion or the best option for those seeking cloud services? What would Google lose if all companies were required to operate in standardized, responsible ways? One may argue that since they have already promoted outperforming the PUE industry standard (Gao, 2014; Google Data Centers, n.d.-a; Evans & Gao, 2016), they would seek to best their competitors still. Since efficiency does appear to play an impactful role in the company's part in the climate crisis, would such standards actually still be useful? If every company, especially in light of the more recent proclamations by Larry Fink of BlackRock, dedicates themselves to reducing their impact, does efficiency and sustainability become the standard expectation? If so, what will happen to Google's work to position themselves in a very particular way?

These questions could not be reasonably addressed in the scope of this thesis. However, my critical discourse analysis led me to ask these questions. Before starting this project, I did not understand renewable energy, or what key phrases I should be aware of, or what the processes of sustainability look like as described by Google. Without immersing myself in the documents and using them to build articulations between company commitments and the renewable energy market, for example, it would be difficult to understand what questions still need answered. The analysis in this thesis is important as researchers assess the role data centers play in the climate crisis, but more importantly, the ways the companies discursively attempt to address their role in it.

This project began after I found myself wondering why the Internet — the very platform that enables so many campaigns, news, and information about climate change— was itself so damaging to the environment. Admittedly, each of the sections for this project were stored and written using the Google Drive cloud service. I, like so many, rely on the Internet each day and I do not wish to, as Raymond Williams wrote, "give up this power" (1959, p. 97). This analysis revealed to me that search engines and cloud service providers are beginning to make bigger strides in being aware of and reducing their environmental impacts. My understanding of Google as a company has given me glimpses of hope, but each glimpse is measured with lingering concerns and questions. If a company like Google issues press releases, posts materials and reports related to their commitments on separate websites and blogs, it could appear on face-value that they are doing enough or more than is currently required in their efforts. I fear that Google winning awards for their efforts in Renewable Energy, their investments, and their recognition as a leader in innovation will give the faulty perception that they are the best standard or possible scenario for the industry. I believe that such optimistic consumerism, especially for a company that positions itself as benevolent, will not result in not being held to even higher standards. From the materials comprising the server chips in each of the servers housed in the data centers to the water that is required to cool them, Google relies on vast resources. Google is acquiring RECs and PPAs at rates outpacing their competitors, and more work is necessary to explore what such acquisitions do for the market of Renewable Energy beyond what may be disclosed in Google materials. These are complicated articulations but they are necessary ones to study because they have helped to make cloud technology an essentially banal technology, one which recedes to the background of daily life while it continues to impact global energy resources.

While I am skeptical that companies are taking enough steps to meet the dire urgency of the climate crisis we are facing, I do remain hopeful that change is still possible. As cultural studies scholar, Lawrence Grossberg, wrote, “we have to imagine a world in which many worlds can exist together. And we have to figure out what is going on, and how it has, for so long, prevented us from moving toward more humane realities” (Grossberg, 2010, p. 294). This project offers a means of understanding what is going on between Google, their data centers, and the finite resources they require. This project offers findings that are consistent with analysis conducted by a researcher over a decade ago (Ilhner, 2009), demonstrating that while advancements are made, many emerging themes of corporate discourse and climate crisis remain similar. This project also contributes to current conversations emerging inside and outside the field in which other scholars, journalists, and writers are attempting to imagine a world in which we can be better. We can advocate for change, asking policy makers, energy companies, and technology companies to do more to ensure we address the climate crisis. To do so, we need to understand how Google’s discursive construction of sustainability potentially limits the ability to imagine other means of sustainable action at the corporate level. We must move past such discourse and recognize the complex tensions, dimensions, and relationships of this media infrastructure. The Internet is 24/7, and as Google promotes, the company appears to discursively argue corporate benevolence and retroactive sustainability are saving answers while still contributing to creating a world in which humans cannot exist humanely in the present and in the future.

APPENDICES

Appendix A

Google Cloud Efficiency

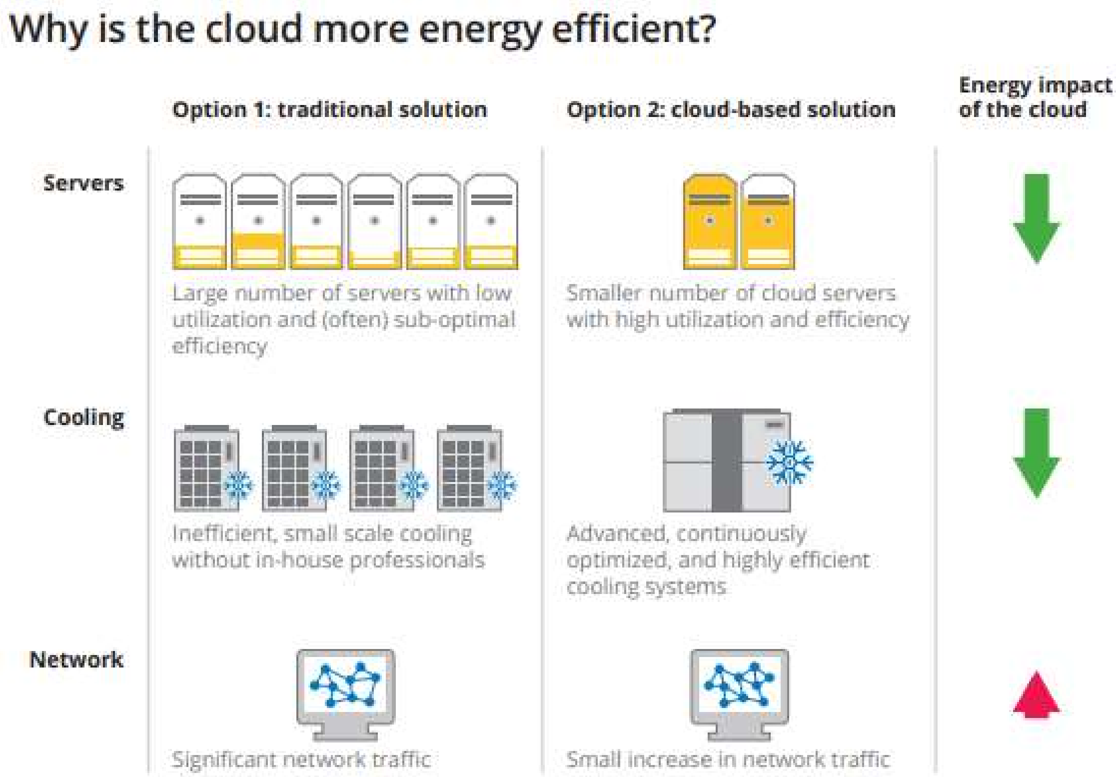

Figure 1: Google's Energy Efficient Cloud, (Google, 2012, p. 2)

Appendix B

Google's "Circular Economy"

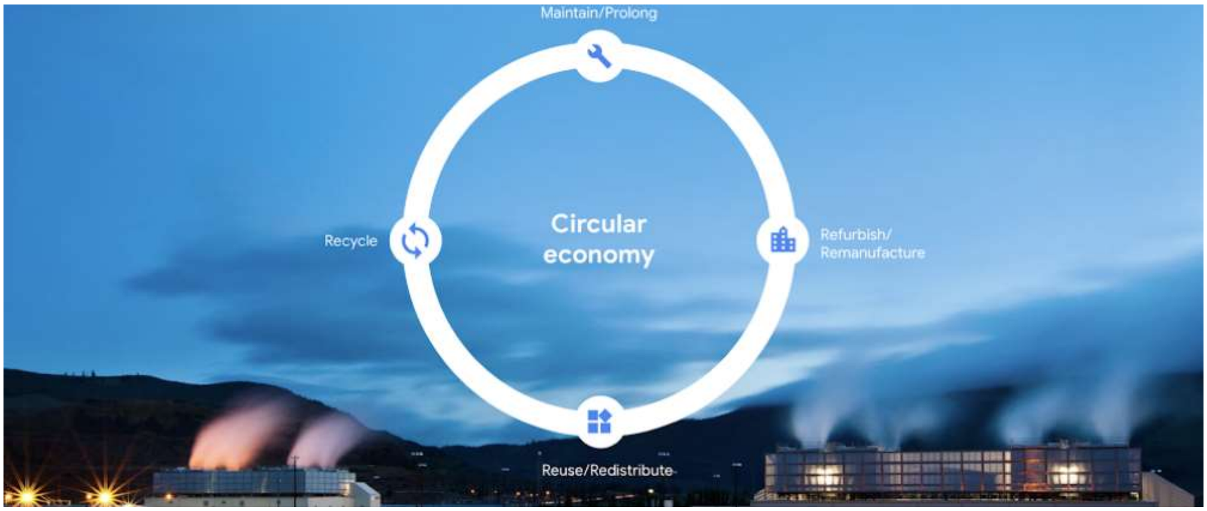

Figure B: Google's Model of a Circular Economy (Brandt, 2019)

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