Exhibit No.:
Issues: Economic Benefits of Data Center Investments in Missouri
Witness: G. Subahs Alias
Type of Exhibit: Direct Testimony
Sponsoring Party: Evergy Missouri Metro
Case No.: EO-2023-0022
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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO.: EO-2023-0022

DIRECT TESTIMONY

OF

G. SUBASH ALIAS

ON BEHALF OF

EVERGY MISSOURI METRO

Kansas City, Missouri
November 2022

DIRECT TESTIMONY

OF

G. SUBASH ALIAS

Case No. EO-2023-0022

Q: Please state your name and business address.

A: My name is G. Subash Alias. My business address is 120 S. Central. Suite 1535 St. Louis, MO 63105.

Q: By whom and in what capacity are you employed?

A: I am employed by the Missouri Partnership and serve as Chief Executive Officer.

Q: On whose behalf are you testifying?

A: I am testifying on behalf of Evergy Missouri Metro ("EMM").

Q: What is Missouri Partnership and what are your responsibilities at the company?

A: Missouri Partnership is a public-private economic development organization formed in 2006 for the specific purpose of marketing the state and attracting new companies to create jobs and investment in Missouri. Our organization works very closely with governmental and private partners to attract businesses to the state. Missouri Partnership works in collaboration with the Hawthorn Foundation, Missouri Department of Economic Development ("DED"), and many regional partners such as the Kansas City Area Development Council, to attract companies that have created more than 31,000 jobs and $5.6 billion in new capital investment in Missouri. As CEO, I am involved in leading the team of professionals that market the state of Missouri to companies that are considering relocating or investing in new operations in Missouri.

Economic Development has four components – entrepreneurship, business expansion, business retention, and business attraction. Additionally, Economic development organizations typically represent states, regions, counties, cities, industry sectors, and service territories. Often it takes multiple entities to effectively work together to advance economic development. Missouri Partnership represents the interests of the DED on business attraction efforts at the state level.

Q: Please describe your education, experience and employment history.

A: I have been with the Missouri Partnership since April 2011. I've been actively engaged in marketing the state to companies that are considering relocating or investing new operations in Missouri. My experience crosses multiple sectors including aerospace and defense, automotive, advanced manufacturing, financial and professional services, and data centers.

Before joining Missouri Partnership, I worked for the Pittsburgh Regional Alliance ("PRA"), an affiliate of the Allegheny Conference on Community Development. At the PRA I was engaged in business attraction, expansion and retention efforts for the greater Pittsburgh region as well as leading the PRA's Pittsburgh Impact Initiative – an existing business outreach program.

Prior to working and living in Pittsburgh, I spent nine years in a similar role with the St. Louis Regional Chamber & Growth Association. Today, the organization is known as Greater St. Louis, Inc. In addition to attraction/expansion/retention activities, I was involved with the region's development and enhancement of the advanced manufacturing and transportation/distribution industry clusters.

In 1994 I earned my undergraduate degree in Business Administration from St. Ambrose University in Davenport, Iowa and received my MBA from the Olin School of Business at Washington University in St. Louis, Missouri in 2002.

Q: Have you previously testified in a proceeding at the Missouri Public Service Commission ("MPSC" or "Commission") or before any other utility regulatory agency?

A: No, I have not.

Q: What is the purpose of your direct testimony?

A: The purpose of my direct testimony is to address the importance of recruiting data centers to Missouri, including the one proposed by Google, LLC ("Google"). Additionally, my direct testimony will speak to supporting the information provided by Missouri Partnership's state, regional and local partners to help secure the investment planned by Google. The success of the project for the state, region, and Google is critically dependent on securing competitive energy rates.

Q: What is Google?

A: Google is a U.S.-based technology company that offers technology services and products and operates multiple data centers in the country and around the world to power its portfolio of products and services.

Q: What is Google's line of business?

A: I understand that Google operates data centers to support their diversified portfolio of products and services, including a search engine, email service, web browser, and cloud platform. Due to the constant demand for their services, Google data centers are required to operate constantly without interruption and require highly reliable electric power service.

Q: Are you familiar with the Google data center project that serves as the potential customer for this proposed Special High Load Factor Market Rate tariff?

A: Yes, I am. Missouri Partnership played an active role in recruiting Google and in my previous role, I was the project manager representing Missouri Partnership. This effort started a few years ago when Google was looking across Missouri and other states to find a location for a potential data center. Property records show that Google acquired about 78 acres within the Hunt Midwest Business Center in 2019. Google is considering a $600 million investment that could bring about 30 full-time jobs in addition to construction jobs.[1] More recently, the Kansas City Business Journal reported that Google acquired an additional 236 acres in December 2021 in order "to ensure [they] have the option to further grow, should [their] business demand it."

The Missouri Partnership team has collaborated with the DED, Kansas City Area Development Council, Evergy Missouri West, and the City of Kansas City, MO to assist the company in navigating daily challenges faced in establishing a hyper-scale data center, thereby to attract Google to select Kansas City for their latest expansion.

Q: Do you have any experience attracting other data centers to the State?

A: Missouri enacted the Data Center Sales Tax in 2015 and, as a result, the state has seen an increase in interest by large and small companies looking to establish data centers in the state. Missouri Partnership, along with a number of our state, regional and local community partners, collaborated over a number of years to successfully recruit Meta's

[1] https://www.bizjournals.com/kansascity/news/2021/12/17/google-shalerock-data-center-northland-land-sale.html

latest hyper-scale data center. The project began in 2018 and it was recently announced that the company has selected Kansas City, MO for its next hyper-scale data center. In addition to Meta, the Golden Plains Technology Park includes two additional zones for data center facilities that will support the growing demand of data, cloud and other hosting services.

Q: Have you conducted any quantitative research on the economic impacts of data centers owned and operated by Google or others?

A: Not personally, no. However, I have reviewed a number of reports from reputable entities that quantify the economic impact of such investments. Based on my review and my decades of experience working in economic development, I find these reports to be reasonable estimates of the impact of such investments.

Q: What are the expected benefits for the community from a Google data center?

A: For my part, I am aware that Google data centers spur significant economic development within the states and communities where located, including the creation of permanent, professionally oriented career employment. In April 2022, Oxford Economics prepared a report that analyzed the economic benefits of Google data centers throughout the United States.[2] The report found that in 2020 alone, Google's U.S. data centers generated $6.4 billion in economic activity, including $4.0 billion in income from more than 57,804 jobs.[3] As of April 2022, Google has invested approximately $17.5 billion in its twelve U.S. data centers.

Based on the Oxford Economics report, Google's investment in its data centers across the U.S. has created 57,804 new jobs, including 13,281 jobs relating to data center

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[2] See Schedule GSA-1 for the Oxford Economics Study
[3] *Id.* at 4.

operations, 42,417 relating to capital investments and construction, and 2,106 jobs relating to clean energy projects.[4] Due in part to the relatively high wages paid by Google at its data centers and the high contribution of economic activity associated with the Google supply chain, Google data centers also contribute significantly to the growth of jobs, income, and economic activity in each state where they are located including a wide array of industries that are not typically impacted by data center operations. For example, Google's impact on jobs was spread across a wide range of sectors led by Construction and Utilities (19,786), Information and Professional Services (8,554), and Trade and Transportation (6,432), among other industries.[5] The economic activity supported by Google's data center investment and operations also leads to increased tax revenue for all levels of government. In fact, Google's US data centers generate $6.4 billion annually in increased economic activity, which results in $1.4 billion in added tax revenue ($556 million of which goes to state and local governments).[6]

Q: More broadly, how do data centers benefit local economies?

A: In a 2017 report titled, *Data Centers – Jobs and Opportunities in Communities Nationwide*[7], the United States Chamber of Commerce reports that the average data center adds $32.5 million in economic activity to its local community each year. More specifically the report states,

> "While being built, a typical data center employs 1,688 local workers, provides $77.7 million in wages for those workers, produces $243.5 million in output along the local economy's supply chain, and generates $9.9 million in revenue for state and local governments.

[4] *Id.*at 16-18.
[5] *Id.*at 6.
[6] *Id.* at 57.
[7] See Schedule GSA-2 for the USCC-CTEC Data Center report

> Every year thereafter, that same data center supports 157 local jobs paying $7.8 million in wages, injecting $32.5 million into the local economy, and generating $1.1 million in revenue to state and local governments."[8]

As stated in the Chamber report by U.S. Chamber Technology Engagement Center's senior vice president:

> "Innovation drives our economy, and data centers drive innovation. When communities support data centers, those data centers in turn create jobs, improve local public infrastructure, and encourage skills training for workers and businesses… [w]ith the right policies in place, data centers can serve as an important source of economic growth." *Id.*

Data center development can also result in the improvement of critical infrastructure in the area in the form of water resources, energy expansion, fiber connectivity enhancements, road development, etc.[9] According to Jill L. McCarthy of the Kansas City Area Development Council, "Data centers are low users of public services. They do not put a strain on police/fire, public works, street repairs, etc. Given the very high capital investment in the development, the benefit to the school districts is extraordinary without adding impact to their budget or classroom expansion."[10]

Q: Are data centers of economic value to Missouri in general?

A: Data Centers are extremely valuable to a community. Large-scale investment in Missouri's technology infrastructure, paired with long-term operations in the state fosters a number of benefits to the state. First, data centers can contribute to income, job, and skills development. Next, data centers can increase and diversify the tax base, and are an economic catalyst for the economy. Such operations typically do not strain public services.

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[8] *Id* at 2.
[9] *See* Exhibit 4, Direct Testimony of Jill L. McCarthy, Case No. EO-2022-0061 (Nov. 2, 2021) at 14:10-17.
[10] *Id.*

Due to the operation's longevity and ongoing investment, they have the potential to provide extraordinary benefits to a community. Additionally, while the direct jobs of such data centers may seem small in comparison to the investment, what is less obvious and another reason why they are attractive is because they can create many more construction jobs and supporting jobs (or indirect jobs) as these facilities are continually evolving as technology progresses and equipment is replaced. Finally, as someone that markets Missouri to the rest of the world, being able to say that a marquee company like Google is investing in our state attracts attention. Despite viable sites, a skilled workforce, and infrastructure required to build data centers, Missouri and many other midwestern states are sometimes invisible to the rest of the world and bypassed in attracting data center projects because it has not been able to previously package incentives that reduce upfront development costs. We are competing fiercely in a very crowded field of other highly competitive states. Energy costs are among the most important long-term operational costs for data center developments. Creating mechanisms allowing for competitive electric rates makes Missouri more visible for such attraction projects. Having a name like Google in our community makes prospective clients think twice before passing us up. This will be an incredibly impactful story for us to share across the globe as we look to further elevate Missouri's profile on the tech sector map.

Q: Based on your experience, what factors contribute to the decision to build a data center in Missouri?

A: Missouri competes with other states in the region for data center projects. In my experience, data center developers consider many factors that contribute to successful development and operations, including land availability, infrastructure, cost, and long-term investment certainty. Developers also consider access to skilled workforces, regional private partnerships, and reliable and stable access to utilities.

As data centers are large users of electricity, access to competitively priced, reliable power that is from renewable sources or allows integration of renewable energy are often paramount in deciding where to place data centers. Siting is a large concern for data center developers, as they must be placed near reliable utilities that are capable of providing power in an economically efficient manner.

Q: How has the state of Missouri sought to attract data centers?

A: In 2015, the state legislature passed a program providing economic development tools and tax exemptions to data center operations. *See* Section 17 144.810, RSMo. Mark Stombaugh, the Director of the Regional Engagement Division of the DED, filed testimony in the Case No. EO-2022-0061 ("EMW Tariff Case"), and cited to this statute as an indication that the Missouri Legislature's established public policy is to attract data centers as evidenced by the economic development tools made available to data center developers and operators.[11]

From my experience working with state agencies, including DED, I can attest that projects like these are a critical focus for Missouri. Development and operation of data centers provides a robust and long-term source of employment and capital investment for the state. Data centers also attract investment in related enterprises that are supported by or benefit from proximity to data centers. Therefore, they act as springboards to future investment beyond the substantial investment of the data center alone.

[11] *See* Exhibit 5, Direct Testimony of Mark Stombaugh, Case No. EO-2022-0061 (Nov. 2, 2021) at 4:12-23.

Q: How does the proposed Special High Load Factor rate fit within Missouri's goals to foster economic development?

A: Despite viable sites, skilled workforce, and infrastructure required to build data centers, Missouri has historically been bypassed in attracting data center projects because it has not been able to package incentives that reduce upfront development costs.[12] For data centers, the price of electricity is a significant factor for development.[13] Providing special rates for large customers that provides competitive pricing and that aligns energy pricing with the market associated with the renewable energy resources, while protecting the interests of other utility customers is imperative in attracting this business.[14]

Additionally, as stated previously, the Missouri Legislature's established public policy is to attract data centers as evidenced by the economic development tools made available to data center developers and operators.[15]

Q: Are other states in our region attempting to recruit data center developers?

A: Yes, they are. We face growing competition from our neighbors as states have begun to realize how economically vital these projects are in this digital transformation era. Missouri is not alone in attempting to attract data centers. This increases the need for Missouri to remain creative and considerate in how it can successfully attract and retain these projects.

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[12] *See* Exhibit 4, Direct Testimony of Jill L. McCarthy, Case No. EO-2022-0061 (Nov. 2, 2021) at 7:16-19.
[13] *Id.*at 11:11-15.
[14] *Id.*
[15] *See* Exhibit 5, Direct Testimony of Mark Stombaugh, Case No. EO-2022-0061 (Nov. 2, 2021) at 4:12-23.

Q: Is there any data on the economic impacts of data centers on other local economies in our region?

A: Yes there is. In a study prepared by Magnum Economics, LLC ("Magnum") reviewing the impact of data centers on the Nebraska Economy, [16] Magnum found that the construction and operation of a "single new typical hyperscale data center would have a potential total economic impact on Nebraska of almost $270 million in total economic output during the two-year construction period, including 1,200 construction jobs plus 720 non-construction jobs supported in the community during the construction phase."[17] After the new facility is fully operational, "it would support $82 million annually in total economic output in Nebraska, including supporting 300 jobs."[18]

Magnum found that data centers were among the most high-performing lines of business and "a valuable (and growing) contributor to a strong and robust state economy" because of the combination of rapidly rising investment and wages that are coextensive with the proliferation of data centers.[19] In fact, the "wages for data center jobs are almost twice as high as the average across all industries, and these wages have grown 25 percent faster than the average pay for a private sector job in Nebraska."[20]

Nebraska's success is driven by its incentive programs that attract data centers, and has resulted in new developments that include three large data centers operated by Meta and Google.[21] These three data centers that were announced between 2018 and 2021 will bring $1.5 billion in construction investment to Nebraska.[22]

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[16] *See* Schedule GSA-3 for the Nebraska Data Center Impact Study.
[17] *Id.* at 3.
[18] *Id.*
[19] *Id.*
[20] *Id.*
[21] *Id.* at 3-4.
[22] *Id.* at 5.

The promise of creating competitive incentives like the Special High Load Factor rate to Evergy Missouri Metro is that Missouri could better compete for new business. In 2021 alone, Nebraska was projected to receive $579 million in economic output from construction and operations combined, including: 1,520 construction jobs; $81.9 million in associated construction pay and benefits; 490 full-time-equivalent onsite operations jobs inside data centers; and $50 million in associated data center operations pay and benefits.[23] But expanding to include the secondary impacts, Magnum projected a $1.3 billion in economic output in 2021 alone.[24]

Q: How important are state incentives in regional competition to attract data center investments?

A: They are critical. As noted in Magnum's study, "competition among states for data centers is significant, and data centers carefully evaluate the business climate in various states when making location decisions."[25] Nebraska, Illinois, Indiana, Minnesota, and Ohio, among others, all provide state incentives aimed at attracting data centers.[26] Therefore, it is critical that Missouri continue to consider how it can leverage incentive offerings to attract these large scale investments in the state.

[23] *Id.* at 6.
[24] *Id.*
[25] *Id.* at 10.
[26] *Id. at 10-12.*

Q: Are you familiar with the proposed tariff in this case?

A: Yes, I have a general understanding of the tariff. The Specific High Load Factor Market rate ("MKT Tariff") is described by Evergy witness Bradley D. Lutz in more detail. Generally, the tariff is designed to provide a competitive price and align energy pricing with the market associated with the renewable energy resources that customers obtain through their own means, while protecting other EMM customers by covering incremental costs.

Q: Is the proposed tariff necessary to attract data center development in Missouri?

A: Competitive energy rates are important to recruiting data centers because they are large, constant users of power. Based on the testimony provided by Bradley D. Lutz, the MKT tariff provides a fair mechanism for providing such rates. We view the Google data center as a critical target for Missouri, and that offering competitive energy pricing opportunities to integrate renewable energy resources is a proven way of attracting business. I also note that the Commission did approve a similar tariff relating to Velvet Tech Services, LLC's proposed data center in Evergy Metro West's service territory.

Q: Does that conclude your testimony?

A: Yes, it does.

THE ECONOMIC IMPACT OF GOOGLE DATA CENTERS IN THE UNITED STATES

OCTOBER 2022

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OCTOBER 2022

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EXECUTIVE SUMMARY

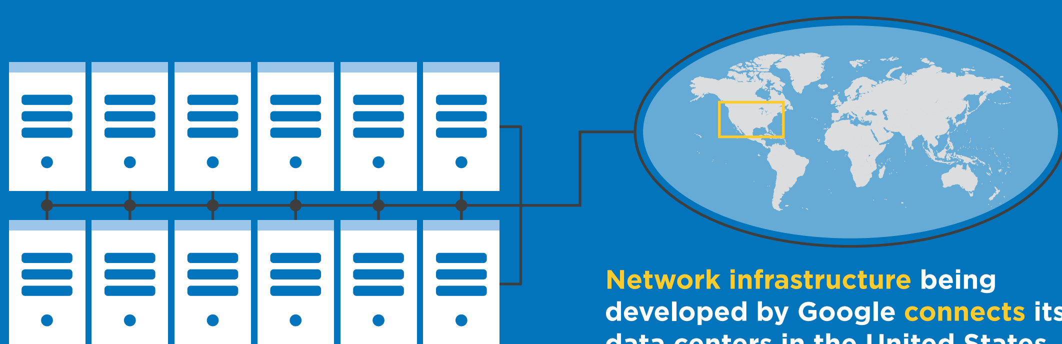
Digital transformation fosters significant opportunities for global economies enabling innovation and improving processes and services. This transformation, greatly accelerated by the COVID-19 pandemic, has required significant new infrastructure to meet the growing demand for digital services. As students and employees shifted to remote work and school, and the public and private sectors required expanded online services, Google has been increasing its capacity to meet these rising digital needs across the globe.

This report analyzes the economic impact that results from Google's hyperscale data center investments throughout North America. These include:

- Data center operations
- Capital investment and construction at the data centers
- Clean energy projects

In 2006, Google opened its first North American data centers in Georgia and Oregon and has since opened new data centers in nine other states, including Iowa, North Carolina, Oklahoma, and South Carolina (2008); Alabama, Tennessee, Texas, Nevada; and two campuses in Virginia (all 2019). Together, these 12 campuses represent a $17.5 billion investment in North America's technological future. Through network infrastructure currently being developed by Google, these data centers are connected to countries throughout the world. This infrastructure consists of fiber links that span North America and physically connect the entire region to the global internet.

$17.5 billion
Investment by Google in 12 North American data center campuses.



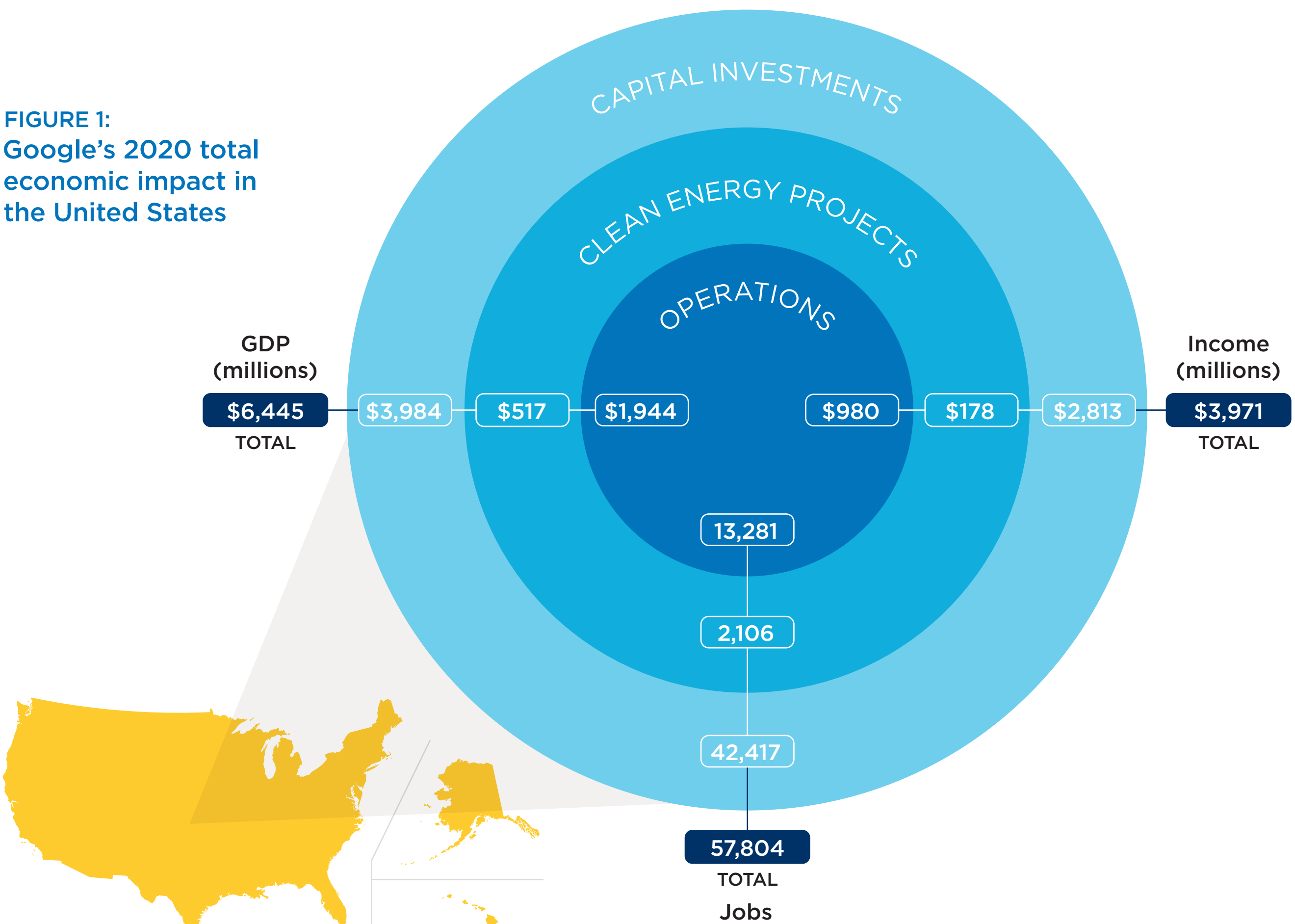
Network infrastructure being developed by Google connects its data centers in the United States to points throughout the world.

In addition to calculating the economic impact attributable to operations at Google's data centers, this report explores how Google's clean energy and capital investments further add to the company's economic impact in the United States. To satisfy its clean energy commitments, for example, Google has long-term procurement agreements with wind and solar power producers. These agreements result in clean energy projects that bring environmental benefit, support the growth of the clean energy industry in the United States, and add to economic impact.

Google's capital investments in its data centers also significantly contribute to the company's economic impact. These include both the large upfront cost associated with the initial construction of a data center and the ongoing capital investments Google makes in each data center campus. When we later explore the economic impact attributable to Google in each of the states and counties where it operates a data center, we will describe in more detail how Google's capital investment supports construction jobs at the local level.

In total during 2020, Google's data center operations, clean energy and capital investments supported 57,804 jobs, generated nearly $4.0 billion in income for workers, and added $6.4 billion in economic activity as measured by GDP, throughout the United States.

FIGURE 1:
Google's 2020 total economic impact in the United States

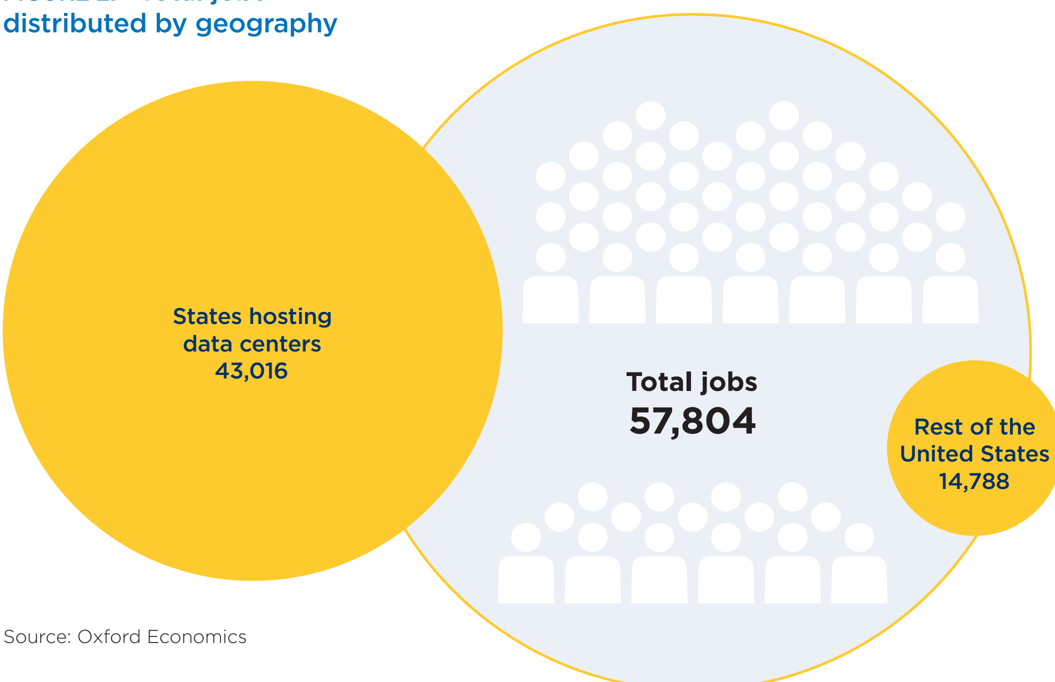


Source: Oxford Economics

Google's data center operations, clean energy and capital investments support 57,804 jobs throughout the United States.

The 57,804 total jobs include both direct jobs and those jobs that result through spillover effects as Google workers and suppliers spend their wages and earnings throughout the region. While most of these jobs are in the states where the data centers are located, nearly 15,000 are located elsewhere in the country. Most of this widespread distribution of jobs can be attributed to the network of people and businesses that provide Google with the goods and services needed to support data center operations and capital and clean energy projects (i.e., Google's supply chain).

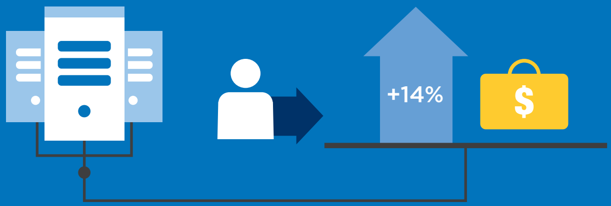
FIGURE 2: Total jobs distributed by geography



Source: Oxford Economics

43,000 jobs are in states hosting a data center, and nearly 15,000 more are distributed elsewhere in the country.

At the heart of Google's economic impact are the data centers themselves. Data center operations support 13,281 total jobs throughout the United States (see Figure 1). The total income associated with these jobs is $980 million. When we examine the relationship between the jobs and income at the national level, we find that the average income per job supported by Google's data center operations exceeds the national average income per job by 14%.



Jobs supported by Google data center operations generate average income per job that is 14% higher than the national average.

In addition to supporting well-paying jobs, Google's economic impact touches all sectors of the economy. The jobs supported by Google's data center operations, clean energy, and capital investments are widely distributed among diverse industries, many of which are not normally associated with data center operations. As Figure 3 shows, Google's impact on jobs was spread across a wide range of industries led by Construction and Utilities (19,786), Information and Professional Services (8,554), and Trade and Transportation (6,432). Please note that although Google supported an estimated 3,032 in the Accommodation and Food Services industry, this number was dramatically reduced during the pandemic as a result of travel restrictions.[1]

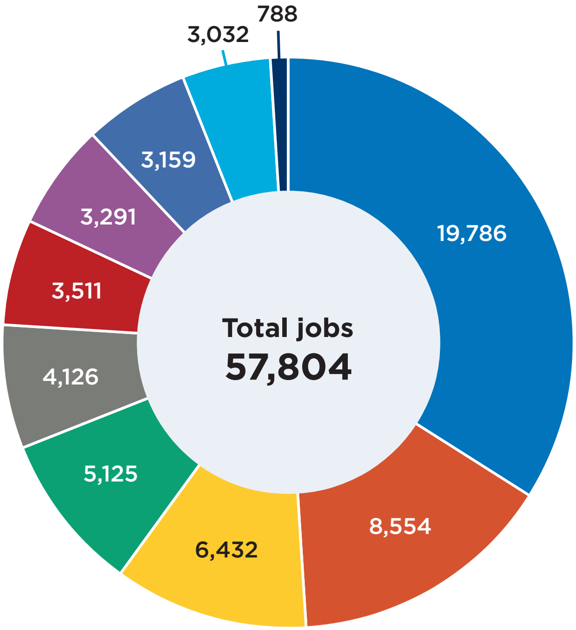


FIGURE 3:
Distribution of Google's data center-supported jobs by industry

Total jobs by industry

- Construction and Utilities
- Information and Professional Services
- Trade and Transportation
- Health, Education, and Government
- Management and Administrative Services
- Finance, Insurance, and Real Estate
- Manufacturing
- Entertainment and Other Services
- Accommodation and Food Services
- Agriculture and Mining

Source: Oxford Economics

Jobs supported by Google are widely distributed, and most are in industries not normally associated with data center operations.

To calculate the economic impact attributable to its clean energy projects, Google provided Oxford Economics with data on 26 wind and solar projects throughout the country that are supported by its clean energy commitments. Each year, these projects require people to operate and maintain the infrastructure and keep the

[1] As examples, travel from the Georgia data center was down 75% during 2020 as compared to the prior year, and down 72% in Iowa during the same time period.

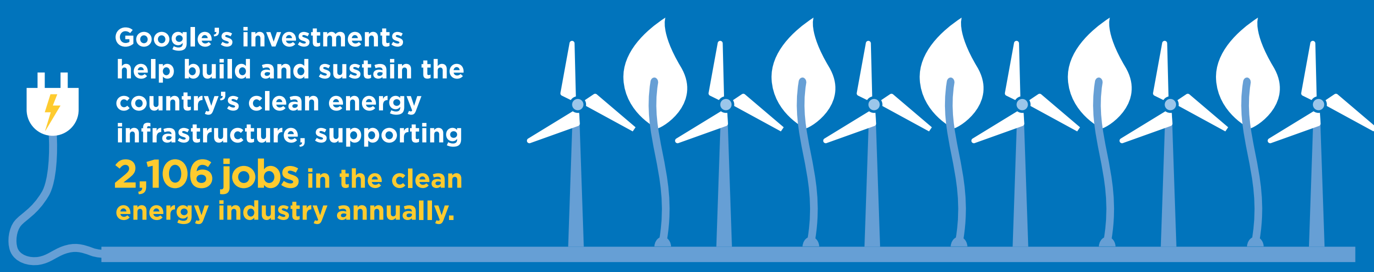
electricity produced by these projects connected to the electrical grid. In the figure below, we examine the nature and distribution of the 2,106 jobs supported each year in the United States as a result of Google's clean energy projects.

FIGURE 4: Geographic distribution of clean energy jobs

Location	Direct	Indirect	Induced	Total
States hosting a data center	167	688	401	1,256
All other states	16	243	591	850
US total	**183**	**931**	**992**	**2,106**

Source: Oxford Economics

Included in the figure above are 183 jobs held directly by those in the clean energy industry and another 931 jobs in companies that provide equipment and services to the industry (i.e., "supply chain"). An additional 992 induced jobs are supported by the spending out of wages of those employed directly or indirectly. Taken together Google data centers support 2,106 jobs through their clean energy investment—1,114 of which are directly or indirectly tied to clean energy and its supply chain.



The 2,106 jobs described in Figure 4 are recurring and the result of ongoing operations and maintenance associated with Google's clean energy projects. However, the initial building of this infrastructure generated its own economic impact. In fact, when full spillover effects are included, we estimate that each of these projects supported 468 workers employed for an average of three years building, installing, and making these facilities operational. When all projects are aggregated, 36,529 people-years of employment were supported by investments required to build and install the clean energy infrastructure needed to satisfy Google's clean energy commitments. Thus, Google's clean energy commitments help the United States to build and sustain its clean energy industry.

We also examined the economic impact of data center capital investments made by Google. Capital investments refer to the physical infrastructure put in place to create and improve a given data center. It includes activities such as the construction of new buildings and infrastructure and additional improvements made to existing structures. Capital investments also include the purchases of equipment used on-site. Each year, Google makes significant capital investments to its data centers and when these are made, the economic impact is sizable. At each data center, however, the amount of capital investment fluctuates a great deal year by year. To address this fluctuation, we calculated the average annual amount of capital investment that Google has made at each data center since that campus opened. From there, we calculated the annual average amount of economic impact associated with the capital investment that has occurred at each data center.

Using that methodology, we estimate that each year, capital improvements at Google data centers support (on average) over 42,000 jobs throughout the United States (see Figure 1). These include jobs in construction plus those involved in the manufacturing of equipment used in the capital investment, as well as spillover effects in the broader economy. In our report, we describe the particular contribution made by construction jobs in the communities where data centers are located.

In addition to its economic and fiscal impacts and investments in network infrastructure and clean energy, Google is an active participant in the local communities where its data centers are located. Through partnerships and programs, Google performs educational outreach, provides local grants, and helps prepare local workforces for opportunities in emerging technologies. Specific examples are illustrated in a case study found later in this report.

CONTENTS

CONTENTS

1. INTRODUCTION

This study examines the overall economic impact that Google data centers have across the United States and in each state and county where a Google data center is located. Twelve data centers were included in our report.[2]

FIGURE 5: Google data centers: $17.5 billion invested to date

Location		Year opened	Total investment (billions)
Jackson	Alabama	2019	$0.6
Douglas	Georgia	2006	$2.4
Pottawattamie	Iowa	2008	$2.5
Caldwell	North Carolina	2008	$1.2
Clark	Nevada	2019	$1.2
Mayes	Oklahoma	2008	$3.0
Wasco	Oregon	2006	$1.8
Berkeley	South Carolina	2008	$2.4
Ellis	Tennessee	2019	$0.6
Madison	Texas	2019	$0.6
Loudoun (2)	Virginia	2019	$1.2
Total			**$17.5**

Source: Google, LLC

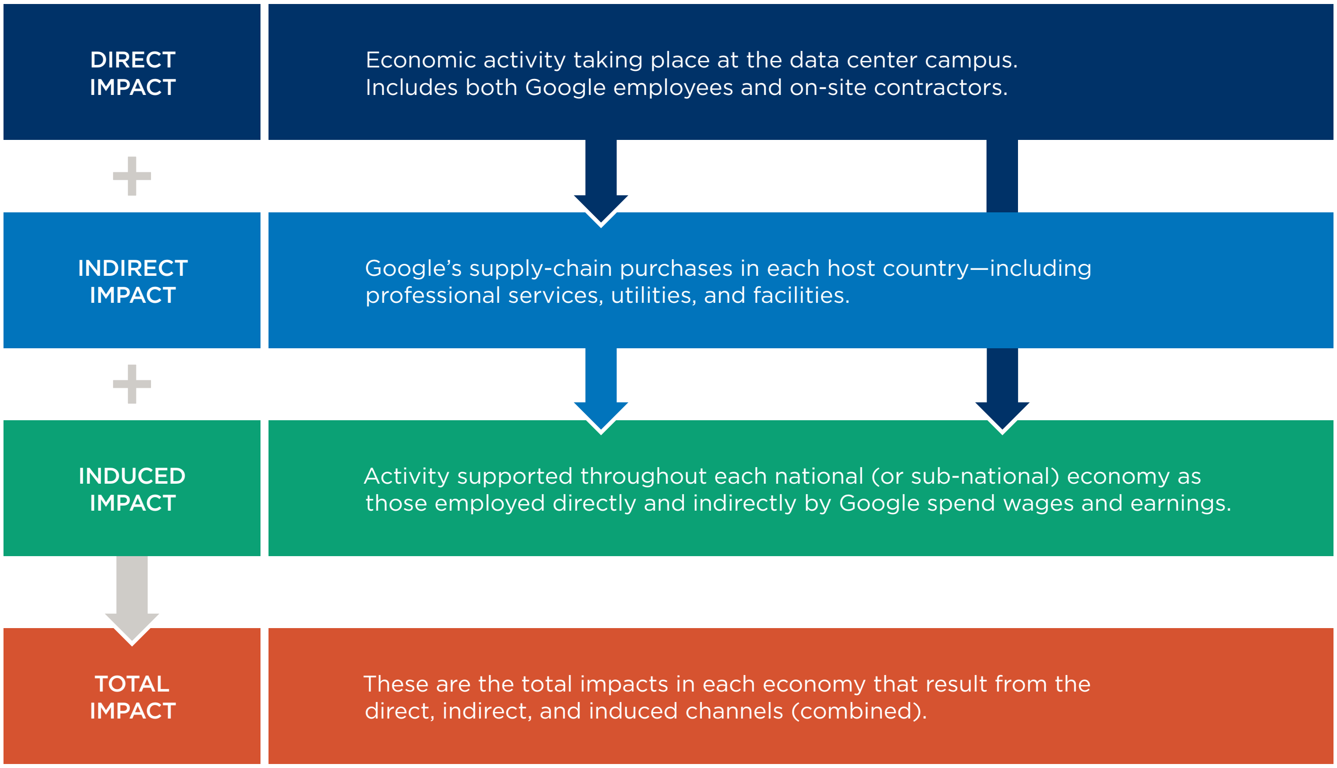
Oxford Economics calculated Google's economic impact at the national, state and county levels. In describing our results, we refer to three "channels" of economic activity:

- **Direct:** On-site workforce at the data center.
- **Indirect:** The economic activity associated with the supply-chain purchases made by Google to vendors who provide services that support the data center. This is the business-to-business network that supplies Google with the goods and services associated with data center operations.
- **Induced:** This channel measures the spillover effects that result as workers at the data center and those of the businesses in Google's supply chain spend their wages and earnings throughout the broader economy.

2 Google operates other facilities in the United States including other data center operations that were not included in this report.

The following schematic depicts the relationship among these three channels:

FIGURE 6: **An economic impact overview**

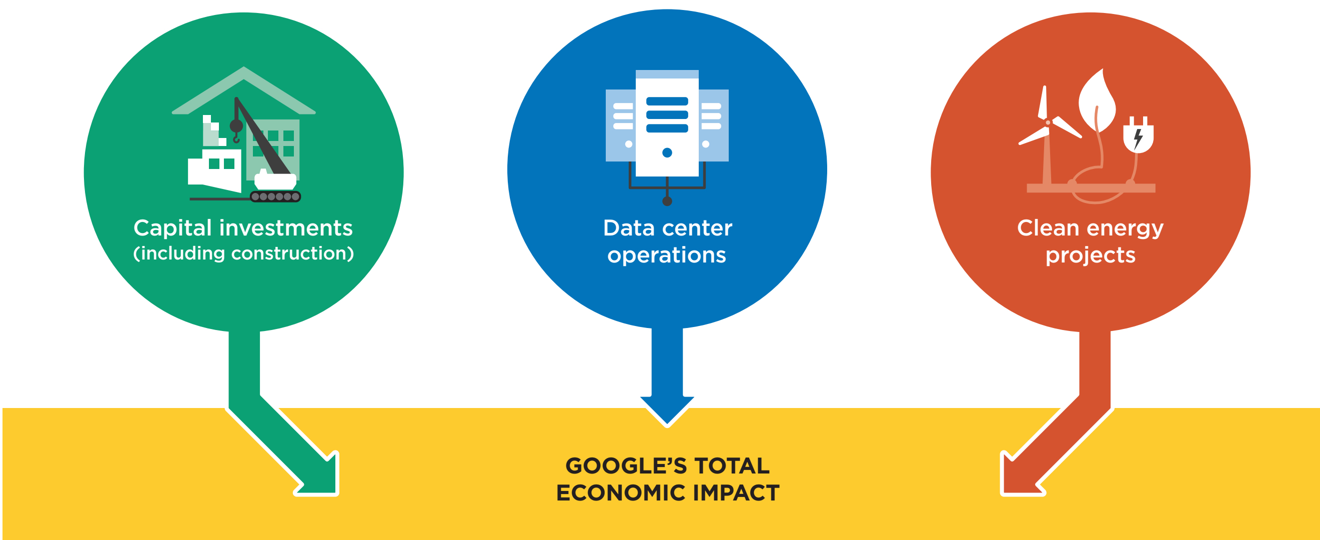


In this report, we examine how Google data centers generate economic impact from three different business activities:

- operations of the data centers;
- on-site capital investment including construction; and
- wind and solar projects supported by Google clean energy commitments.

Each of these activities generates economic impact through the three channels described above. These impacts are independently calculated because each requires unique modeling and assumptions. The total economic impact of Google data centers is the sum of the economic impacts calculated for each of these activities—as depicted in the figure below:

FIGURE 7: **Total economic impact: Operations, clean energy projects, and capital investment**



Most of our analysis is focused on the recurring economic impact that results each year from Google's data center operations, clean energy, and capital investments. By recurring, we mean the economic impact that is expected to repeat in subsequent years.

In addition to the large upfront capital investment that is associated with the initial construction of a data center, Google makes ongoing capital investments in each data center campus that generate significant economic impact. Given that these capital investments fluctuate in size from year to year, we calculated an annual average amount of capital investment for each data center that is based on the actual capital investment that has occurred at that particular data center. Our estimate of recurring economic impact includes the economic impact associated with these annual averages.

Also included in our report are the one-time economic impact benefit attributable to the initial investment in wind or solar power generation projects that result from Google's clean energy commitments. These and other impacts associated with clean energy projects are discussed in the next chapter on Google's economic impact at the national level.

Interpreting economic impact results

In general, the size of country or regional economic impact varies based on the data center size and the amount of Google's supply chain that is located in that specific geography:

- **Size:** The bigger the data center, the bigger the economic impact, other things being equal. For example, the bigger the data center, the bigger the economic impact at the data center itself plus that of the network of businesses in its supply chain.
- **Concentration:** The greater the concentration of the data center's supply chain that is located in the country or region being examined, the greater the economic impact in that location. More specifically, the bigger the supply chain located in a country or region, the bigger the economic impact found in that location's indirect channel.

Differences in either of size or concentration get amplified as we consider the induced effects occurring in the broader economy. That is because the more workers that are located in the country or region (whether direct employees or those in the supply chain), the more likely it is that economic benefit will spill over to the broader (local) economy as these workers spend their wages near to where they live.

For readers interested in our technical modeling assumptions we have included a separate chapter on methodology found at the end of this report. To complete our calculations, Google provided us with data regarding its operations, clean energy, and capital investments. However, all analytic findings and conclusions presented herein are the result of independent research conducted by Oxford Economics.

COMMONLY USED TERMS

Capital investments (data centers): The expenditures Google made in property, plant, and equipment at its data center campuses. Most significant is the construction or renovation of infrastructure put in place at each data center campus, including the construction of the data center building itself.

Capital investments (clean energy projects): The wind and solar projects that result from Google's clean energy commitments (see discussion below). Each wind or solar project constructed is a one-time occurrence and hence the economic impact associated with the manufacture and installation of each wind or solar project is also treated as a one-time occurrence.

Clean energy commitments: Google enters into agreements to purchase clean energy. As noted above, these commitments result in the construction of wind and solar projects.

Gross Domestic Product (GDP): GDP is defined as the total market value of all final goods and services produced within a region during a given time period (usually annually). As a broad measure of overall domestic production, it functions as a comprehensive scorecard of a region's economic health.

Income: Includes all forms of employment income, including employee compensation (wages, salaries, and benefits) and proprietor (or self-employment) income.

People-years: Throughout our report, a job supported by Google is generally understood to be a job that will be supported year after year given Google's current operations. We treat jobs attributable to the capital investment of clean energy projects differently because once the project is completed the job is no longer supported by the investment. To account for this finite duration, we count each job supported during the construction period as one person-year for each year that each project is being constructed. For example, one person employed for two years of construction employment would be counted as two people-years.

2. UNITED STATES

Google opened its first data centers in the United States in 2006 and has since opened data center campuses in a total of 11 states. State-of-the-art internet service requires a sophisticated interconnected network that links data centers and brings their computational and communication power closer to users and customers. To improve this service in the United States, Google continually strengthens and expands network infrastructure that spans the country and connects the data centers to countries throughout the world.

The data centers generate significant economic impact in the states and counties where they are located. In this chapter, we will explore how the economic impact spreads more broadly throughout the United States, including to states without a Google data center. Much of the distribution of the economic impact is the result of the national supply chain that supports Google's data center operations. These are the businesses throughout the country that supply the data centers with equipment or provide services that support data center operations. In Figure 8, for example, we see that one in every four jobs supported by Google is in a state not hosting one of the 12 data centers examined in this report.

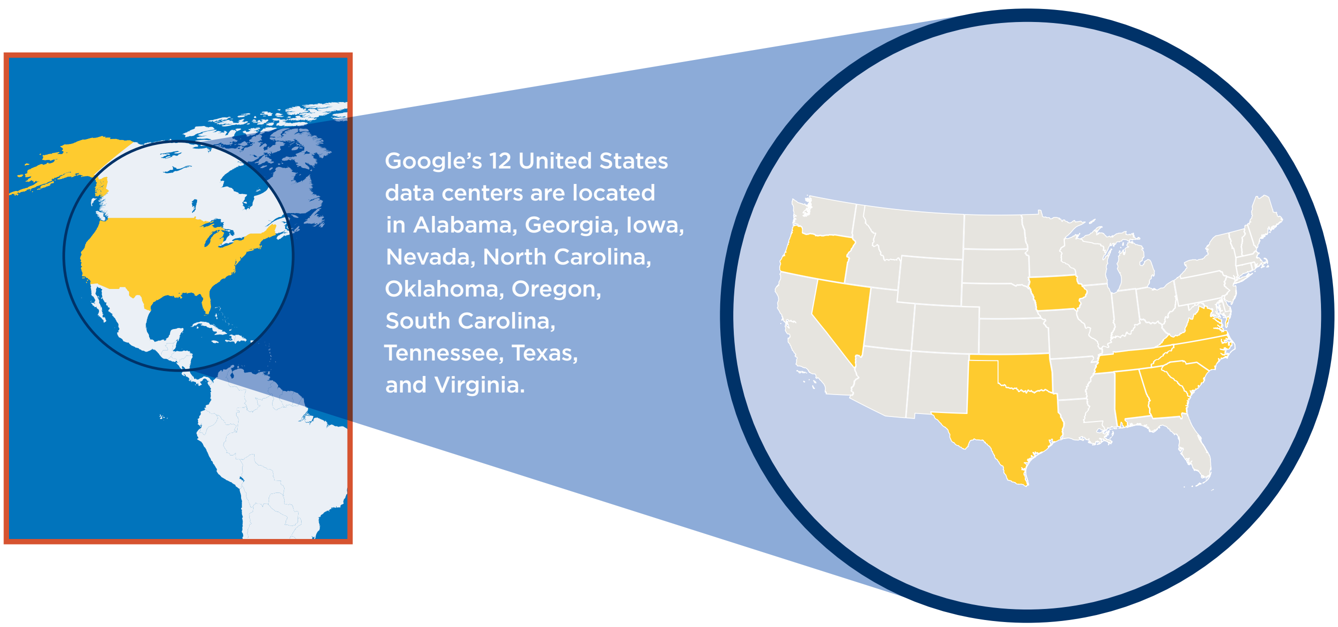
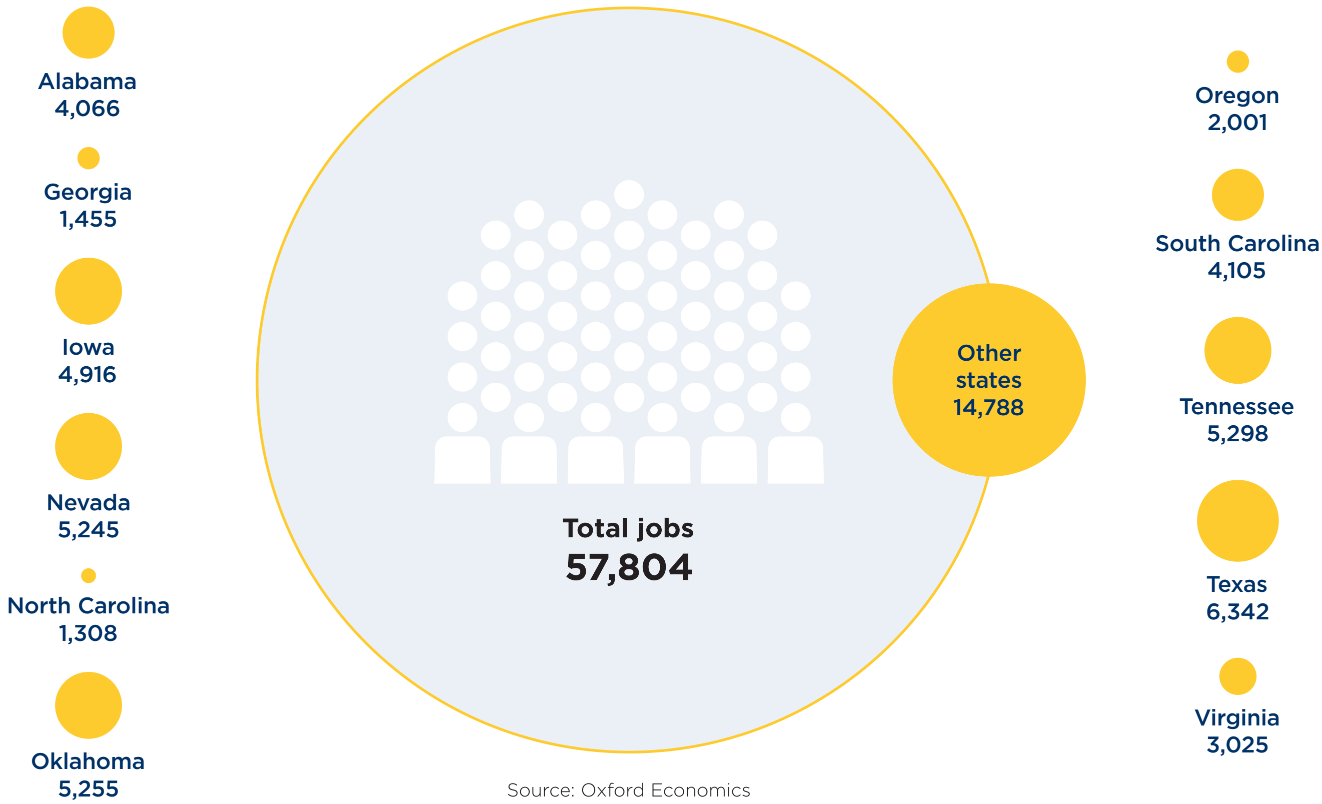


FIGURE 8: Geographic distribution of jobs[3]



Source: Oxford Economics

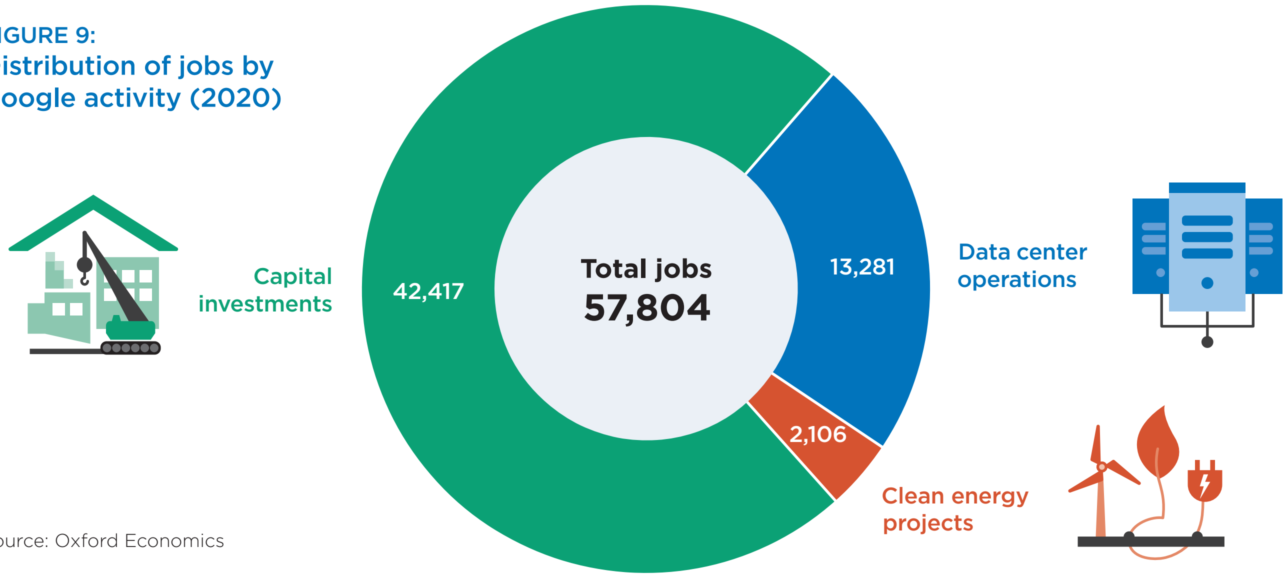
For each job attributable to data center operations, more than 3 additional jobs are supported by Google's clean energy and capital investments.

In addition to the geographically disperse distribution of jobs that it supports, Google's economic impact spills over through the economic ecosystem that its data centers support. Google regularly makes significant capital investments in its data centers. Each time an investment is made, workers are brought on site to install or construct new infrastructure or equipment on that campus. The clean energy projects that Google makes in support of its data centers generates still more economic impact. While data centers are the driving force behind Google's

[3] Because the state-level economic modeling only captures the supply chain within that state, and in particular does not capture when the supply chain of one Google data center uses inputs from a state with another Google data center, the impacts in the named states are slightly underestimated and the impacts in "Other states," which are calculated by subtracting state-level impacts from the national impacts, are equivalently overestimated.

economic impact, the related investments that support data center operations make a major contribution. In fact, for each job supported by data center operations, another 3.4 jobs are attributable to Google's ongoing investments in its data centers.

FIGURE 9:
Distribution of jobs by Google activity (2020)



Source: Oxford Economics

2.1 CLEAN ENERGY PROJECTS

Through its purchases of wind and solar power, Google has become one of the largest corporate purchasers of clean energy.[4] In addition to bringing environmental benefit, the company's clean energy projects produce substantial economic impact and in 2020 supported 2,106 jobs and generated $178 million in income for those workers.

FIGURE 10: Jobs supported by clean energy projects in the United States

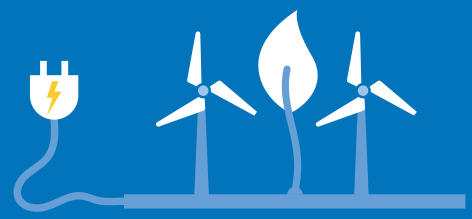
	Direct	Indirect	Induced	Total
Jobs	183	931	992	2,106
Income (millions)	$31	$90	$57	$178

Source: Oxford Economics

Google's clean energy commitments have resulted in the investment of new wind and solar farms. Google provided Oxford Economics with data on 26 wind and solar projects throughout the United States that are supported by its clean energy commitments. Each year, these projects require people to operate and maintain the infrastructure and keep the electricity produced by these projects connected to the electrical grid. The 2,106 jobs and $178 million in income that is described in Figure 10 are attributable to those workers whose jobs each year are supported by Google's clean energy projects. Of these workers, 183 are employed directly in the clean energy industry, another 931 in the supply chain that supports that industry, and a further 992 jobs supported as a result of employees spending their wages and earnings in the economy.

[4] Schechner, Sam. "Amazon and other tech giants race to buy up renewable energy." *The Wall Street Journal*, June 23, 2021.

Each year, Google's clean energy projects support 2,106 jobs throughout the United States.

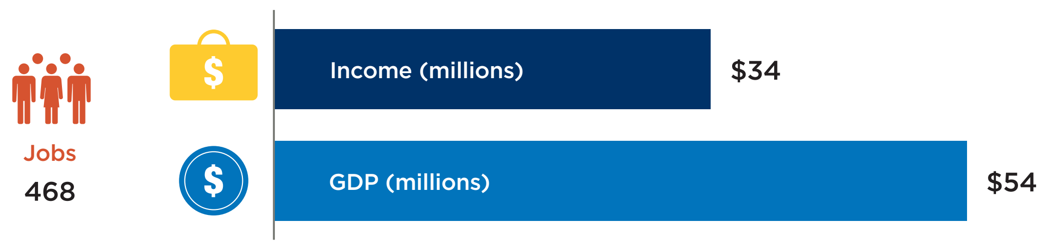


21,739 people-years were spent building and installing wind and solar projects supported by Google's clean energy projects in the United States.

Another 14,790 people-years were supported through spillover effects.

Constructing and installing each of these clean energy projects also generated economic impact which was estimated by first examining the capital investment made in each of the 26 projects. Once we calculated an average investment cost for each project, we then estimated that on average each project took three years to complete from the time construction began on its components until it was fully operational and connected to the utility grid. Based on that methodology we found that each project generated the following economic impact during each of the three years that it was being developed:

FIGURE 11: Annual construction impact per project (total jobs supported)



Source: Oxford Economics

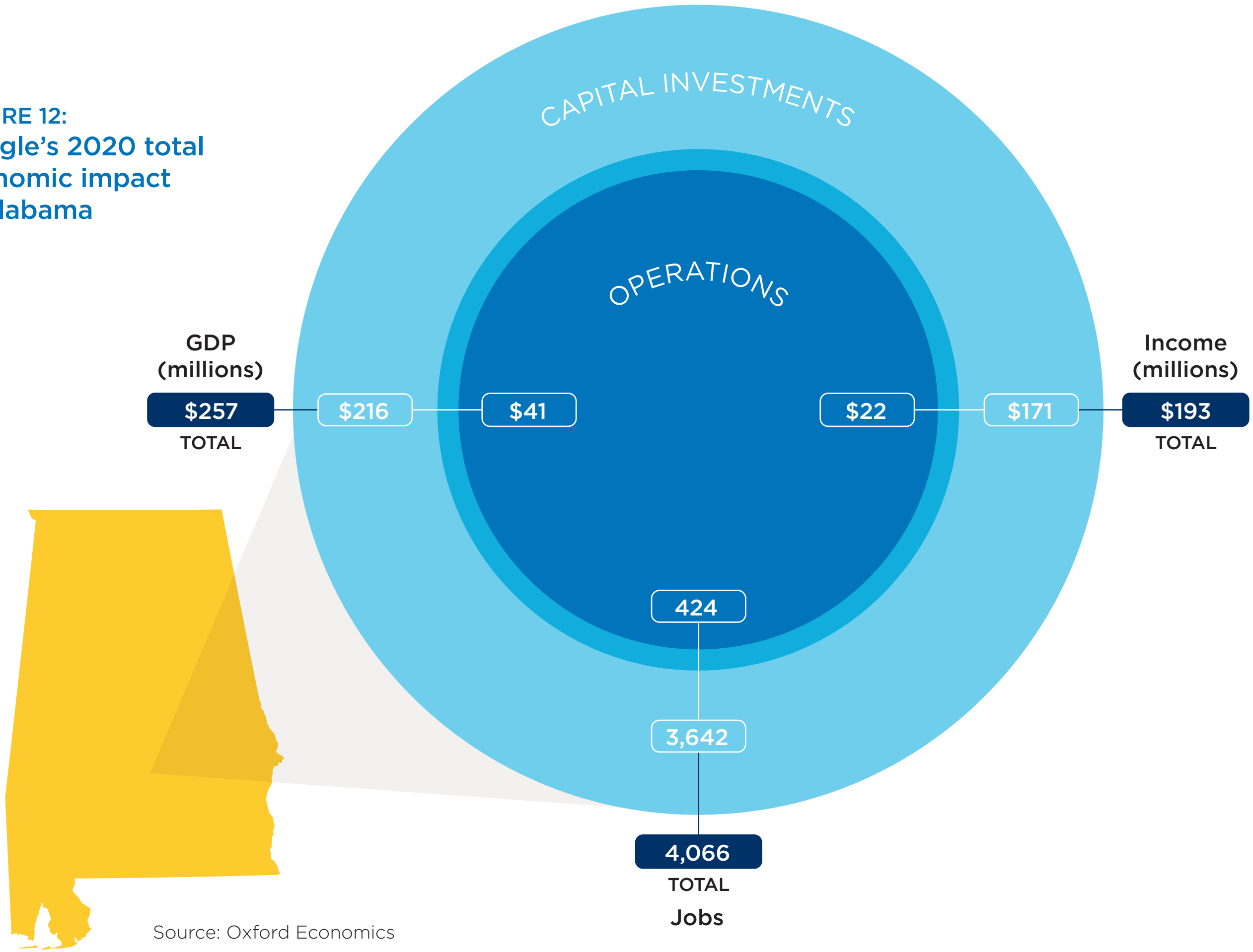
We found that on average, each new wind or solar project supported by Google generated 468 jobs, $34 million in income for workers, and contributed $54 million to GDP during each of the three years that the project was in development. When all 26 projects are considered, we calculate that Google's clean energy projects supported the equivalent of 36,504 people-years of work, when accounting for direct, indirect and induced effects. In a concrete way, Google investments are helping to build the clean energy industry in the United States.[5]

[5] Google has a stated goal to operate on 24/7 carbon-free energy, everywhere and at all times by 2030. It is expected that Google will increasingly be sourcing carbon-free energy in the same countries where it has data center operations to enable the company to meet its commitment to source carbon-free energy on the same grids where it operates its data centers.

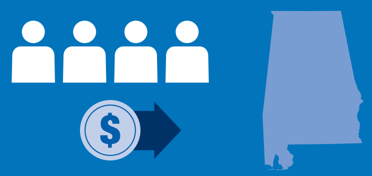
3. ALABAMA

The Bridgeport data center opened in Jackson County, Alabama, in 2019. Today, the campus represents a $600 million Google investment that contributes broadly to Alabama's economy. In 2020 operations at Bridgeport supported 4,066 jobs in Alabama, generated $193 million in income for workers, and added $257 million to state GDP.

FIGURE 12:
Google's 2020 total economic impact in Alabama



Source: Oxford Economics



In 2020, the Bridgeport data center supported 4,066 total jobs and generated $193 million in income for workers in Alabama.

3.1 JACKSON COUNTY

Most of the economic impact attributable to the Bridgeport data center is concentrated in Jackson County. In 2020, the data center supported 3,349 jobs and generated $134 million in income for workers in the county. When compared to state figures, this means that 82% of the jobs supported by Google in Alabama are located in Jackson County.

As seen in Figure 13, capital investments make an especially important contribution at the local level. As a relatively new data center, these have been particularly large at the Bridgeport data center.

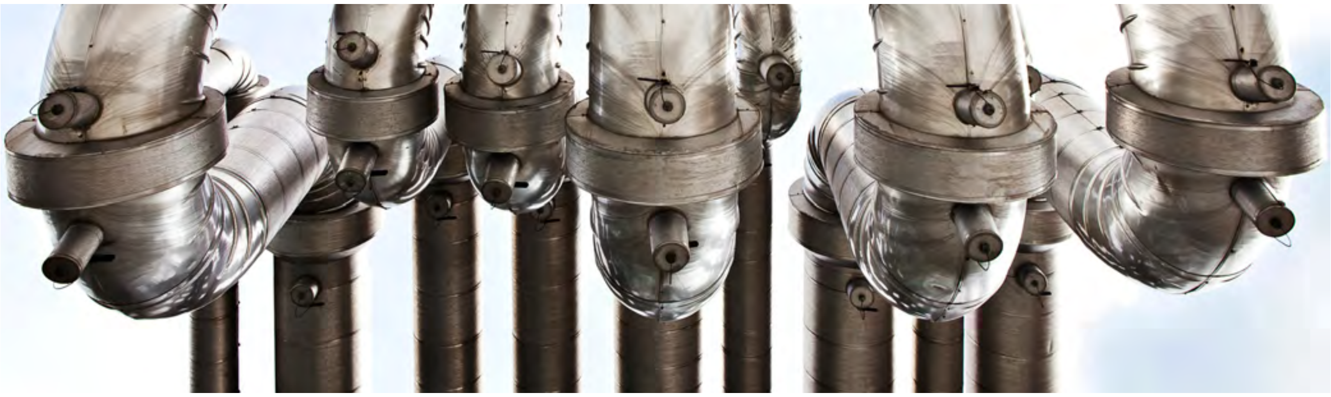
FIGURE 13: Google's 2020 economic impact in Jackson County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	362	$33	$17
Capital investments	2,987	$137	$117
Total	**3,349**	**$170**	**$134**

Source: Oxford Economics

When we examine the 2,987 jobs supported by capital investments in more detail, we find that 2,532 are in the construction industry. Much of Google's economic impact at the county level is the result of the ongoing investments that Google makes in the data center. As a result, for each job supported by data center operations in Jackson County an additional 7.2 jobs are supported by capital investments in the facility.

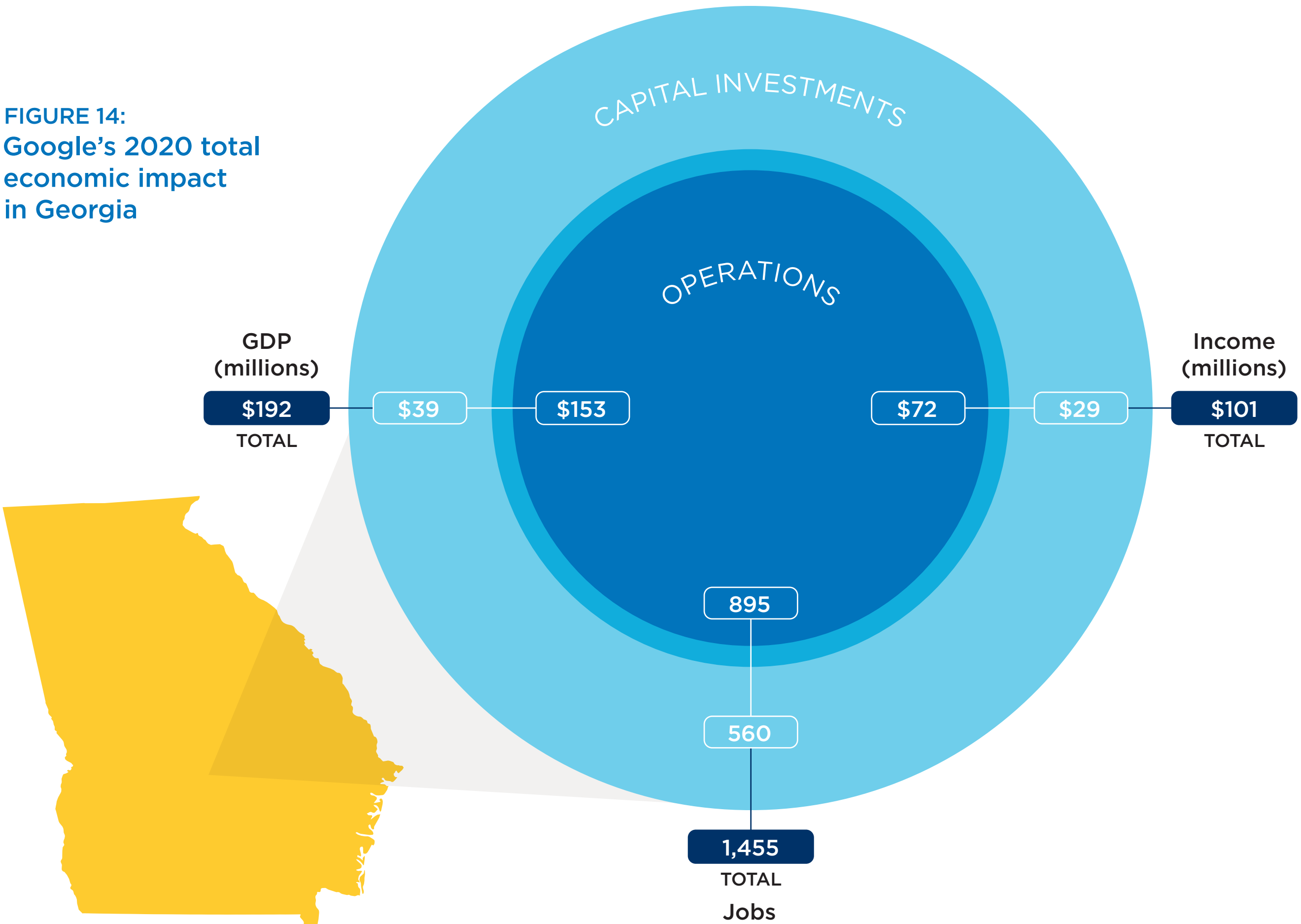
On average, Google's capital investments annually support over 2,500 construction jobs in Jackson County.



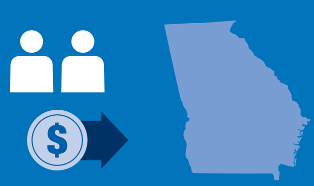
4. GEORGIA

The Lithia Springs data center opened in Douglas County, Georgia, in 2006. Today, the campus represents a $2.4 billion investment that contributes broadly to Georgia's economy. In 2020, operations at Lithia Springs supported 1,455 jobs in the state, generated $101 million in income for workers, and added $192 million to state GDP.

FIGURE 14:
Google's 2020 total economic impact in Georgia



Source: Oxford Economics



In 2020, the Lithia Springs data center supported 1,455 total jobs and generated $101 million in income for workers in Georgia.

4.1 DOUGLAS COUNTY

Most of the economic impact attributable to the Lithia Springs data center is concentrated in Douglas County. In total the data center supports 1,106 jobs in the county and generates $68 million in income for workers in the county. When compared to state figures, this means that 76% of the jobs supported by Google in Georgia are located in Douglas County.

As seen in Figure 15 most of the economic impact in Douglas County is attributable to data center operations. Still, ongoing capital investments at the data center support additional economic activity in the county. Based on the historic amount of capital investment occurring in Lithia Springs, we estimate that during an average year this activity supports 434 jobs in the county. Of these, 343 are in the construction industry.

FIGURE 15: Google's 2020 economic impact in Douglas County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	672	$121	$54
Capital investments	434	$20	$14
Total	**1,106**	**$141**	**$68**

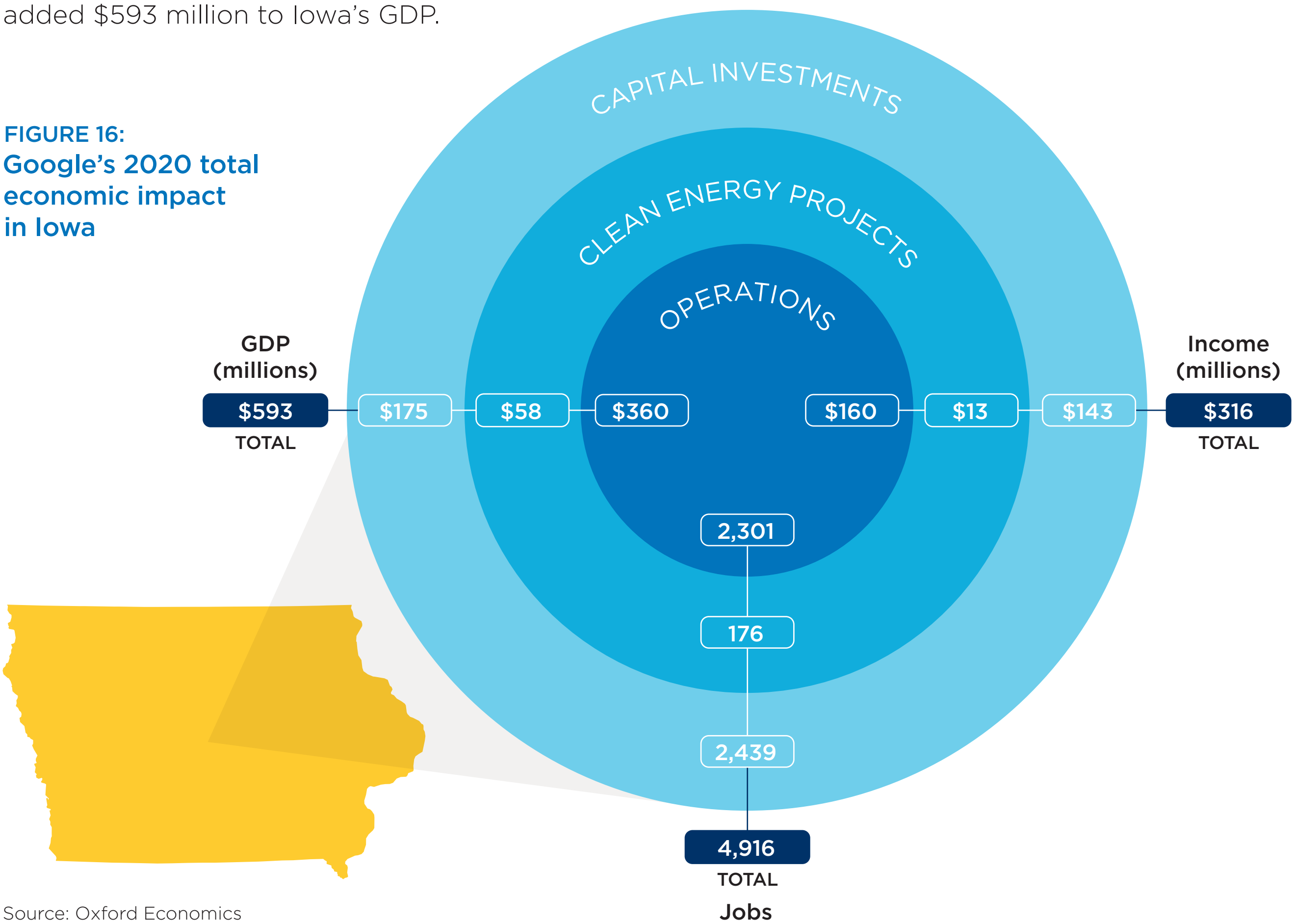
Source: Oxford Economics

On average, Google's capital investments annually support
343 construction jobs
in Douglas County.

5. IOWA

The first Council Bluffs data center opened in Pottawattamie County, Iowa, in 2006. In 2012, Google significantly expanded its operations in Council Bluffs with the addition of an adjacent campus. In our report, we refer to these combined operations as the Council Bluffs data center campus. Today, the campus represents a $2.5 billion investment that contributes broadly to Iowa's economy. In 2020, operations at Council Bluffs ultimately supported 4,916 jobs, generated $316 million in income for workers in the state, and added $593 million to Iowa's GDP.

FIGURE 16:
Google's 2020 total economic impact in Iowa



Source: Oxford Economics

In 2020, the Council Bluffs data center supported 4,916 total jobs and generated $316 million in income for workers in Iowa.

Data center operations and capital investment contribute most to Google's economic impact in the state, but the company's in-state clean energy projects also support 176 total jobs. Of these, an estimated 126 are in the clean energy industry itself (including its supply chain).

5.1 POTTAWATTAMIE COUNTY

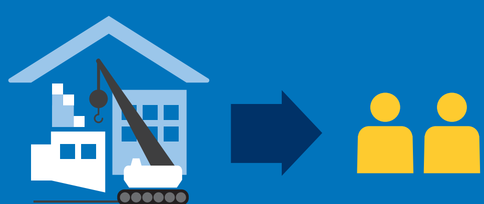
Most of the in-state economic impact attributable to the Council Bluffs data center campus is concentrated in Pottawattamie County. In total, the data center supports 3,690 jobs and generates $235 million in income for workers in the county. When compared to state figures, this means that 75% of the jobs supported by Google in Iowa are located in Pottawattamie County.

FIGURE 17: Google's 2020 economic impact in Pottawattamie County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	1,682	$249	$113
Capital investments	2,008	$139	$122
Total	**3,690**	**$388**	**$235**

Source: Oxford Economics

As seen in the figure above, capital improvements make an especially important contribution at the local level. Based on the historic amount of capital investment occurring in Council Bluffs, we estimate that during an average year this activity supports 2,008 jobs in the county. Of these, 1,573 are in the construction industry.

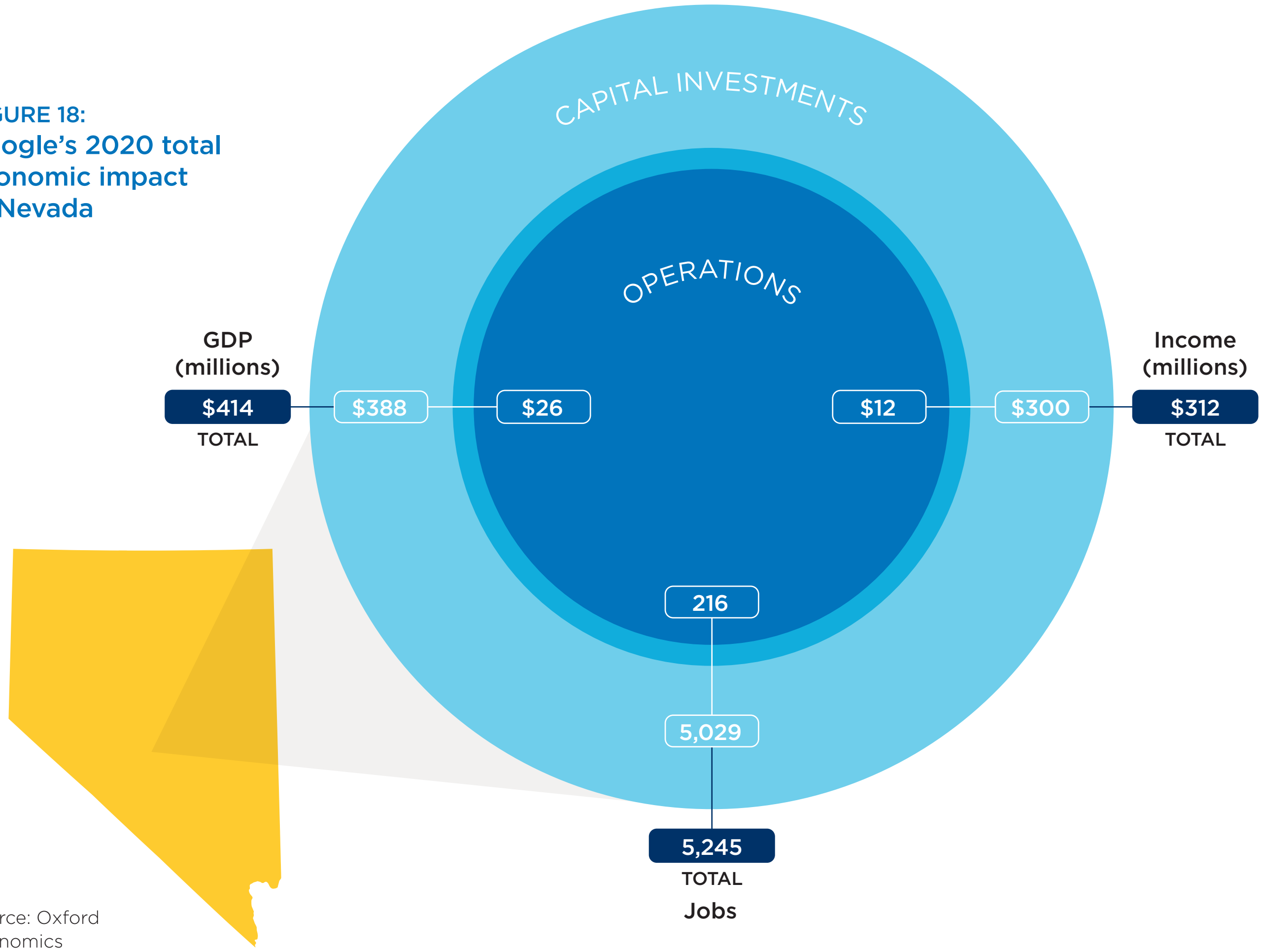


On average, Google's capital investments annually support 1,573 construction jobs in Pottawattamie County.

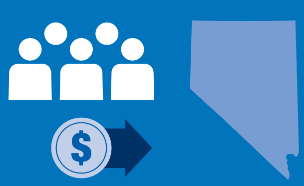
6. NEVADA

The Henderson data center opened in Clark County, Nevada, in 2019. Today, the campus represents a $1.2 billion investment that contributes broadly to Nevada's economy. In 2020, operations at the Henderson data center supported 5,245 jobs, generated $312 million in income for Nevada workers, and added $414 million to state GDP.

FIGURE 18:
Google's 2020 total economic impact in Nevada



Source: Oxford Economics



In 2020, the Henderson data center supported over 5,245 total jobs and generated $312 million in income for workers in Nevada.

6.1 CLARK COUNTY

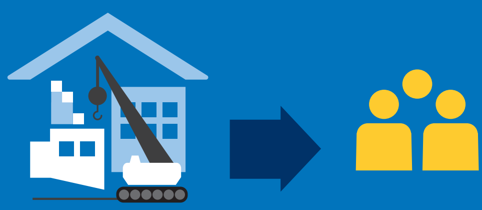
Almost all of Henderson's economic impact is concentrated in Clark County, where the data center and most of its in-state supply chain are located. In total, 5,208 jobs are supported in the county, and most of these (4,992) are attributable to the capital investments made by Google in the data center campus.

When capital investments are examined in more detail, we find that 3,292 of the jobs supported in Clark County are in the construction industry.

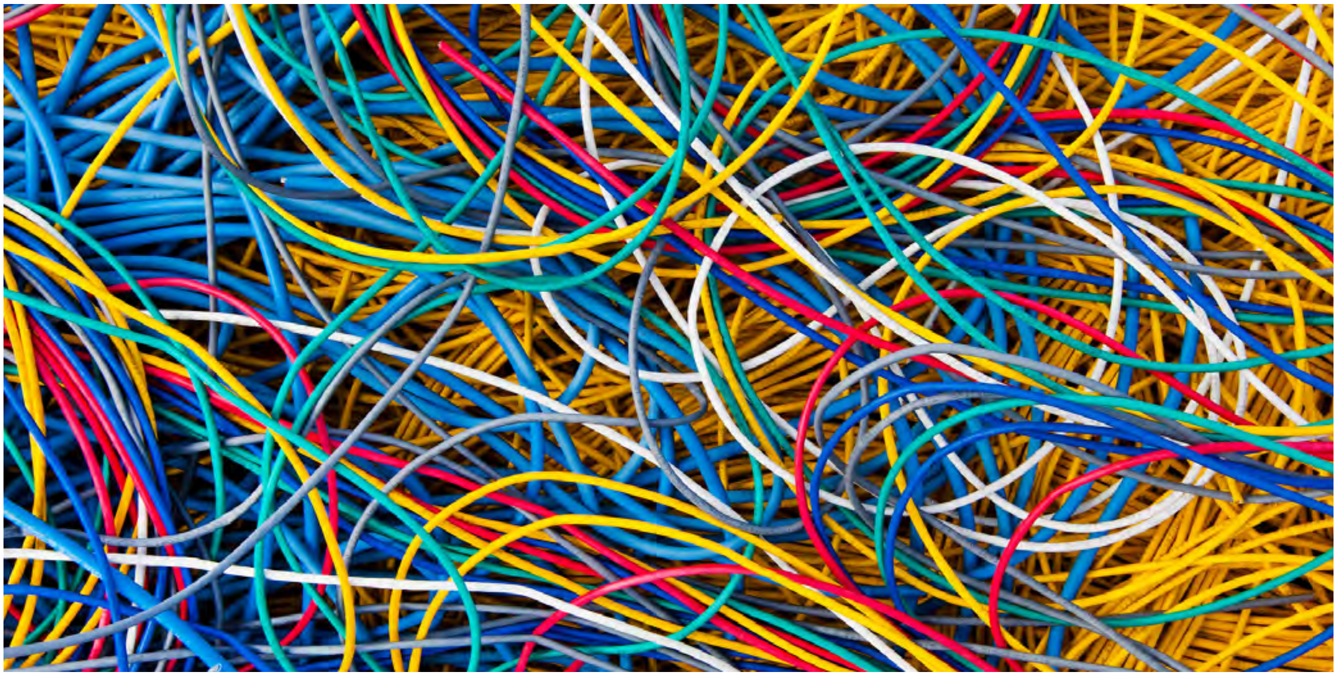
FIGURE 19: Google's 2020 economic impact in Clark County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	216	$25	$12
Capital investments	4,992	$376	$290
Total	**5,208**	**$401**	**$302**

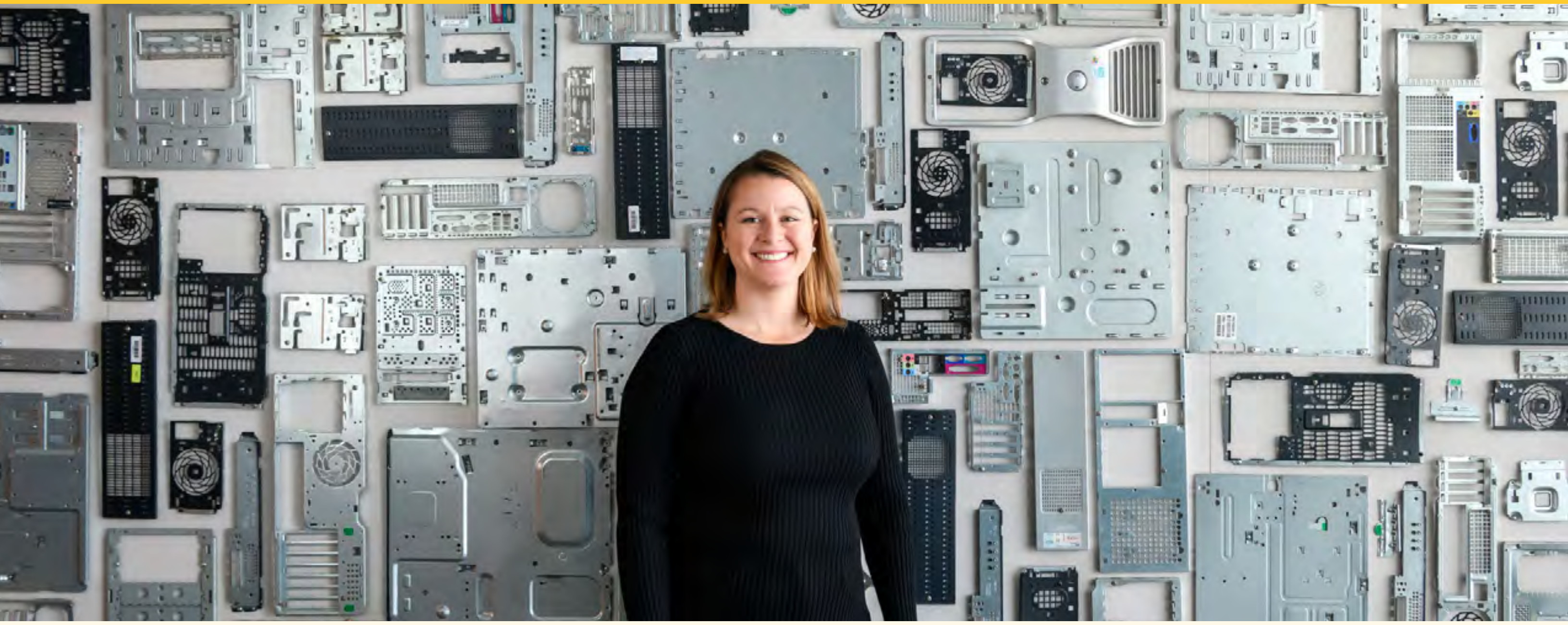
Source: Oxford Economics



On average, Google's capital investments annually support 3,292 construction jobs in Clark County.



Transforming classroom learning



Heather Crawford-Ferre believes that technology can help students learn but that significant preparation is required to get the most out of digital tools. "We need to get teachers up to speed," says Dr. Crawford-Ferre. "Our teachers don't necessarily have any formal training in how best to use technology for their teaching, and we want them to have digital fluency in the classroom."

Dr. Crawford-Ferre, a mathematics teacher herself, serves as State Coordinator for the Nevada Ready 21 program, an initiative of the Nevada Department of Education that focuses on technology, equity, and building a future-ready workforce. The program has support from Google, which operates two data centers in the state and is sponsoring an ambitious effort to help train up to 10,000 of Nevada's 17,000 primary- and secondary-school teachers on how to use the latest software tools to enhance classroom learning.

Nevada Ready 21 offers teachers the training needed to achieve Level 1 in the Google for Education certification program, which provides instruction on the use of a suite of digital tools designed for the classroom. An additional training path leads more advanced teachers to gain Level 3 certification, which equips them to train their fellow educators.

This is specialized training on an everyday topic, according to Amy Mayer, the founder and CEO of friEdTechnology, a Texas-based professional development firm hired by the state of Nevada to help train its first cohort of Google-certified teachers. "It's not that those teachers come in ignorant of how to use technology," says Ms. Mayer. "But knowing how to use it to transform learning is a big and different thing." The model of what a teacher should be has changed. "Now we need to be guides on the side, not sages on the stage."

The pandemic helped clarify the importance of mastering new forms of learning for students and teachers alike. The friEdTechnology training is carried out through a series of online video sessions and some individualized learning, which teachers can access at their own pace. Teachers in Nevada must spend between 12 and 20 hours on their own to master the material. While they are not paid for their time, teachers who gain formal certification could eventually see a boost in their salary.

Students, meanwhile, are adept with the technology required to watch videos or consume social media, but those are just the first steps to successful implementation in the classroom. "They know how to consume media, but don't know how to use digital technologies in order to learn," says Ms. Mayer. For example, as part of its formal educational goals, the state now expects 8th grade students to create digital work that includes text and video, and 12th graders to edit and critique audio, video, and other digital media.

In Carson City, LeAnn Morris, a former first-grade teacher who is now a certified Google trainer, is excited about the ability to create individualized lesson plans for each student in a classroom. "Having resources available for teachers to be able to customize a student's learning is a very powerful motivation to use this technology," says Dr. Morris.

With all 7,600 students in the school district using networked notebook computers, teachers can get real-time feedback on how well their lesson plans are working. That might mean seeing real-time results of a pop quiz or whiteboard exercise or assessing how much each individual student actually contributed to a group project. "It's one of the most powerful things about working with this technology," says Dr. Morris.

Last school year, seven of Carson City's 486 K–12 teachers received their Level 1 certifications, and now that Dr. Morris has become a certified trainer, she hopes to help at least five more teachers reach the first level during the program's next round.

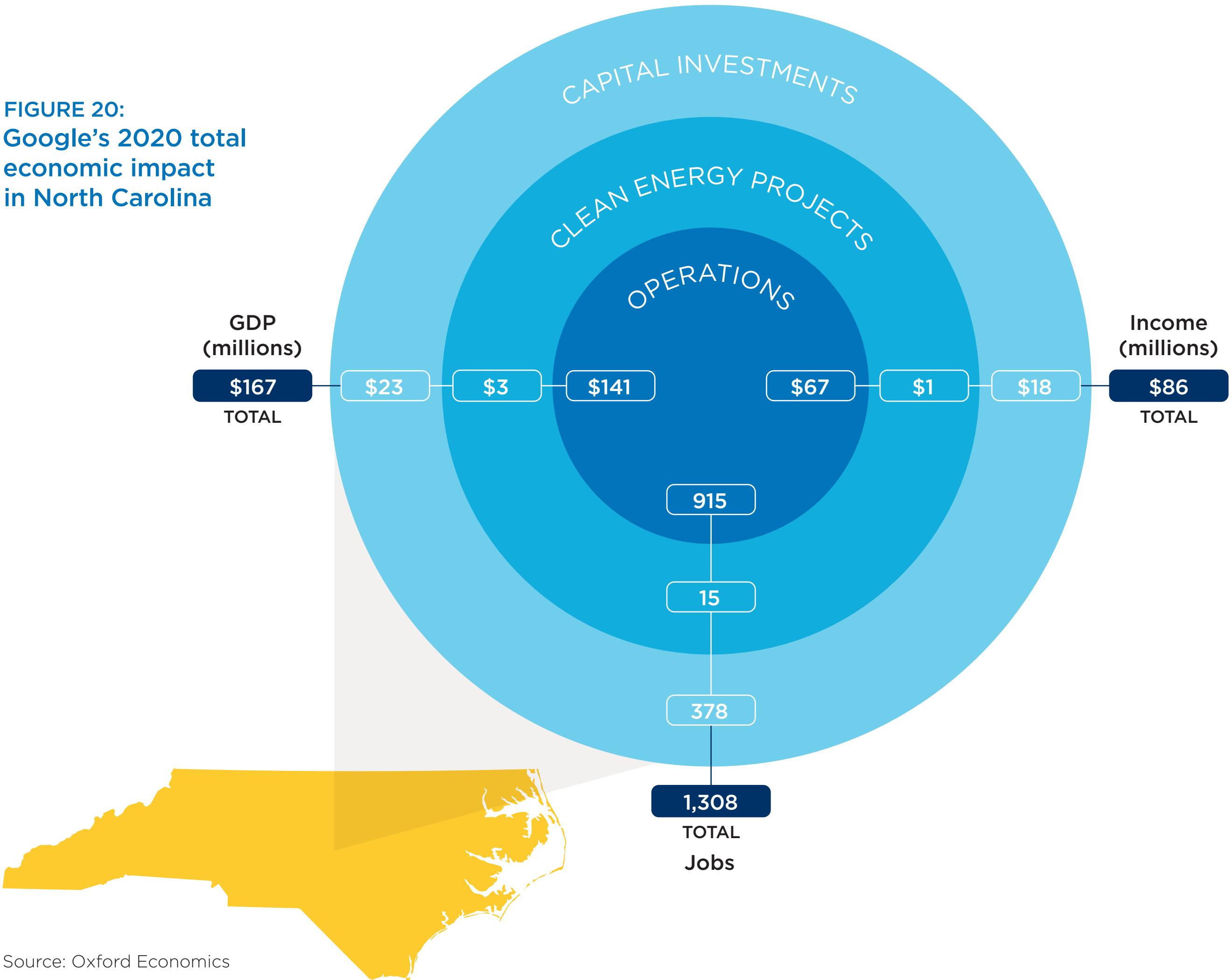
"To know the ins and outs of these Google apps so I could use them more effectively is something I have been wanting to do for a long time," Dr. Morris says. Before she undertook the training, she didn't understand how much she could transform classroom learning by using new tools.

"I feel like I can make the classroom more interactive and engaging for teachers and students alike," she notes. "Getting real-time feedback on whatever the assignment the student is working on is a very powerful resource."

7. NORTH CAROLINA

The Lenoir data center opened in Caldwell County, North Carolina, in 2008. Today, the campus represents a $1.2 billion investment that contributes broadly to North Carolina's economy. In 2020, the data center supported 1,308 jobs, generated $86 million in income for North Carolina workers, and added $167 million to state GDP.

FIGURE 20:
Google's 2020 total economic impact in North Carolina



Source: Oxford Economics

Data center operations contribute most to Google's economic impact in North Carolina but as we will explore more below, so do the regular capital investments that the company makes in Lenoir. In addition, clean energy projects in North Carolina add to Google's in-state economic impact.

In 2020, the Lenoir data center supported 1,308 total jobs and generated $86 million in income for workers in North Carolina.

7.1 CALDWELL COUNTY

Most of the North Carolina economic impact attributable to the Lenoir data center is concentrated in Caldwell County, where the data center is located. In total, the data center supports 888 jobs and generates $56 million in income for workers in the county. When compared to state figures, this means that 68% of the jobs supported by Google in North Carolina are located in Caldwell County.

As seen in Figure 21, both data center operations and capital investments make important contributions at the county level and support a diverse range of jobs. For example, when we examine the 308 jobs supported by capital investments in Caldwell County in more detail, we find that 257 are in the construction industry.

FIGURE 21: Google's 2020 economic impact in Caldwell County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	580	$93	$45
Capital investments	308	$14	$11
Total	**888**	**$107**	**$56**

Source: Oxford Economics

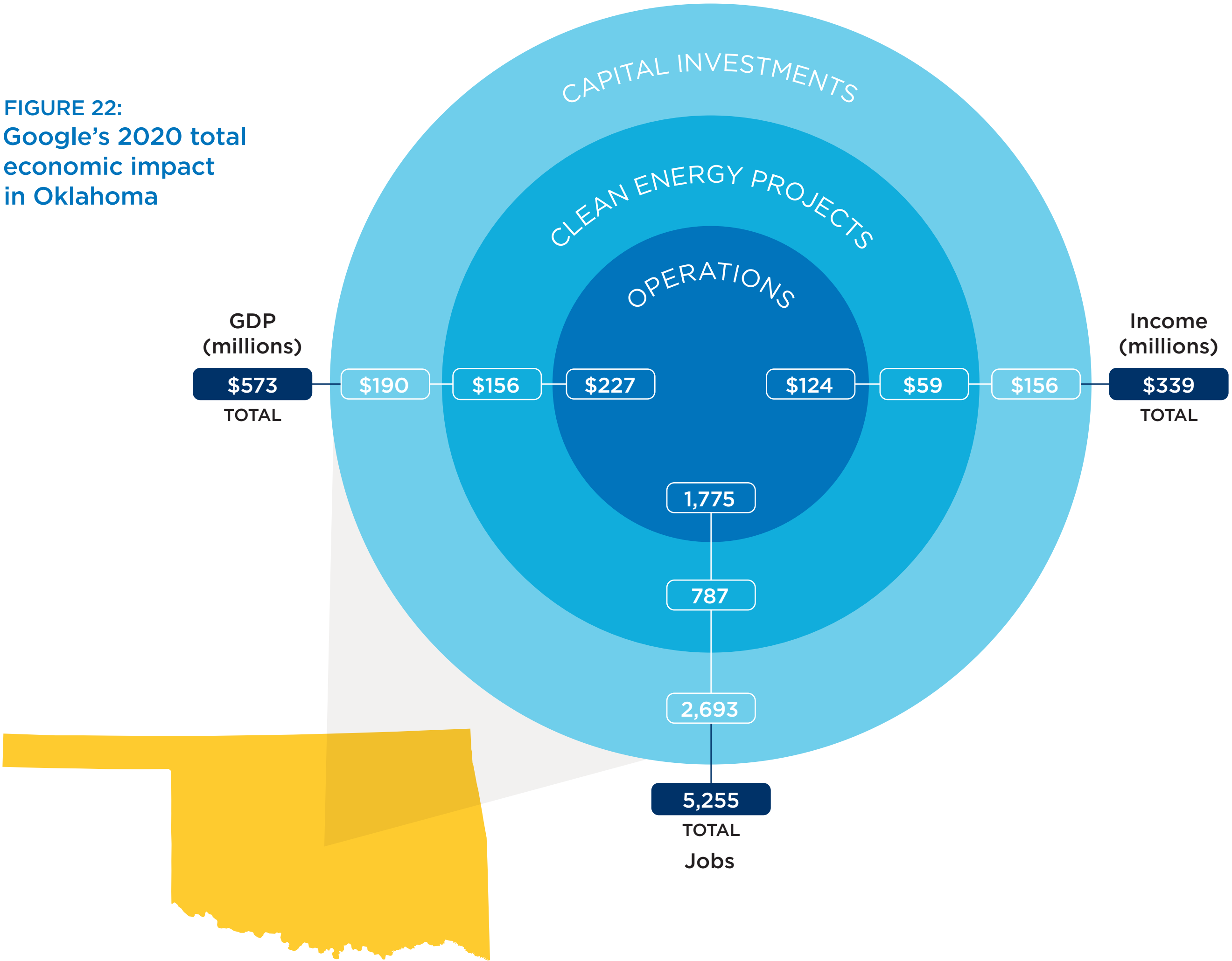
On average, Google's capital investments annually support 257 construction jobs in Caldwell County.

8. OKLAHOMA

The Pryor Creek data center opened in Mayes County, Oklahoma, in 2008. Today, the campus represents a $3.0 billion investment that contributes broadly to Oklahoma's economy. In 2020, operations at the Pryor Creek data center supported 5,255 jobs, generated nearly $339 million in income for workers in Oklahoma, and added $573 million to state GDP.

Operations, clean energy, and capital investments each significantly contribute to Google's economic impact in Oklahoma. Capital investments are analyzed more in our discussion on Mayes County (below). At the state level, we examined the 787 jobs supported by Google's clean energy projects in more detail. We found that 551 of these positions are in the clean energy industry itself (including its supply chain).

FIGURE 22:
Google's 2020 total economic impact in Oklahoma



Source: Oxford Economics

In 2020, the Pryor Creek data center supported 5,255 total jobs and generated $339 million in income for workers in Oklahoma.

8.1 MAYES COUNTY

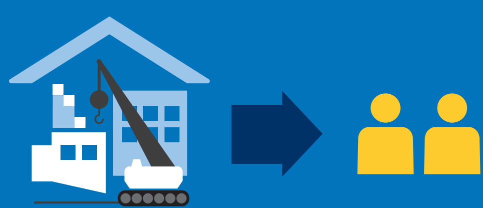
A substantial amount of Pryor Creek's economic impact is concentrated in Mayes County, where the data center supports over 3,347 jobs and generates $215 million in income for workers. When compared to state figures, this means that 64% of the jobs supported by Google in Oklahoma are in Mayes County.

As seen in Figure 23, both data center operations and capital investments make important contributions to Google's in-county economic impact and support a diverse range of jobs. For example, when we examine the 1,962 jobs supported by Google's capital investments in more detail, we find that 1,520 of these jobs are in the construction industry.

FIGURE 23: Google's 2020 economic impact in Mayes County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	1,385	$159	$89
Capital investments	1,962	$143	$126
Total	**3,347**	**$302**	**$215**

Source: Oxford Economics

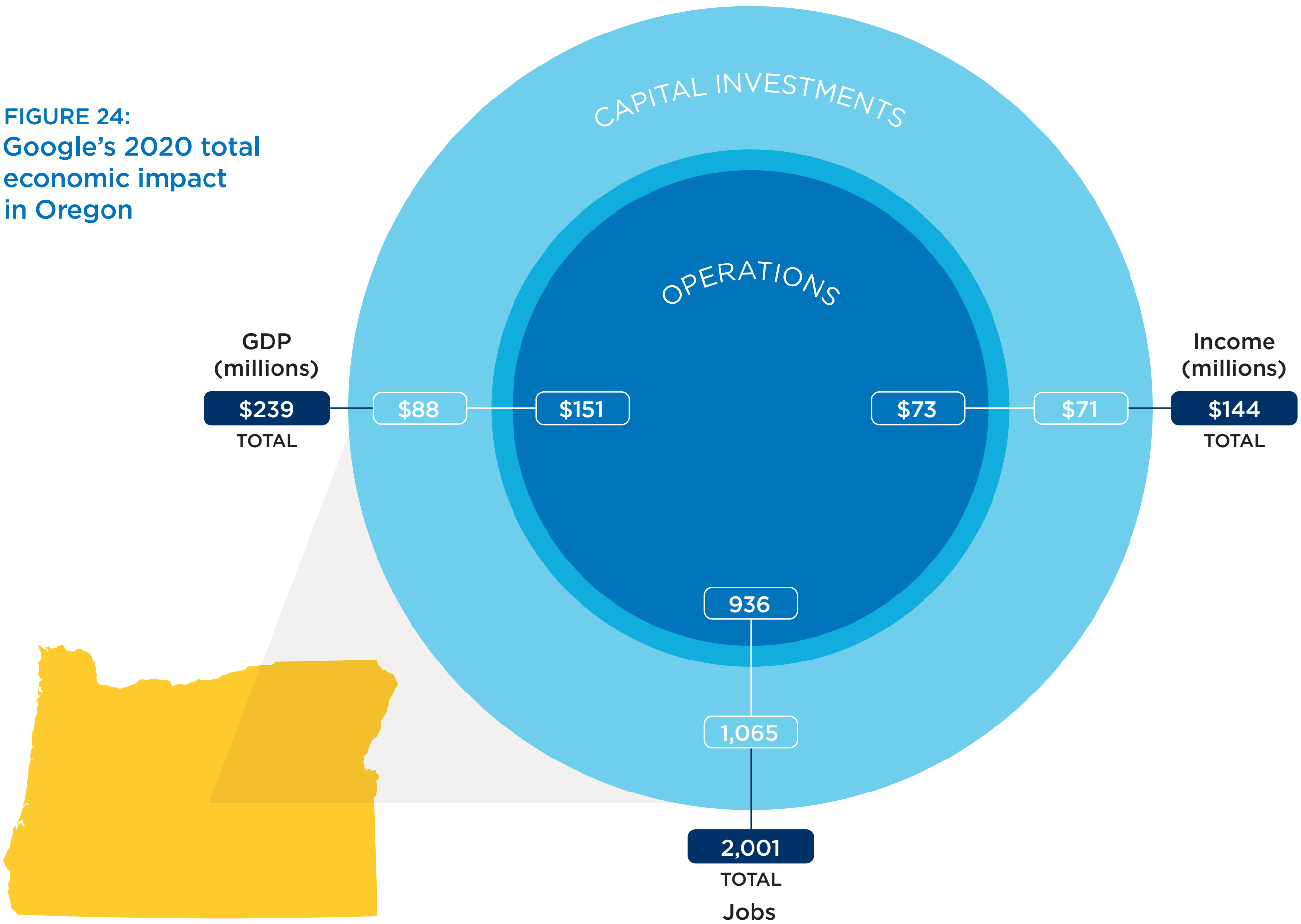


On average, Google's capital investments annually support 1,520 construction jobs in Mayes County.

9. OREGON

The Dalles data center opened in Wasco County, Oregon, in 2006. Today, the campus represents a $1.8 billion investment that contributes broadly to Oregon's economy. In 2020, operations at The Dalles supported 2,001 jobs, generated $144 million in income for workers in Oregon, and added $239 million to state GDP.

FIGURE 24:
Google's 2020 total economic impact in Oregon



Source: Oxford Economics

In 2020, the data center in The Dalles supported 2,001 total jobs and generated $144 million in income for workers in Oregon.

9.1 WASCO COUNTY

A substantial amount of The Dalles' economic impact is concentrated in Wasco County, where the data center supports 1,661 jobs and generates $123 million in income for workers. When compared to state figures, this means that 83% of the jobs supported by Google in Oregon are in Wasco County.

As seen in Figure 25, both data center operations and capital investments make nearly equal contributions to Google's in-county economic impact and support a diverse range of jobs. For example, when we examine the 855 jobs supported by Google's capital investments in more detail, we find that 574 of these jobs are in the construction industry.

FIGURE 25: Google's 2020 economic impact in Wasco County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	806	$129	$64
Capital investments	855	$69	$59
Total	**1,661**	**$198**	**$123**

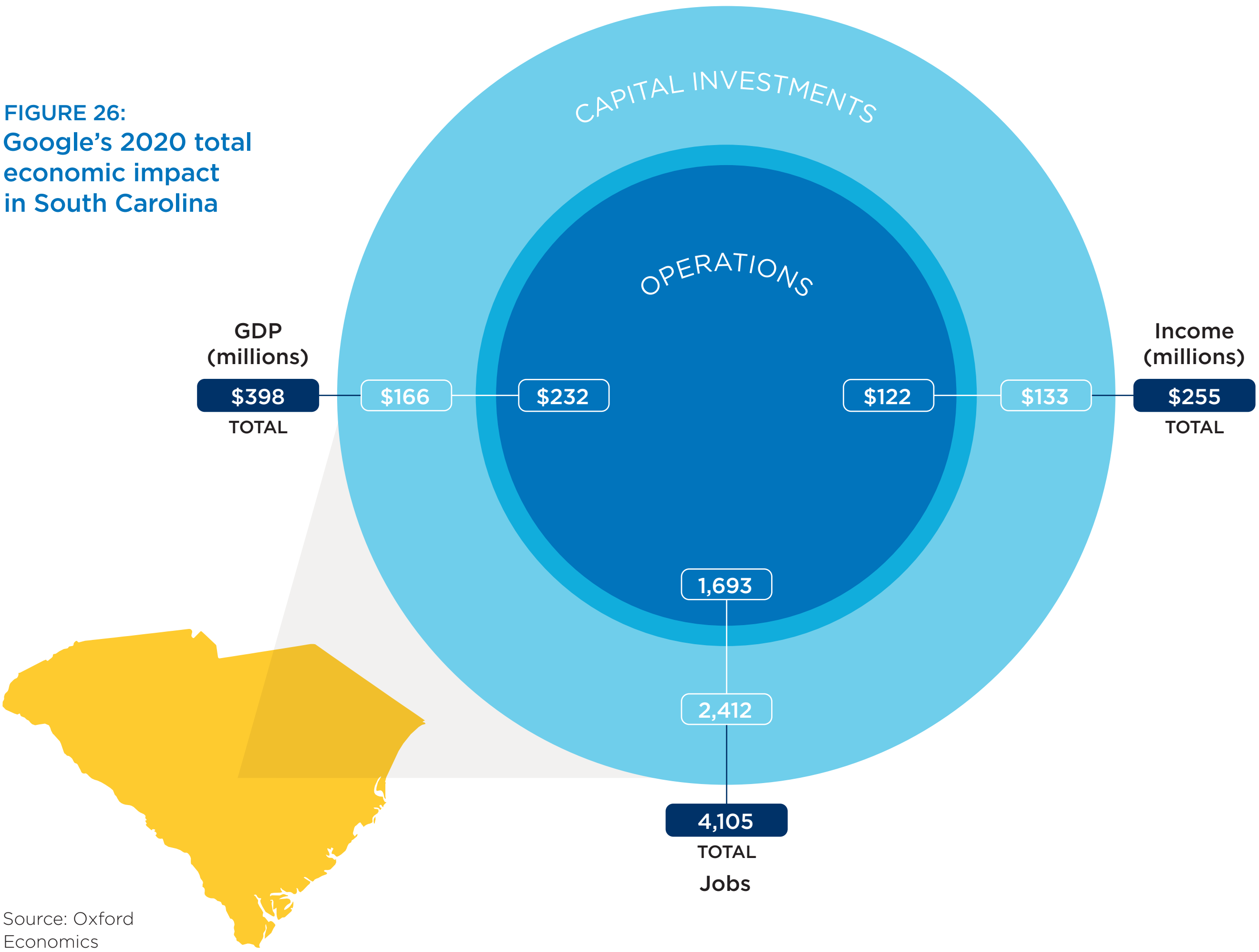
Source: Oxford Economics

On average, Google's capital investments annually support 574 construction jobs in Wasco County.

10. SOUTH CAROLINA

The Moncks Corner data center opened in Berkeley County, South Carolina, in 2008. Today, the campus represents a $2.4 billion investment that contributes broadly to South Carolina's economy. In 2020, operations at Moncks Corner supported 4,105 jobs, generated $255 million in income for workers, and added $398 million to state GDP.

FIGURE 26: Google's 2020 total economic impact in South Carolina



Source: Oxford Economics

In 2020, the Moncks Corner data center supported 4,105 total jobs and generated $255 million in income for workers in South Carolina.

10.1 BERKELEY COUNTY

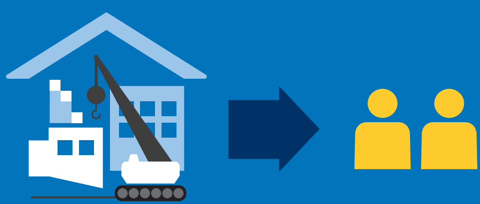
A substantial amount of the Moncks Corner economic impact is concentrated in Berkeley County, where the data center supports 3,199 jobs and generates $206 million in income for workers. When compared to state figures, this means that 78% of the jobs supported by Google in South Carolina are in Berkeley County.

As seen in Figure 27, both data center operations and capital investments make large contributions to Google's in-county economic impact and support a diverse range of jobs. For example, when we examine the 1,960 jobs supported by Google's capital investments in more detail, we find that 1,501 of these jobs are in the construction industry.

FIGURE 27: Google's 2020 economic impact in Berkeley County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	1,239	$180	$95
Capital investments	1,960	$132	$111
Total	**3,199**	**$312**	**$206**

Source: Oxford Economics

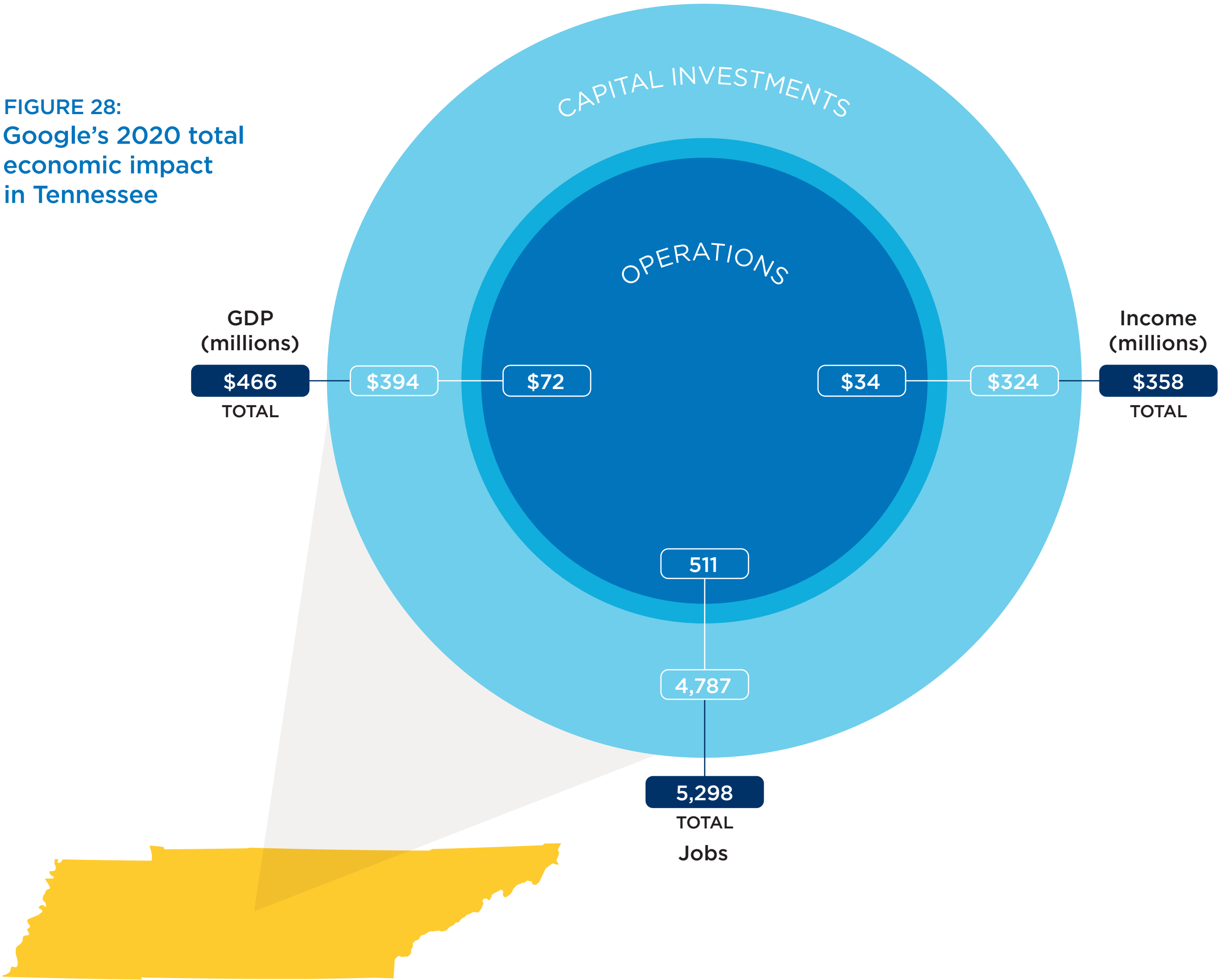


On average, Google's capital investments annually support
1,501 construction jobs
in Berkeley County.

11. TENNESSEE

The Spring Creek data center opened in Madison County, Tennessee, in 2019. Today, the campus represents a $600 million investment that contributes broadly to Tennessee's economy. In 2020 operations at Spring Creek supported 5,298 jobs, generated $358 million in income for workers in Tennessee, and added $466 million to state GDP.

FIGURE 28:
Google's 2020 total economic impact in Tennessee



Source: Oxford Economics

In 2020, the Spring Creek data center supported **5,298 total jobs** and generated **$358 million** in income for workers in Tennessee.

11.1 MADISON COUNTY

Most of Spring Creek's economic impact in Tennessee is concentrated in Madison County, where the data center supports 4,560 jobs and generates $298 million in income for workers. When compared to state figures, this means that 86% of the jobs supported by Google in Tennessee are in Madison County,

At the county level, the economic impact resulting from capital improvements is especially important and accounts for 91% of the jobs in total. When this impact is examined in more detail, we find that nearly 2,900 of these jobs are in the construction industry.

FIGURE 29: Google's 2020 economic impact in Madison County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	432	$63	$29
Capital investments	4,128	$315	$269
Total	**4,560**	**$378**	**$298**

Source: Oxford Economics

On average, Google's capital investments annually support **2,892 construction jobs** in Madison County.

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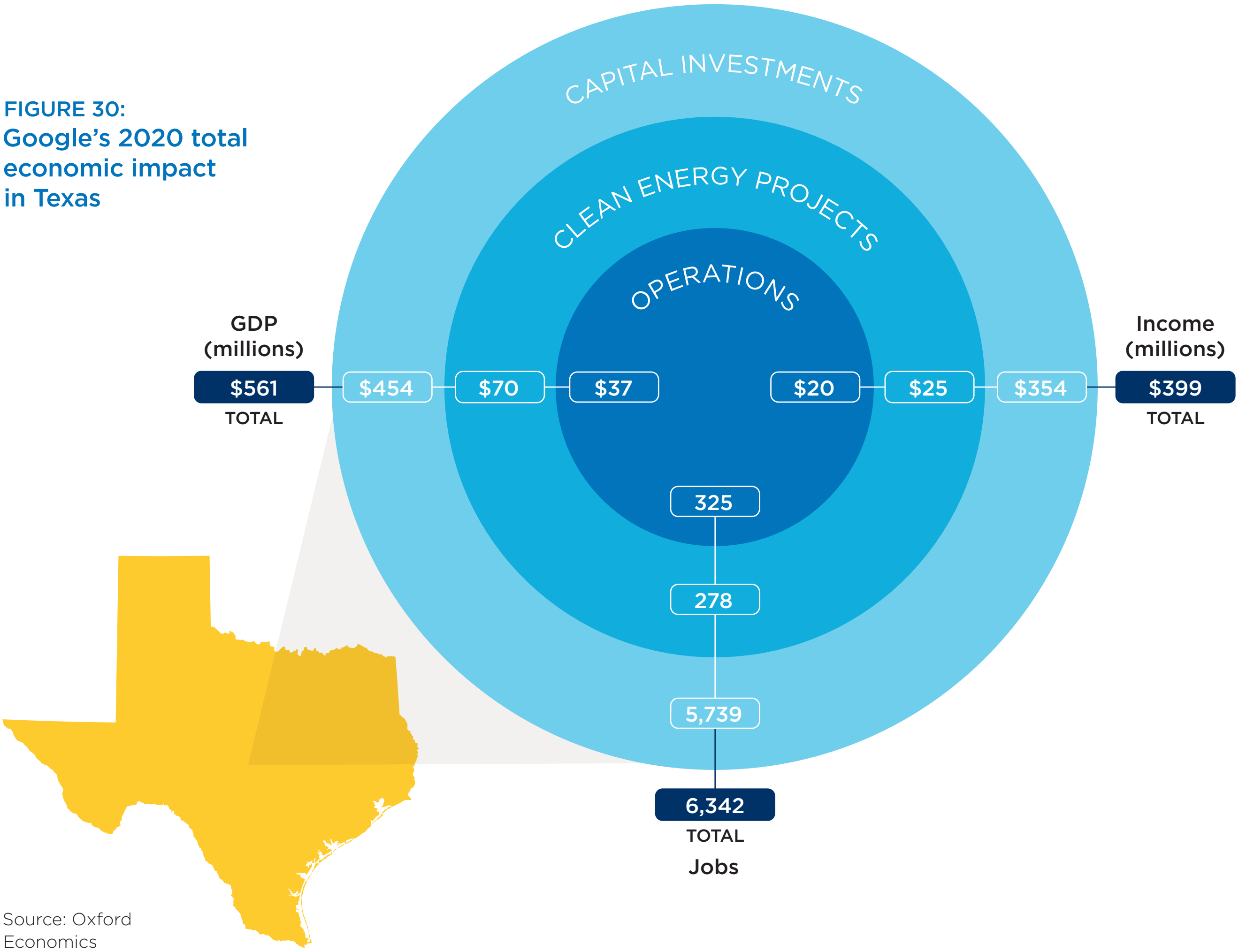
12. TEXAS

The Midlothian data center opened in Ellis County, Texas, in 2019. Today, the campus represents a $600 million investment that contributes broadly to the Texas economy. In 2020, operations in Midlothian supported 6,342 jobs, generated $399 million in income for workers, and added $561 million to state GDP.

As a relatively new data center, capital investments in Midlothian make the largest contribution to Google's economic impact in Texas and this will be discussed in more detail in the following section. At the state level, we examined the 278 jobs supported by Google's clean energy projects in more detail. We found that 168 of these positions are in the clean energy industry itself (including its supply chain).

FIGURE 30: Google's 2020 total economic impact in Texas



Source: Oxford Economics

In 2020, the Midlothian data center supported 6,342 total jobs and generated $399 million in income for workers in Texas.

12.1 ELLIS COUNTY

Most of the Midlothian data center's economic impact is concentrated in Ellis County, where the Google campus supports 4,532 jobs and generates $251 million in income for workers. When compared to state figures, this means that 71% of the jobs supported by Google in Texas are in Ellis County.

At the county level, the economic impact resulting from capital improvements is especially important and accounts for over 94% of the jobs total. When this impact is examined in more detail, we find that 3,371 of these jobs are in the construction industry.

FIGURE 31: Google's 2020 economic impact in Ellis County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	265	$29	$16
Capital investments	4,267	$270	$235
Total	**4,532**	**$299**	**$251**

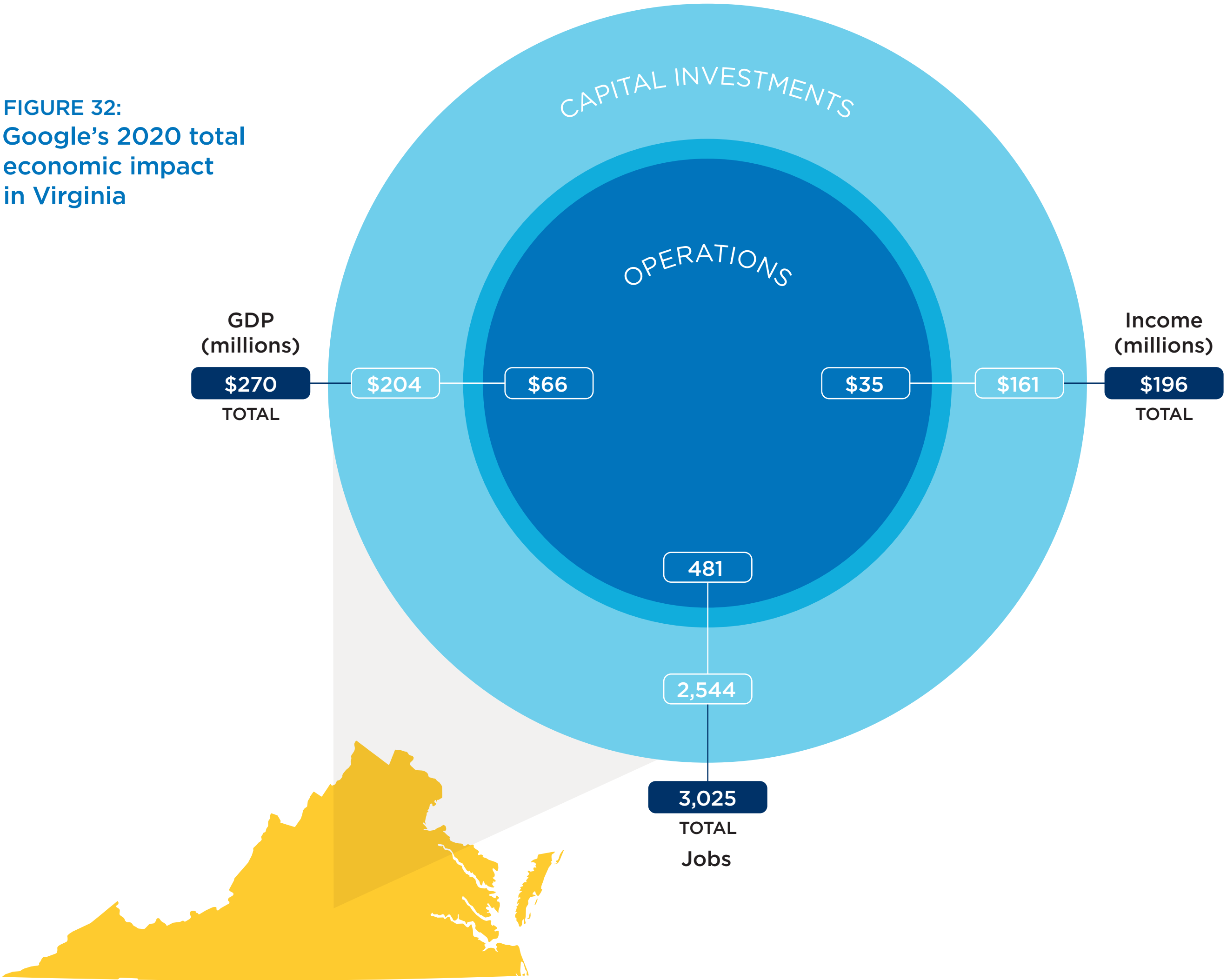
Source: Oxford Economics

On average, Google's capital investments annually support 3,371 construction jobs in Ellis County.

13. VIRGINIA

In 2019 Google opened new data centers in Sterling and Leesburg, Virginia. Both of these campuses are located in Loudoun County and together they represent a $1.2 billion investment that contributes broadly to the state's economy. In 2020, operations at the two data centers supported 3,025 jobs, generated $196 million in income for workers in Virginia, and added $270 million to state GDP.

FIGURE 32:
Google's 2020 total economic impact in Virginia



Source: Oxford Economics

In 2020, the Loudon County data centers supported 3,025 total jobs and generated $196 million in income for workers in Virginia.

13.1 LOUDOUN COUNTY

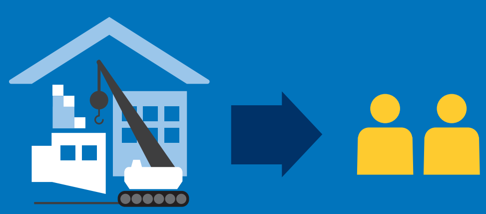
A substantial amount of Google's economic impact is concentrated in Loudoun County, where the data centers are located and support 2,373 jobs and generate $167 million in income for workers. When compared to state figures, this means that 78% of the jobs supported by Google in Virginia are in Loudoun County.

At the county level, the economic impact resulting from capital improvements is especially important since these are relatively new campuses. In fact, capital investments account for 84% of the jobs supported by Google in the county. When this impact is examined in more detail, we find that 1,527 of these jobs are in the construction industry.

FIGURE 33: Google's 2020 economic impact in Loudoun County

Google activity	Jobs	GDP (millions)	Income (millions)
Operations	388	$50	$28
Capital investments	1,985	$164	$139
Total	**2,373**	**$214**	**$167**

Source: Oxford Economics



On average, Google's capital investments annually support 1,527 construction jobs in Loudoun County.

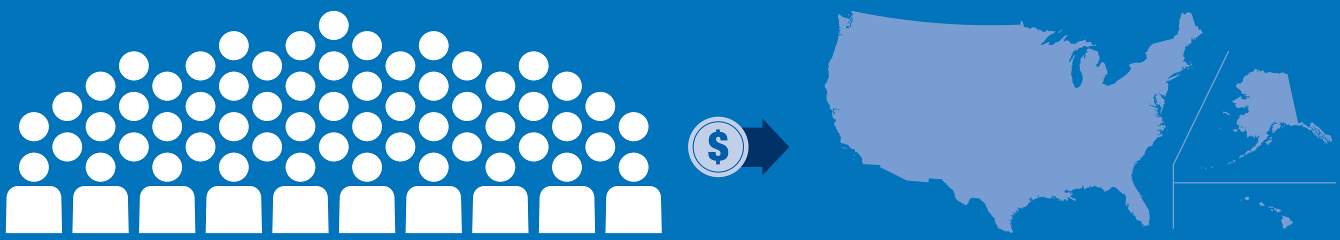
14. CONCLUSION

In 2020, Google's data centers and related infrastructure investments supported 57,804 jobs and generated nearly $4 billion in income for workers throughout the United States. Most of these jobs are in the states and counties that host a data center. However, one in four jobs are located in other states as a result of the distributed supply chain across the US that provide goods and services supporting Google's data center operations, infrastructure, and clean energy projects. The result of this integrated supply chain is that Google's economic impact cascades throughout the United States.

Google data centers are at the heart of an economic ecosystem that supports job growth in a variety of key industries. For each job supported by Google's data center operations, an additional three jobs are supported by Google's capital and clean energy projects. During 2020, these included nearly 20,000 workers in the

Construction and Utilities industries, more than 8,500 in the Professional Services and Information and Telecommunications industries, and nearly 6,500 more in Trade and Transportation. Workers in a wide range of industries have jobs that are supported by Google data centers.

Google data centers support 57,804 total jobs throughout the United States and generate nearly $4.0 billion in income for workers in a wide range of industries.



In total, Google data centers generate $6.4 billion in added economic activity (as measured by GDP). In addition to jobs and income for workers, this level of economic activity results in added tax revenue for all levels of government. Of the $1.4 billion in tax revenue supported by Google data centers, $556 million is annual tax revenue for state and local governments throughout the United States.

Google's commitment to long-term clean energy has resulted in investment in 26 wind and solar projects throughout the country. In addition to climate benefits, these clean energy projects also generate economic impact. On a recurring basis, Google's clean energy projects support 1,114 workers in the clean energy industry (including its supply chain). In addition, nearly 22,000 people-years of work were spent building, constructing, and installing the clean energy infrastructure that results from Google's clean energy commitments.

Google's data center operations, capital, and clean energy projects all result in substantial economic impact that is broadly distributed across the United States. In no less important ways, Google's engagement in the communities near where the data centers are located helps residents, schools, and businesses better prepare for the opportunities of today and tomorrow.

15. APPENDIX: METHODOLOGY

15.1 INPUT-OUTPUT MODELS AND ASSUMPTIONS

Google provided Oxford Economics with a great deal of actual (2020) expenditure information specific to each data center campus and its investments in its clean energy commitments. This information was not explicitly included in this report because of proprietary and trade secret concerns (see section 15.2) but was used to keep calculations robust. These and other inputs were analyzed using an input-output model developed by IMPLAN. Google data center operations were assumed to resemble the profile for data centers that is ultimately derived from the US Bureau of Economic Analysis input-output tables for NAICS code 51820.

For certain spend categories, (e.g., computer equipment), Google was not able to provide a breakdown of the location from which the purchased goods or services were sold, only the location of the data center for which it was purchased. For these spend categories, we built assumptions based on national- and industry-specific data within the IO tables themselves.

Sub-national impacts were calculated differently in the United States and the rest of the world. For the United States, impacts were calculated using an input-output model developed by IMPLAN. IMPLAN provides data for assumptions regarding what share of total national expenditures were spent within the county and state in which each data center is located. This is most important for the data centers' largest spend category: electricity. Certain other expenditures, such as catering, were assumed to be 100% spent locally.

Included in our direct employment calculations are all workers located on-site at each data center campus. These include both Google employees and third-party contractors. In previous work with Google, we developed profiles for the types of functions and costs associated with the third-party contractor workforce at some of the company's US data centers. We relied on those earlier profiles to estimate the costs associated with third party contractors at each of the data centers included in this study.

15.2 TREATMENT OF PROPRIETARY INFORMATION

As noted previously, Google provided us with detailed operational and investment data that was used in producing all economic impact calculations presented throughout this report. However, operational information regarding Google data centers is largely confidential and not routinely disclosed by the company. To accommodate this concern, we made one important modification in how we presented our results: specifically, with respect to direct employment on-campus. Our calculations were made using actual on-campus data. In our report, however, we present as direct employment only figures that are consistent with what the company has previously disclosed publicly about employment at the location. This adjustment in presentation did not affect any calculation that we made, nor did it alter any key conclusion presented but does result in small adjustments to the mix of direct and indirect channels that we present at some locations. Note that total economic impact results and presentation are unaffected by this accommodation.

15.3 CLEAN ENERGY CALCULATIONS

To sustain its commitment to clean energy, Google enters into financial arrangements that result in the construction of new wind and solar projects in many of the countries where it operates its data centers. The nature of these financial commitments is not routinely disclosed publicly. Google provided us with detailed information regarding the amount, timing, and location of wind and solar farms established in response to Google's financial commitments. To calculate the economic impact associated with these investments, we relied upon various statistics published by the International Renewable Energy Agency (IRENA),[6] These included IRENA estimates for both solar and wind total installed costs by country, and IRENA estimates for the levelized cost of electricity (LCOE) by country or region for both wind and solar projects. Through these published data, we estimated the amount of electrical output produced by these investments and the operating and maintenance costs associated with annual operations. Once annual operational costs were estimated, they were further refined using cost breakouts published by windpowermonthly.com (see "Big Turbines Push down O&M costs," Milborrow, David. May 2020).

The data provided by Google was also used to calculate the economic impact of the capital expenditures associated with its clean energy commitments. In making these calculations, we calculated the average construction expenditure per year over the construction period, which we assumed to be three years.

15.4 DATA CENTER CAPITAL INVESTMENT

Google regularly invests in expansions and improvements to its data center campuses, in addition to the initial investment to construct the data center. We were provided with total investment data on all of these investments, which we annualized by dividing the total amount of investment at each campus by the number of years that campus has been operational. Capital investment data were broken into spending on constructing the data center itself, purchases of computer and electronic equipment for the data center, and professional services in designing the data center. The construction expenditure was assumed to be 100% local; the equipment and professional services expenditures were allocated geographically for each data center based on national and industry-specific data in the input-model used.

6 "Renewable Power Generation Costs in 2019." Published by the International Renewable Energy Agency. 2020.

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DATA CENTERS

Jobs and Opportunities in Communities Nationwide

U.S. Chamber of Commerce
Technology Engagement Center

REPORT HIGHLIGHTS

Technological innovations are rapidly changing our lives, our businesses, and our economy. Technology, no longer an isolated business sector, is a facilitator enabling innovation, growth, and the strengthening of America's traditional business sectors. From transportation and energy to finance and medicine, businesses rely on technology to interact with their customers, improve their services, and make their operations more globally competitive. Innovative technology is deeply integrated into the economy and is the driving force behind the creation of new jobs in science, health care, education, transportation, and more. Technology has fundamentally transformed our economy—and is poised to fuel even more growth in the future.

Overall, there were 6 million jobs in the U.S. technology industry last year, and we expect this to increase by 4.1% in 2017. Technology-related jobs run the gamut—from transportation logistics and warehousing to programmers and radiologists. In 2012, economists estimated that each high-tech job in the U.S. creates five additional jobs in other local goods and services sectors across all occupations—for example, construction workers, lawyers, dentists, schoolteachers, cooks, and retail clerks.

So what is the backbone that supports the rapid growth of this sector?

Data centers are facilities that house computers that store and process data, anchor our nation's economic growth, bolster job creation, and enable globally competitive innovations.

Burgeoning technologies like drones and sensors, both of which farmers use to monitor their crops and gather key information about their soil and how to increase their yields, are powered by data centers. Lifesaving gene therapies for diseases like cancer and hemophilia are powered by these centers.

Heat sensing drones deployed after natural disasters to locate survivors and deliver lifesaving equipment can arrive at the scene faster than first responders. Wearable technologies that we sport help us lead healthier lifestyles. Distance learning courses empower children and adults to learn new skills or trades to keep up with the constantly evolving job market. Innovations in science, energy, manufacturing, health care, education, transportation and many other fields—and their jobs—are being powered by data centers.

But the benefits of data centers go beyond powering America's cutting-edge innovations. The economic impact, direct and indirect, is substantial.

While being built, a typical data center employs 1,688 local workers, provides $77.7 million in wages for those workers, produces $243.5 million in output along the local economy's supply chain, and generates $9.9 million in revenue for state and local governments. Every year thereafter, that same data center supports 157 local jobs paying $7.8 million in wages, injecting $32.5 million into the local economy, and generating $1.1 million in revenue to state and local governments. And the economic impacts don't stop here.

Opening data centers creates other real, tangible benefits for residents. Data centers directly and indirectly improve local public infrastructure—roads, power lines, water, and sewage systems. They increase the pool of skilled workers and often attract additional centers or partner businesses.

Data centers aren't passive bystanders—they contribute financial and other resources and collaborate with local organizations to support their communities.

With 6 million jobs and 2.5 million job openings, America's technology sector is driving economic growth, expanding global dominance in innovation and entrepreneurship, and putting

Americans to work. Without data centers, we can't power the innovations to keep our economy moving.

That's why the U.S. Chamber Technology Engagement Center (C_TEC) works with hundreds of technology and manufacturing companies on rational policy solutions to drive economic growth and spur innovation to create jobs. To capitalize on the environment for all Americans, our companies need accelerated investment and infrastructure deployment at all levels. Too many regulatory barriers threaten infrastructure improvements.

The tens of thousands of Americans working to build and operate data centers in our local communities are proof that with the right policies and investments, technology will continue to generate jobs and benefits for hardworking families.

Table 1. Initial Capital and Operating Expenditures of a Typical Data center

Net rentable square feet (NRSF)	165,141
Capital expenditure per NRSF	$1,305
Initial capital expenditures	$215.5 M
Land acquisition (6.2%)	$13.4 M
Construction building (20.9%)	$45.0 M
IT equipment (72.9%)	$157.1 M
Annual operating expenditures (8.6% of capital expenditures)	$18.5 M
Power (40.0%)	$7.4 M
Staffing (15.0%)	$2.8 M
Real estate taxes and insurance (5.5%)	$1.0 M
Maintenance, administration, and others (39.5%)	$7.3 M

Table 2. Economic Impacts of a Typical Large Data center to Local Communities

CONSTRUCTION PHASE 18-24 MONTHS	OPERATION PHASE ANNUALLY
1,688 Local Jobs	157 Local Jobs
$77.7 million wages	$7.8 million wages
$243.5 million local economic activities	$32.5 million local andeconomic activities
$9.9 million state & local taxes	$1.1 million state & local taxes

LANDSCAPE OF THE DATA CENTER INDUSTRY

Nam D. Pham, Ph.D.[1] | May 1, 2017

Data centers are facilities containing information technology equipment including servers and networking computers for data processing, data storage, and communications. Large data centers usually consist of shells stacked with racks of servers and IT equipment on a raised floor with power backup and temperature control systems. Many large data centers also have their own power generators for heating and cooling equipment.

Two broad categories of data center ownership are enterprise and colocation. Enterprise, or corporate, data centers are built and owned by large technology companies such as Amazon, Facebook, Google, Microsoft, Yahoo, as well as government agencies, financial institutions, insurance companies, retailers, and other companies across all industries. Enterprise data centers support web-related services for their organizations, partners, and customers. Colocation data centers are typically built, owned, and managed by data center service providers such as Coresite, CyrusOne, Digital Realty Trust, DuPont Fabros, and QTS. These data center service providers do not use the services themselves but rather lease the space to one or multiple tenants. Since third-party data center solutions offer flexibility and scalability of IT needs, many large enterprises operate their own data centers and lease space from data center service providers at the same time. For example, IBM, CenturyLink, and Equinix have their own large data centers and also the largest tenants of Digital Realty Trust. In addition to their own data centers, Microsoft also leases data centers from many different data service providers including Digital Realty Trust, DuPont Fabros, Vantage Data Centers, and CyrusOne.

According to the U.S. Department of Energy, there are 3 million data centers scattered across urban and rural areas in the U.S. More than 90% of the servers are, however, housed in data centers and owned or leased by small- and medium-size businesses. Less than 10% of servers located in large data centers are owned by major cloud providers and national super computer centers.[2]

The Data Center Institute classifies data centers into six size standards, measuring by compute space or rack yield. Compute space is the area, measured in square foot (sf) or square meter (m2), within the data center facility containing server racks and related IT equipment. Rack yield is the number of racks that can fit within a compute space. A rack is normally set to be 25 sf to allow aisle and perimeter space around the server room (Table 3).

As data reliability and privacy become more vital in the digital economy, data centers require uninterruptible power supply systems to minimize the downtime for servers and security systems for their users. Data center infrastructure costs and operational complexities increase with the reliability level. Uptime Institute created a standard Tier Classification System that has four tiers to consistently evaluate the infrastructure performance or uptime of data centers (Table 4).

The number of internet users and the number of applications have been rising exponentially for decades. Commercial users increasingly rely on the internet to provide their services and to store data; noncommercial users access the internet for emailing, texting, streaming videos and music, and social networking through Google, YouTube, Facebook, and Twitter, to name a few. Consequently, more data centers are created to meet the demand of the rising amount of data that is created and stored.

Table 3. Data center Size Classifications[3]

Size Metric	Rack Yield	Compute Space (sf)
Mega	> 9,000	> 225,000
Massive	3,001 - 9,000	75,001 - 225,000
Large	801 - 3,000	20,001 - 75,000
Medium	201 - 800	5,001 - 20,000
Small	11 - 200	251 - 5,000
Mini	1 - 10	1 - 250

Table 4. Data center Infrastructure Tiers[4]

Tier	Description	Uptime	Downtime Per Year
I - Basic Capacity	Data centers provide dedicated site infrastructure to support IT beyond an office setting, including a dedicated space for IT systems, an uninterruptible power supply, dedicated cooling equipment that does not shut down at the end of normal office hours, and an engine generator to protect IT functions from extended power outages.	99.671%	28.8 Hours
II - Redundant Capacity Components	Data centers include redundant critical power and cooling components to provide select maintenance opportunities and an increased margin of safety against IT process disruptions that would result from site infrastructure equipment failures. The redundant components include power and cooling equipment.	99.749%	22 Hours
III - Concurrently Maintainable	Data centers have no shutdowns for equipment replacement and maintenance. A redundant delivery path for power and cooling is added to the redundant critical components of Tier II so that each component needed to support the IT processing environment can be shut down and maintained without impactingthe IT operation.	99.982%	1.6 Hours
IV - Fault Tolerance	Site infrastructure builds on Tier III, adding the concept of Fault Tolerance to the site infrastructure topology. Fault Tolerance means that when individual equipment failures or distribution path interruptions occur, the effects of the events are stopped short of the IT operations.	99.995%	26.3 Minutes

CAPITAL AND OPERATING EXPENDITURES OF DATA CENTERS

Large data centers are capital intensive and require significant investments in time and money to build. Depending on the size and the tier, initial capital investments for large data centers start from several hundreds of millions of dollars and can be over one billion dollars. It is very common that new and larger data centers are added to the same site or campus of the first data center over time. For example, Switch, which designs, constructs, and operates some of the most advanced data centers, has been continuously building and expanding its core Las Vegas Campus. Upon the completion of its Las Vegas 12 data centers, Switch Las Vegas Campus covers nearly 2.4 million square feet with 315 MW capacity of power.

A large up front investment for the initial construction phase includes land purchase, shell construction, and equipment installation. The annual operating costs to run data centers consist of power, staff, taxes, maintenance, and other administration costs. Many cost components such as land prices and taxes vary substantially across states and cities.

CONSTRUCTION PHASE: Three main components of capital expenditures during the initial phase of large data centers are land acquisition, shell construction, and mechanical and electronic equipment purchasing and installation. The construction phase is typically between 18 months and 24 months (Table 5).

Land acquisition: The cost of land includes the property purchase, consultant fees, and brokerage fees. Although the smallest component of a data center's capital expenditures, the cost of land varies substantially across states, counties, and cities. In 2015, CBRE estimated an average cost of land to be 2.5% of total construction and operating costs over 10 years of a typical 5 MW enterprise project across 30 U.S. cities. The CBRE research shows the cost variation from 0.1% of total costs over 10 years in Kansas City, Missouri to 9.9% in Southern California.[5] Other estimates conducted by Uptime Institute and Microsoft range from 0.5% and 2.0% of the initial capital investment.[6]

Base building construction: The base building construction costs include architectural planning and design, building permits, local taxes, land excavation and grading, roadways, tie-ins to utilities, and the building shell. Although less than land prices, construction costs also vary across areas. For example, CBRE estimated that the construction costs of a Tier III 5 MW enterprise project in expensive areas such as Boston and Silicon Valley could be 45% higher than the cost of construction in less expensive areas such as Tulsa and Charlotte. Microsoft Corporation and Forrester Research estimated the cost of a base building shell is approximately 16% of initial capital investment and $200 per sf.[7] The construction costs also increase with the redundancy level of Tier III and Tier IV facilities compared with Tier I and Tier II facilities.[8] Architectural planning and design range between 7.0% (Microsoft) and 25% of the total construction costs (Forrester). The costs of building permits and taxes paid to local governments vary substantially by location. Forrester Research estimated $70 per sf in building permits and taxes paid to local governments.

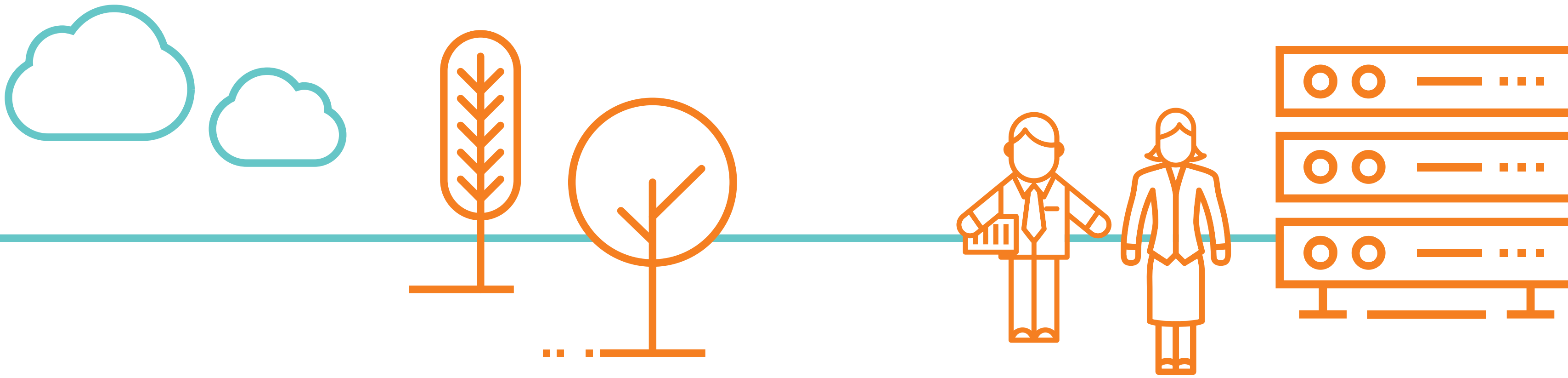
Mechanical and electrical equipment: The costs of data center infrastructure include mechanical and electronic equipment purchases and installation. Mechanical equipment includes computer room air-conditioning units, refrigerant loops, condenser plants or chillers, and water tanks. Electrical equipment includes power distribution units, transformers, patch panels, UPS systems, auto transfer switches, and generators. These costs exclude servers, data storage equipment, and networking devices that are not attached to the building shell. Mechanical and electrical costs range between 82% and 85% of initial capital investment (Microsoft and Uptime Institute).[9] The American Society of Professional Estimators found that electrical equipment costs are approximately 25%, and labor installation costs account for 75% for data centers.[10]

Table 5. Capital Expenditures During the Initial Construction Phase

Land Acquisition	Base Building Construction	Mechanical & Electrical Equipment
Costs include transaction, consultant fees, and brokerage fees. The cost of land acquisition is the smallest cost item but varies substantially across areas. Cost estimates are 2.5% of total project costs over 10 years (CBRE), 2.0% of total cost of data centers (Microsoft), and 0.5% of initial CAPEX (Uptime Institute).	Costs include architectural planning and design, building permits, local taxes, land excavation and grading, roadways, tie-ins to utilities, and base building shell. The cost of the building shell is less varied across regions. Cost estimates are around 16% of initial capital investment and $200 per sf. Costs are rising with higher tier of data centers	Costs include mechanical and electronic equipment and exclude servers, data storage equipment, and networking devices that are not attached to the building shell. Cost estimates are between 82% (Microsoft) and 85% (Uptime Institute) of initial capital investment; the American Society of Professional Estimators estimated electrical equipment accounts for 25% and labor installation accounts for 75% for data centers.

Table 6. Annual Operating Expenditures

Power	Staffing	Taxes	Other
The largest operating item, ranging between 40% and 80% of total annual expenditures.	The second largest operating item, including 24x7x365 security, operations, and IT staff. Staffing expenditures account for 15% of annual operating expenditures.	Property taxes are estimated to be between 8.7% of total cost over 10 years and about 12% of annual operating spending. State and local governments are increasingly providing tax incentives to attract data centers.	Other costs include administrative, maintenance, security, and landscaping. Repairs, replacement, and upgrade of IT equipment and infrastructure begin in year three of operation.



OPERATION PHASE: Annual operating expenditures of a data center are grouped into four main categories: power, staffing, taxes, and other maintenance and administration (Table 6). Estimates of annual operating costs are between 6.0% and 10% of initial capital investment and data centers are typically depreciated over the course of 15 years.[11]

Power: The largest expenditure to operate a data center is power. Typically, half of the power consumption is for running IT equipment (computers and servers) and the other half is for cooling and power infrastructure at data centers.[12] Depending on the data center tier (level of uptime), energy source (traditional versus renewable energy), and region, power expenditures can range from 40% (Uptime Institute) to 80% (Forrester Research) of the overall cost of operating a data center.[13]

Staffing: The second largest expenditure to operate a data center is staffing. Data centers employ security staff, operations staff, and on-site IT engineering and management staff. Most of the positions are 24x7x365 to maintain and operate data centers nonstop. Staffing costs are about 15% of annual expenditures (Uptime Institute) and 4.9% of total costs, including construction, over 10 years (CBRE).[14] DCD Intelligence estimated the data center industry employed 108,500 people in the U.S. in 2015, accounting for 17.5% of global data center employment. It also estimated the proportion of people working on the IT/networks side of the data center industry have increased while those on the facility side have remained steady.[15]

Taxes: A large data center invests hundreds of millions of dollars in capital expenditures in the first couple of years for construction and then continues to spend millions of dollars each year for operations. Data centers generate significant property, sales, and income tax revenues for state and local governments. Uptime Institute estimated that property taxes account for 12.2% of annual operating expenditures of data centers. Similarly, CBRE estimated net taxes of data centers in 30 cities account for 8.7% of the total project cost over 10 years.[16]

Other: Other operating expenditures include maintenance, insurance, security, landscaping, and administration. In addition to ongoing activities, data centers replace, repair, and upgrade to newer and more efficient IT equipment and infrastructure after about three years–and then on an ongoing basis into the future.

INITIAL CAPITAL AND ANNUAL OPERATING EXPENDITURES OF A TYPICAL LARGE DATA CENTER

We use financial data of the most recent development projects and 2016 annual income statements of data center service providers and enterprises to estimate the initial capital and annual operating expenditures of a typical data center. Financial data of data centers are obtained mainly from a company's annual reports filings with the U.S. Securities and Exchange Commission and other publicly available information. The initial capital expenditures include the cost to purchase the land, construct the building shell, and purchase and install mechanical and electrical equipment (IT infrastructure). The annual operating expenditures include power, staffing, taxes, maintenance, and other administrative costs of a data center.

Our data sample includes 244 large colocation and enterprise data centers of the 10 largest data center service providers and enterprises, covering over 40 million net rentable square feet, located across 16 states.[17] The 10 enterprises and service providers in our sample, in alphabetical order, are Apple, CoreSite, CyrusOne, Digital Realty Trust, DuPont Fabros, Facebook, Google, Microsoft, QTS, and Yahoo.

Recent initial capital expenditures on data centers in our sample totaled $8.2 billion and created more than 6.2 million net rentable square feet (NRSF), averaging $1,305 per square foot. The breakdown of initial capital expenditures are 6.2% to acquire the land, 20.9% to build the base building (including planning and design, building permits, local taxes, land excavation and grading, roadways, tie-ins to utilities, and the building shell), and 72.9% to purchase and install mechanical and electrical equipment (including computer room air-conditioning units, refrigerant loop, condenser plant or chiller, and water tank, power distribution units, transformers, patch panels, UPS systems, auto transfer switches, and generators) (Table 7).

Table 7. Initial Capital Expenditure and Operating Expenditure of a Typical Data Center

Net rentable square feet (NRSF)	165,141
Capital Expenditure per NRSF	$1,305
INITIAL CAPITAL EXPENDITURES	**$215.5 M**
Land acquisition (6.2%)	$13.4 M
Construction building (20.9%)	$45.0 M
IT equipment (72.9%)	$157.1 M
ANNUAL OPERATING EXPENDITURES (8.6% OF CAPEX)	**$18.5 M**
Power (40.0%)	$7.4 M
Staffing (15.0%)	$2.8 M
Real estate taxes and insurance (5.5%)	$1.0 M
Maintenance, administration, and others (39.5%)	$7.3 M

Annual operating expenditures accounted for 8.6% of the initial capital expenditures of data centers in our sample. The largest component of annual operating expenditures is power, followed by staffing, taxes, and maintenance. Annual power spending and staffing expenditures are 40.0% and 15.0% of annual spending, respectively. Real estate taxes and insurance expenses are 5.5% and maintenance and all other administrative expenses are 39.5% (Table 7).

ECONOMIC IMPACTS OF A TYPICAL DATA CENTER

Large data centers bring in millions of dollars in initial investment directly to local communities that create ripple effects throughout the surrounding areas. The initial investment directly creates construction jobs to build the data center itself and public infrastructure, including roads, water, sewer, network/fiber, and electrical infrastructure. After being built, data centers operate around the clock, directly creating 24 x 7 x 365 security, operations, and IT jobs. During the construction and operation phases, data centers purchase goods and services from local suppliers and pay wages to their employees, contractors, and vendors. With their earnings, workers spend on housing, food, clothes, education, entertainment, and other daily goods and services. State and local governments generate tax revenues from workers' personal incomes, sales taxes from business activities, and property taxes from individuals and data centers.

We apply regional economic multipliers (RIMS II) constructed and published by the Department of Commerce's Bureau of Economic Analysis (BEA) to calculate the direct, indirect, and induced economic impacts of a data center on local communities. The economic impacts include direct, indirect, and induced effects of the construction and operation of data centers. Direct impacts are changes in economic activity arising from the first round of spending resulting from the initial demand (constructing and operating a data center). Indirect impacts are changes in economic activity resulting from the subsequent rounds of spending by industries along the supply chain affected by the initial demand. Induced impacts are changes in economic activity resulting from the changes in spending by workers whose earnings are affected by the direct and indirect changes.[18]

The economic impact calculations in this study include two phases—the construction phase and the operation phase of data centers. The economic impacts of the construction phase include direct construction jobs and indirect and induced jobs supported by the construction, wages paid to construction workers and indirect and induced workers in the communities, and indirect and induced economic activities supported by the construction. The economic impacts of the operation phase include direct, indirect, and induced jobs supported by the operation of data centers, wages paid to all workers, and all economic activities. We then use average state and local income tax and sales tax rates to estimate tax revenues collected by state and local governments on direct, indirect, and induced jobs and economic activities within the state. Social impacts are real-life monetary and nonmonetary contributions of enterprises to local communities.

Overall, a $215.5 million initial capital investment on building a typical large data center of 165,141 sf supports 1,688 jobs during the 18-24 month construction phase and $77.7 million in wages. After excluding all mechanical and electrical equipment assumed to be produced outside the state, capital investment of the typical data center creates $243.5 million in economic activity for local communities where the data center is located. In addition to property and sales taxes paid directly by the data center, state and local governments generate nearly $9.9 million in income taxes paid by direct, indirect, and induced workers and sales taxes by indirect and induced economic activities (Table 8).

During its yearly operation, a typical large data center supports another 157 local jobs and $7.8 million in wages at the data center and along the supply chain. The data center each year added $32.5 million in additional economic activity to local communities. In addition to property and sales taxes paid directly by the data center, local governments receive an additional $1.1 million per year in individual income and sales taxes (Table 8).

$7.8 MILLION

in annual wages generated by a typical large data center

CONSTRUCTION PHASE: A typical data center, based on our sample of colocation and enterprise data centers, is 165,141 net rentable square feet (NRSF) and requires an initial capital investment of $1,305 per sf, totaling $215.5 million for the initial capital investment. The construction cost breakdowns of our data sample are: 6.2% for land acquisition, 20.9% for the building shell, and 72.9% for mechanical and electrical equipment purchases and installation.

We calculate the construction cost of the shell to be $45.0 million (20.9% of $215.5 million) and the cost of purchasing and installing mechanical and electrical equipment to be $157.1 million (72.9% of $215.5 million). Since mechanical and electrical equipment is most likely purchased from out-of-state vendors and does not produce significant economic impacts within the state where the data center is located, we apply only half of mechanical and electrical equipment spending (i.e., $78.5 million) to represent the installation costs that are spent on local workers. Also, we do not calculate the economic impacts of the land purchase on local economies. Thus, the construction phase of a typical data center creates a $123.5 million construction demand ($45 million for building the shell and $78.5 million for the installation of mechanical and electrical equipment) that affects local economies.

We apply the Bureau of Economic Analysis' (BEA's) regional economic multipliers to calculate the economic impacts of the construction on local economies. The magnitude of economic multipliers varies across regions, depending on the structure of the economy of each individual state. For each additional $1 million spent on a construction project, BEA estimates that between 9 (Delaware) and 17 (Georgia) direct, indirect, and induced jobs are created within a state across all industries along the supply chain. BEA also estimates that an additional $1 million in construction demand creates an additional $0.6 million wages for all direct, indirect, and induced jobs within a state, ranging from $0.5 million in Delaware to $0.8 million in Texas. Last, an additional $1 million in construction demand creates $2.0 million in direct, indirect, and induced output within the state, ranging between $1.6 million in Wyoming and $2.4 million in Texas.

We calculate that $123.5 million investment on construction within the state where the data center is located supports 1,688 direct construction jobs and indirect and induced jobs along the supply chain within the state. These direct, indirect, and induced jobs generate $77.7 million in wages and produce $243.5 million in output within the state. Assuming an average of 5.0% for income state and local tax rates, state and local governments generate $3.9 million income tax revenues from $77.7 million in wages. Since many states offer tax incentive programs, we exclude all direct economic activities of the data center to calculate sales tax generated by state and local governments. Assuming a 5.0% sales tax, state and local governments generate another $6 million from the indirect and induced output within the state. Altogether, state and local governments generate $9.9 million in income and sales taxes during the 18–24 months of the construction period (Table 9).

Table 8. Economic Impacts of a Typical Large Data center to Local Communities

Construction Phase 18-24 months	Operation Phase Annually
1,688 local jobs	157 local jobs
$77.7 million in wages	$7.8 million in wages
$243.5 million in local economic activities	$32.5 million in local economic activities
$9.9 million in state and local taxes	$1.1 million in state and local taxes

Table 9. Economic Impacts of a Typical Data Center | Construction Phase

Data Center Outputs	Economic Multipliers	Impact
Direct construction jobs and indirect and induced jobs within the state	13.666	1,688
Wages of direct construction jobs and indirect and induced jobs	0.629	$77.7 M
Direct construction outputs and indirect and induced output	1.97	$243.5 M
State and local taxes		$9.9 M
Income taxes of direct, indirect, and induced jobs	5%	$3.9 M
Sales taxes from indirect and induced outputs	5%	$6.0 M

Table 10. Annual Economic Impacts of a Typical Data Center | Operation Phase

Description	Economic Multipliers		Total Impact
Direct, indirect and induced jobs within the state	Power	5.342	157
	Data center	10.659	
Wages of direct, indirect, and induced jobs	Power	0.311	$7.8 M
	Data center	0.503	
Direct, indirect, and induced output	Power	1.574	$32.5 M
	Data center	1.890	
State and local taxes			$1.1 M
Income taxes of direct, indirect, and induced jobs	5%		$0.4 M
Sales taxes from indirect and induced outputs	5%		$0.7 M

CONSTRUCTION PHASE DATA CENTER OUTPUTS

$77.7 Million
Wages of direct construction jobs and indirect and induced jobs

1,688
Direct construction jobs and indirect and induced jobs within the state

OPERATION PHASE: After being built, data centers have annual expenditures on power, staffing, taxes, maintenance, administive costs, and others. Using our data center sample, we estimate that annual operation expenditure accounts for 8.6% of initial capital expenditures. The annual operation expenditures breakdown are 40.0% on power, 15.0% on staffing, 5.5% on real estate tax and insurance, and 39.5% on maintenance, administration, and others.

We calculate annual operating expenditures of a typical large data center to be $18.5 million (8.6% x $215.5 million), of which $7.4 million is spent on power, $2.8 million on staffing, $1.0 million on real estate tax and insurance, and $7.3 million on other maintenance and administration. For the purpose of calculating the annual economic impacts of the data center during the operation phase, we calculate the economic impacts of $7.4 million spending each year on power separately from the rest of the $11.1 million spending on all other maintenance and administration on the data center to account for the increased demand of local utilities.

Similarly, we apply the BEA's regional economic multipliers of the utility industry to calculate the economic impacts of power consumption within a state. For each additional $1 million of spending on power consumption, BEA estimates approximately 5 direct, indirect, and induced jobs are created within a state along the supply chain. BEA also estimates that an additional $1 million in power demand creates $0.3 million wages for all direct, indirect, and induced jobs. Last, an additional $1 million in power demand creates $1.6 million in direct, indirect, and induced output within the state. We then apply the BEA's regional economic multipliers indata processing industry to calculate the economic impacts of the data center spending within a state. For each additional $1 million of spending on data processing, BEA estimates that approximately 10 direct, indirect, and induced jobs are created within a state along the supply chain. BEA also estimates an additional $1 million in data processing demand creates $0.5 million in wages for all direct, indirect, and induced jobs. Finally, an additional $1 million in data processing demand creates $1.9 million in direct, indirect, and induced output within the state.

We calculate that $18.5 million spending on annual operating expenses ($7.4 million on power and $11.1 million on operations) supports 157 direct, indirect, and induced local jobs. These direct, indirect, and induced jobs earn $7.8 million in wages and produce $32.5 million in output. Again, assuming an average of 5.0% for income state and local tax rates, state and local governments generate $0.4 million income tax revenue per year from $7.8 million wages. Since many states offer tax incentive programs, we exclude all direct spending of the data center in our calculations of sales tax generated by state and local governments. Assuming 5.0% sales tax, state and local governments generate another $0.7 million per year from indirect and induced output within the state. Altogether, state and local governments generate $1.1 million income and sales taxes per year during the life of the data center (Table 10).

SPILLOVER BENEFITS TO LOCAL COMMUNITIES

Data centers create positive long-lasting effects on local communities. Building new data centers creates more demand for expanding and upgrading local roads, power, water, and sewage systems. Data centers also spend their own resources to train local workers. These assets remain in the community and benefit other local businesses and residents. With these improvements, data centers attract other data centers and businesses to communities. Like other industries, data centers tend to group together geographically and follow others as seen in Colorado Springs, Raleigh, Des Moines, and other places across the country. In 2017 alone, both Apple and Google have purchased land to build or expand data centers in Nevada. Furthermore, data centers make charitable contributions, partner with local educational institutions, and support local organizations to build stronger communities.

CONTINUOUS ECONOMIC DEVELOPMENT: The development of large data centers tends to happen in stages with ongoing investment in construction to increase capacity. As a result, local economies have additional inflow investments and pipeline projects that promote economic growth. For example, Google in 2016 acquired another 74 acres in Dalles, Oregon, to expand its first corporate data center that was built a decade earlier. The new expansion is estimated to be approximately $600 million, bringing its total investment on data centers in the area to $1.8 billion. Similarly, the Apple and Facebook data centers in Prineville, Oregon, have brought over $1 billion in new investments, which helped the county's economy transition from its dependence on the wood products industry. These projects have created thousands of construction jobs that helped Prineville to reduce unemployment from 20% during the Great Recession to 8%. The diversification of businesses helps lessen local economies' dependence on a particular sector.

ADDING POOL OF TALENTED AND SKILLED WORKERS TO ATTRACT ADDITIONAL BUSINESSES: The availability of related skilled labor such as engineers and construction workers is crucial for high-end and large-scale data centers. The pool of skilled workers in the data center industry, such as building architects and engineers, IT engineers and technicians, and computer system designers, creates advantages for local communities to attract other data centers and other industries as seen in Ohio, Central Washington, and Virginia. Workers trained by Apple and Facebook in Prineville, Oregon, by Google in Dalles, and Dell, Intuit, Microsoft, and Yahoo in Central Washington are valuable assets for these regions.

IMPROVING AND UPGRADING INFRASTRUCTURE: Many data center developments are located in rural areas where public infrastructure is limited. The building of data centers in underdeveloped areas creates a high demand for expansion and the upgrade of public roads, power, water, and sewer systems. In some cases, data centers directly collaborate with local companies to find innovative solutions. These public infrastructure improvements are long lasting and benefit all local businesses and residents.

COMMUNITY IMPACT: Data centers contribute to local communities in different ways, including cash donations, local sponsorships, community grants, STEM education, computer donations, and community assistance. In addition to monetary donations, corporate employees are active volunteers who provide assistance to communities. For example, Google each year works with local organizations to sponsor community events such as Storm the Citadel to promote STEM education, Googlefest to help local teachers, nonprofit leaders, and small business owners use the Internet more effectively, and other seminars to help business owners set up and run successful websites. Google has awarded $1.9 million in grants to South Carolina nonprofits and schools.[19] Similarly, Facebook awarded more than $2 million to schools and qualified nonprofits to support STEM education and technological and economic development in communities in which operate data centers,[20] entered into a partnership with Isothermal Community College in North Carolina to develop the curriculum for its Datacenter Institute,[21] and launched a pilot program with the Town of Forest City, North Carolina and Rutherford County Schools to provide free Wi-Fi access to 75–100 students' homes.[22]

INNOVATION: Power is the largest component of data center operating expenditures. Companies are constantly evaluating the source and the cost of power for data centers. Over the past decades, data center owners have been actively involved in clean and renewable energy development by working with local utility and renewable energy companies to develop and purchase power from local wind, solar, and micro-hydro resources. For example, Apple employs an innovative cooling system that reuses water 35 times, resulting in a 20% reduction in overall water consumption in its data center. The data center also uses a rainwater-supplied system for on-site landscape irrigation, further reducing overall water consumption.[23] The Apple campus in Maiden, North Carolina, is supported by renewable energy from two separate 100-acre solar arrays that each produce 42 million kilowatt-hours (kWh) of energy annually.[24] Google contracted many agreements to purchase renewable energy, including the agreement to purchase 407 megawatts of wind-sourced power from MidAmerican Energy Company to supply its data center in Council Bluffs, Iowa. Google sets its goal of powering all its operations with 100% renewable energy. In addition to powering its last seven data centers with renewable energy, Facebook has also begun working with local energy utilities to help create renewable energy tariffs to cover 100% of the anticipated energy consumption for new data centers in Los Lunas, New Mexico, and Papillion, Nebraska. These tariffs are accessible to all companies and Yahoo recently announced the tariff would enable its Nebraska facility to go 100% renewable, as well. Inspired by the model of open source software, the Open Compute Project was launched in 2011 with a mission to share the innovations of IT hardware designs. Since then, the Open Compute Project has become a collaborative community of hundreds of IT and non-IT companies to share specifications and best practices for creating the most energy efficient and economical data centers.

OPPORTUNITIES FOR CITIES

The demand for large data centers is growing because of the demands of increased internet usage and from the migration of smaller to larger data centers. Large businesses are increasingly moving to bigger data centers to achieve cost savings since large data centers experience economies of scale. In its 2016 Cisco Global Cloud Index, Cisco projects that global data center storage capacity will grow nearly 5 times and the number of hyperscale data centers will grow more than 87% from 2015 to 2020.[25]

Enterprises and service providers are constantly searching for reliable, dependable, and cost effective solutions for data center site selection. Factors that affect data center decision makers include the capacity and availability of power, labor, geography, real estate, and costs. Since hundreds of millions of dollars are needed to build and to operate a data center per year, the cost element is crucial.

CONCLUSIONS

Recognizing the short and long-term benefits of data centers to communities, many state and local governments have devoted resources to attract these centers to their areas. Local policymakers have introduced business-friendly policy measures such as sales tax exemption for computing equipment and software, machinery equipment, and computers; infrastructure grants; and property tax abatements or exemptions. These incentives drive companies to build data centers and invest in the surrounding areas, creating significant economic and social benefit to local communities.

The Date Center Institute Board has endorsed the following terms and definitions.[26]

Standard Term	Definition
Average Measured Peak kW Load	Reported as kW or MW. The average of the measured Peak kW Loads relative to multiple racks and REU or multiple Compute Spaces.
Average Peak kW Load	Reported as kW or MW. New site design: The design target Peak kW Load a Compute Space is designed, or required to support in terms of power and cooling. Existing operational facility: Use the Average Measured Peak kW Load definition.
Compute Space	Reported in Area (sqft or sqm). The area within the data center facility containing racks, REU and associated IT and/or networking equipment. Located within a single facility that shares critical (power and cooling) infrastructure. A campus environment may have more than one Compute Space. Also known as computer area, computer room, data center room, data hall, raised floor area, technical area, and white space.
Data Center	Also spelt data centre and data center. One or more physical rooms or containers accommodating systems and infrastructure that support the operation of IT systems located in one or more IT racks or Rack Equivalent Units.
Design kW Load	Reported as kW or MW. Applies to the maximum kW load the Compute Space is designed to support in terms of power and cooling.
Enterprise Data Centers	Data centers house critical operations of individual companies.
Load	Reported as kW or MW. The actual measured Peak kW Load as reported by an acceptable measurement device or system relative to the REU or Compute Space. The measurement period must exceed 1 calendar month. Partial results and decimal points are to be rounded up to the nearest whole number.
Peak kW Load	Reported as kW or MW. New site design: The design target Peak kW load a Compute Space is designed, or required to support in terms of power and cooling. Existing operational facility: Use the Measured Peak kW Load definition.
Rack Area	Reported in sqft (ft2) or sqm (m2). Sets a common understanding for rack footprint, allowing for aisle space and perimeter and other space within the room area.
Rack Equivalent Unit (REU)	Converts a heterogeneous environment into a standard unit of measure. Also converts non-traditional rack equipment, including free-standing items into an equivalent Rack as used in Rack Area and Rack Yield. A large piece of equipment may use multiple REUs. 1 x REU in spatial terms equals 1 x [Rack Area]
Rack Yield	Reported as quantity of Racks or REUs. Number of Racks (by Rack Area) that can fit within a Compute Space. Rack Yield = [Compute Space] divided by [Rack Area]
Retail Colocation	Building shell and infrastructure in shared environment, space generally divided by racks or cages. May include IT hardware as well as menu of services.
Wholesale Colocation	Building shell and infrastructure to the power distribution unit providing space, power and cooling. Generally in demised suites above 250 kW.

ENDNOTES

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ABOUT US

C_TEC (U.S. Chamber Technology Engagement Center) promotes the role of technology in our economy and advocates for rational policy solutions that drive economic growth, spur innovation, and create jobs.

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TIM DAY

Senior Vice President, C_TEC

Tim Day highlights the role of technology in our economy and advocates for emerging technology. He is responsible for championing rational policy solutions that spur innovation and create jobs. He joined the Chamber from Teradata Corporation. Before Teradata, Day served as vice president of government affairs at NCR Corporation, was chief of staff to Congresswoman Deborah Pryce (R-OH), legislative director to Congressman David Hobson (R-OH), and legislative assistant to Congressman Joe Barton (R-TX). Day earned a B.A. from Cedarville University in Ohio in 1987. He serves on the board of advisors for the Data Coalition, a Washington, D.C.-based coalition that advocates on behalf of the private sector and the public interest for publishing government information as standardized and machine-readable. In 1998, Day was accepted as a delegate to the American Council of Young Political Leaders.

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THE IMPACT OF DATA CENTERS ON THE NEBRASKA ECONOMY

PREPARED BY

MANGUM economics

FOR

NetChoice

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About NetChoice

NetChoice works to make the Internet safe for free enterprise and free expression.
Choice – Consumers know best the products and services they need.
Limited Government – The internet has thrived under light-touch regulation.
Competition – The internet provides consumers with an abundance of services like never before.

Executive Summary

Nebraska has developed a growing data center sector for the last several years, partially driven by the state's data center incentive programs. Nebraska has over a dozen data centers in the state, mostly in the Omaha metropolitan area, with some smaller facilities in the Lincoln metropolitan area. Meta's (formerly dba Facebook) data center campus in Sarpy County is the largest in the state and one of the largest enterprise data center campuses in the country. We estimate that there are 490 people working full-time in data centers, and over 1,500 construction workers building new data centers in the state. Major data center projects under construction in Nebraska include:

- Meta's completion of the six-building data center project that it announced in 2018.
- Meta's addition of 4 buildings to the campus that it announced in 2021.
- Google's completion of the new data center that it announced in 2019.

With the completion of these projects in the next few years, the amount of data center investment in Nebraska will almost double (the equivalent of a 24 percent compound annual growth rate). For comparison, that is roughly the same rate of growth as has occurred in Northern Virginia (between 2014 and 2021).

This report explores the economic impact of the construction and operation of data centers in Nebraska and illustrates the economic impact that a single new hyperscale data center would create.

Taking into account the indirect economic ripple effects that the direct investment generated, we estimate that the total impact on Nebraska from data centers in 2021 was approximately $1.3 billion in economic output and almost 5,300 jobs.

We estimate that in the last year, the indirect economic activity associated with data centers in Nebraska led to $17.8 million in tax revenue collected by the State of Nebraska and $18 million collected by local governments.

Construction and operation of a single new typical hyperscale data center would have a potential total economic impact on Nebraska of almost $270 million in total economic output during the two-year construction period, including 1,200 construction jobs plus 720 non-construction jobs supported in the community during the construction phase. Once the new Nebraska facility is fully operational, it would support $82 million annually in total economic output in Nebraska, including supporting 300 jobs.

The combination of rapidly rising investment and rapidly rising wages make data centers one of Nebraska's most high-performing lines of business and a valuable (and growing) contributor to a strong and robust state economy. The wages for data center jobs are almost twice as high as the average across all industries, and these wages have grown 25 percent faster than the average pay for a private-sector job in Nebraska.

Data center tax incentives are an effective way to encourage data center investment and growth in a state, and they can accomplish that without negatively impacting State revenues. In fact, over half of U.S. states have sales and use tax exemptionsfor data centers. Virginia's Joint Legislative Audit and Review Commission found in a 2019 report that:

- Up to 90 percent of the data center investment in Virginia made by the companies that received the sales and use tax exemption would have occurred in other states except for the exemption.
- In 2017, the most recent year data was available, the data center tax incentive generated $1.09 of Virginia tax revenue for every dollar that it exempted (this does not include local tax revenue or other economic benefits).

Nebraska is one of many states that offer incentives to encourage data centers to locate or expand in their states. A recent report by Cushman and Wakefield states, "A majority of states throughout the U.S. now offer state-level incentives, often sales- or property-tax abatements for long-term investment." The competition among states for data centers is significant, and data centers carefully evaluate the business climate in various states when making location decisions.

If Nebraska continues to be strongly competitive for data center site selection, we can conservatively estimate that the state should see a 10 percent compound annual growth rate of data centers for 2025 through 2035, following the additional growth in data centers already announced through 2024. If that occurs, then in 2035, the data center contribution to the Nebraska economy will have grown to:

- $4.8 billion in economic output activity associated with data center operations, including:
- 2,670 onsite operational data center jobs plus 11,370 additional jobs supported elsewhere in the Nebraska economy, and
- $1.1 billion in pay and benefits for workers throughout the Nebraska economy.

Nebraska Has a Growing Data Center Market

Nebraska has developed a growing data center sector for the last several years, partially driven by the State's data center incentive programs. The State refunds the sales and use taxes paid on qualifying equipment for data centers that have invested at least $200 million and that have created at least 30 new jobs.

Nebraska sits in the center of the area often referred to as the Silicon Prairie. That name is in reference to the large number of data centers and other tech facilities that have located in Nebraska and Iowa, taking advantage of major fiber installations running along the transcontinental railroad lines that connect the East and West Coasts, reliable low-cost power, abundant supply of renewable energy, and a strong workforce.

Nebraska has over a dozen data centers in the state, mostly in the Omaha metropolitan area, with some smaller facilities in the Lincoln metropolitan area. Meta's data center campus in Sarpy County is the largest in the state and one of the largest enterprise data center campuses in the country. We estimate that there are 490 people working full time in data centers, and over 1,500 construction workers building new data centers in the state.

ADDITIONAL NEAR-TERM DATA CENTER DEVELOPMENT

Based on announcements from companies operating data centers in Nebraska, there is at least $1.5 billion of data center construction that will occur over the next 3 years. Major data center projects under construction in Nebraska include:

- Meta's completion of the six-building data center project that it announced in 2018.[1]
- Meta's addition of 4 buildings to the campus that it announced in 2021.[2]
- Google's completion of the new data center that it announced in 2019.[3]

With the completion of these projects in the next few years, the amount of data center investment in Nebraska will almost double (the equivalent of a 24 percent compound annual growth rate). For comparison, that is roughly the same rate of growth that has occurred in Northern Virginia (the largest and fastest-growing major data center market in the world) between 2014 and 2021.[4]

[1] Papillion Data Center Expanding to Six Buildings.
[2] "Facebook Data Center to Expand in Papillion," *Lincoln Journal-Star*, March 24, 2021.
[3] "Google building $600 million data center near Omaha," *Des Moines Register*, October 4, 2019.
[4] Based on data from CBRE and JLL, we estimate that the data center market in Northern Virginia grew at a 25 percent compound annual growth rate between 2014 and 2021.

THE IMPACT OF DATA CENTERS ON THE NEBRASKA ECONOMY

The large pipeline of data center construction projects listed above means that Nebraska construction workers have a long-term pipeline of local projects that allows them to work locally, rather than having to pursue projects in other states. Construction at the Meta location has been going on continually since 2017.

The construction and ongoing operation of data centers in Nebraska have large impacts on the state's economy. These economic impacts are driven by:

Direct Impacts:

- The spending in Nebraska on the construction of data centers
- The spending on goods and services in Nebraska that data centers make during the ongoing operation of data centers

Indirect Impacts:

- The spending on goods and services in Nebraska made by data center vendors

Induced Impacts:

- The spending by Nebraskans employed in building and operating data centers

Direct Economic Impact: We estimate that in 2021 the construction and operation of data centers in Nebraska directly provided approximately:

- **$579 million in economic output from construction and operations combined, including:**
- 1,520 construction jobs,
- $81.9 million in associated construction pay and benefits,
- 490 full-time-equivalent onsite operations jobs inside data centers, and
- $50 million in associated data center operations pay and benefits.

Total Economic Impact: Taking into account the indirect economic ripple effects that the direct investment generated, we estimate that the total impact on Nebraska from data centers in 2021 was approximately:

- **$1.3 billion in economic output, including:**
- 5,290 jobs, and
- $355 million in associated employee pay and benefits.
- During the operation phase, there are 4.3 additional jobs supported by the data center in other businesses for each operational job inside the data center.

State and Local Tax Revenue: We estimate that in the last year, the indirect economic activity associated with data centers in Nebraska led to:

- $17.8 million in tax revenue collected by the State of Nebraska, and
- $18 million collected by local governments.

Table 1 provides a summary of the total construction and operational impact of data centers on the state of Nebraska over the last year.

Table 1. Summary of Annualized Economic Impact of Data Centers in Nebraska

Direct Effects	Jobs	Pay & Benefits	Economic Output
Data Center Construction	1,520	$81,900,000	$230,000,000
Data Center Operation	490	$50,000,000	$349,000,000
Indirect Effects			
Data Center Construction Phase Supported	600	$38,100,000	$117,700,000
Data Center Operation Phase Supported	1,290	$110,900,000	$407,500,000
Induced Effects			
Data Center Construction Phase Supported	590	$31,500,000	$96,400,000
Data Center Operation Phase Supported	800	$42,800,000	$130,800,000
Total Impact			
Construction Phase Subtotal	**2,710**	**$151,500,000**	**$444,100,000**
Operation Phase Subtotal	**2,580**	**$203,700,000**	**$887,300,000**
Total Economic Impact in Nebraska	**5,290**	**$355,200,000**	**$1,331,400,000**

THE IMPACT OF A SINGLE NEW HYPERSCALE DATA CENTER

To help make the overall statewide estimates of the impact of the entire data center sector more concrete, we can illustrate the economic and fiscal impact potential if just one new $750 million hyperscale data center were to locate in Nebraska. It is important to note that there is significant variability among hyperscale data centers in terms of size, design, capacity, and other characteristics. Our assumptions and calculations are based on an aggregation of information associated with several actual hyperscale data center projects across the country and information provided by industry sources.

Assumptions used to estimate the impact of a $750 million hyperscale data center:

- Construction: $240 million would be spent for construction (including the employment of 1,200 construction workers) in total over the 18 to 24 months that a data center of this scale would typically take for construction.
- Construction: $460 million would be spent on computer equipment that is almost always sourced outside of the region of interest and does not contribute to local economic activity.
- Construction: $50 million would be paid for the purchase of cooling and electrical equipment and other fixtures.
- Operation: eventually employ 100 direct, permanent employees and contractors that provide onsite services such as security and maintenance.

Construction

Direct Economic Impact (24-month construction period):

- **$140.2 million in economic output in the Nebraska economy, including:**
- 1,200 total construction jobs, and
- $52.5 million in associated pay and benefits for construction workers.

Total Economic Impact (24-month construction period):

Accounting for all of the additional effects that the project would cause as the new investment ripples through the Nebraska economy, construction of such a new hyperscale data center would have a potential total economic impact over the two-year construction period of approximately:

- **$269.1 million in total economic output, including:**
- 1,920 jobs supported, and
- $94.5 million in total pay and benefits.

Operation

Direct Economic Impact (annually, once fully built out/operational)

- **$34.2 million in economic output in the Nebraska economy once the data center is fully operational, including:**
- 100 new permanent, onsite operational jobs, and
- $10.2 million in associated pay and benefits for operating workers.

Total Economic Impact (annually, once fully built out/operational):

Once such a facility is fully operational and after accounting for all of the direct and indirect effects that the project would cause in the Nebraska economy, the potential total economic impact would be approximately:

- **$82.4 million annually in total economic output, including:**
- 300 jobs supported once data center operations begin, and
- $24.2 million in pay and benefits.

Data Centers Benefit the Broader Economy in Nebraska

Data centers have generated business for Nebraska companies that are critical pieces of the data center supply chain that in turn generate economic activity and growth for other businesses in Nebraska. Table 2 shows a selection of different Nebraska businesses that are part of the second ripple effect of economic activity related to spending by data centers.

Table 2. Select Businesses Serving Nebraska Data Centers[5]

Company	Nebraska Office Location	Line of Business
Baxter-Kenworthy	Omaha	Electrical design and fabrication services
Commonwealth Electric of Greater Nebraska	Columbus, Grand Island, Kearney, Lincoln, Omaha	Engineering and design-build electrical services
Darland Construction Company	Omaha	Planning, management, and design-build construction services
Gregg Electric Company	Lincoln	Electrical contracting services
Hiller Electric	Omaha	Electrical contracting services
Hy-Electric	Lincoln	Electric construction and maintenance services
Kiewit Corporation	Omaha	Construction and engineering services
Miller Electric Company	Omaha	Design, installation, and maintenance of electrical systems
Olsson	Lincoln	Electrical, mechanical, and structural engineering and design services
Power Protection Products	Omaha	Electrical design, construction, management, and consulting services
Sampson Construction	Kearney, Lincoln, Papillion	Construction design-build and management services
Turner Construction	Omaha	Global construction services
United Electric Supply	Omaha	Electrical equipment and fixtures

[5] None of the companies named here were consulted for this report nor did they request to be included. They are included based only on our own independent research. This list is by no means comprehensive. It is for illustration only.

DATA CENTERS PAY RAPIDLY RISING WAGES

The combination of rapidly rising investment and rapidly rising wages make data centers one of Nebraska's most high-performing lines of business and a valuable (and growing) contributor to a robust state economy. Data centers are extremely capital-intensive and require a large amount of expensive equipment to operate.

The wages for data center jobs are almost twice as high as the average across all industries, and these wages have grown significantly over time. Based on Bureau of Labor Statistics data, between 2001 and 2020 the average annual pay in the data center industry in Nebraska increased 25 percent faster than the pay for an average private-sector job in Nebraska.

- **Data center industry wages in Nebraska:** 105 percent increase ($49,600 to $101,800)
- **Average private sector wages in Nebraska across all industries:** 84 percent average increase in private wages across all industries ($28,000 to $51,400).

Nebraska's Incentive is Required to Keep the State Competitive

Nebraska is one of many states that offer incentives to encourage data centers to locate or expand in their states. A recent report by Cushman and Wakefield states, "A majority of states throughout the U.S. now offer state-level incentives, often sales- or property-tax abatements for long-term investment."[6] The competition among states for data centers is significant, and data centers carefully evaluate the business climate in various states when making location decisions. States with existing sales and use tax incentives revise and extend them from time to time to make them more attractive. Several states have recently added, enhanced, or renewed their sales and use tax incentives in 2020 and 2021 to enhance their competitiveness. The following list shows the extensive recent action on data center incentives across the country in the last few years.

Midwest

- Illinois enacted a new incentive in 2019 that offers up to a 20-year exemption of sales and use tax on data center equipment for carbon-neutral data centers with a $250 million investment and the creation of 20 new jobs.
- Indiana enacted a new incentive in 2019 that offers a 50-year sales and use tax exemption on data center equipment.
- Iowa offers a data center incentive program to encourage data center development.
- Minnesota offers a 20-year sales tax exemption on data center equipment and power.
- Missouri offers a 15-year exemption on sales and use taxes and utility taxes.
- North Dakota enacted a data center incentive in 2021 to replace an incentive that expired in 2020. The new incentive has no sunset date or limitation on the benefit period.
- Ohio offers a full or partial exemption on sales and use taxes on data center equipment.

[6] Cushman & Wakefield Data Center Advisory Group, *Data Center Global Market Comparison*, 2021.

Southeast

- Virginia revised its sales and use tax exemption to require fewer new employees and less capital investment for data centers that locate where the unemployment and poverty rates are higher than statewide averages.

East

- Pennsylvania's original incentive was ineffective at attracting data center investment to the state while billions of dollars of investments were being made in nearby states. The legislature enacted a new sales and use tax exemption that is open indefinitely with benefits available for at least 15 years.
- Connecticut became the latest state to add a completely new data center incentive. Depending on the size and location of the facility, data centers could be exempted from the State's sales and use taxes for 20 to 30 years.
- Maryland enacted a new sales and use tax incentive with a benefit period of 10 to 20 years, depending on the level of investment. The incentive has no sunset date. Following the enactment of Maryland's data center incentive, a data center developer announced plans for a new 2,100-acre data center campus in the state.

West

- Arizona revised and extended its data center sales and use tax exemption by 10 years to run through 2033. The benefit period ranges from 10 to 20 years, with the 20-year benefit reserved for data centers that are considered a sustainable redevelopment project.
- Idaho enacted a new sales and use tax exemption for data center equipment used in new data centers. The new incentive has no program sunset or limitation on the benefit period. In February 2022, Meta announced plans for a 960,000 square foot data center in the state.
- Utah expanded its sales and use tax exemption for data centers with no minimum investment or employment criteria and no program sunset.
- Wyoming offers a sales and use tax exemption on data center equipment. In 2021, legislators rejected a bill that would have repealed the incentive.

COMPETITION BETWEEN STATES

Beyond the extensive list of states with data center incentives, a couple of recent events illustrate the competition between states to attract data centers.

New York – New Jersey – Connecticut

New Jersey is debating adding an incentive. There is a growing realization that the New York-New Jersey region lost its lead in the data center market to Northern Virginia, at least in part because New Jersey is not competitive with other markets on taxes.[7]

An even more dramatic illustration of the sensitivity of data centers to tax changes is the way in which data centers showed their mobility in response to a potential increase in taxes in New Jersey. In the summer of 2020, some elected state officials proposed imposing a 25/100th of one percent or a 1/100th of one percent tax on financial transactions processed in data centers located in New Jersey.[8] In the fall of 2020, the New York Stock Exchange ran its financial transactions out of its data center in Chicago for five days to practice for any possible relocation of the market to data centers outside of New Jersey. The Governor of Texas was involved in attempting to attract Nasdaq to migrate its data center operations to Dallas, the second-largest data center market in the United States. In the spring of 2021, the State of Connecticut enacted a data center incentive to make that state a viable alternative, in the event that New Jersey proceeded with the financial transaction tax.[9]

Illinois – Indiana

In June of 2019, Illinois added a new data center incentive.[10] Although the Chicago area is one of the largest data center markets in the United States, it was not keeping pace with the growth of data centers in the markets of Northern Virginia, Dallas, and Phoenix – all located in states that provide sales and use tax exemptions to attract data center investment. Since the enactment of the Illinois incentive, several new large data center projects have been announced in the state, and over $5 billion in additional data center investment has been committed making it one of the fastest-growing states in terms of data center activity.[11] The neighboring state of Indiana also enacted a 50-year sales and use tax exemption for data centers to attract data centers to the Indiana suburbs of Chicago.[12]

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[7] See Rich Miller, "Will Tax Incentives Jump-Start NJ's Data Center Industry?," *Data Center Frontier*, January 28, 2020. "Twenty years ago, New Jersey probably led the country and data center space, but we haven't moved the needle at all in 20 years." – Gil Santaliz, NJFX "New Jersey was once a hotbed of data center activity, with thriving markets for colocation and financial data centers. The state maintains a substantial and strategically important data center community, but the hottest leasing action has shifted elsewhere, primarily to Northern Virginia." "There is a bill being looked at, and it looks very similar to the broad strokes of what you see in Virginia." – Santaliz

[8] Alex Alley, "NYSE and Nasdaq threaten to leave New Jersey if transaction tax goes ahead," *Data Center Dynamics*, October 20, 2020.

[9] Matt Pilon, "In a crowded pond, CT goes fishing for data centers with new incentives," *Hartford Business Journal*, April 19, 2021.

[10] Ally Marotti. "Data center boosters hope new tax incentives 'stop the bleeding,' keep tech sites in Illinois," *Chicago Tribune*, June 2019.

[11] Companies announcing large data center projects in Illinois since the enactment of the incentive include Aligned Energy, Facebook, Prime Data Centers, NTT, and Stream.

[12] Indiana General Assembly 2019, Indiana House Bill 1405.

Data Center Incentives Do Not Diminish State Tax Revenues

With so many states offering data center sales and use tax incentives, state tax incentives intended to attract data centers do not diminish state tax revenues because data centers generally avoid locating and expanding in states without a sales and use tax exemption. States that do not attract new data center investment do not receive the additional tax revenue and economic impact from data centers. Consequently, when data centers locate in states with sales and use tax exemptions, there is no lost state revenue. States with sales and use tax exemptions for data centers are recognizing that forgoing direct sales and use tax revenue is necessary to gain the economic impact that data centers bring, along with the tax revenue associated with that economic impact.

In June of 2019, Virginia's Joint Legislative Audit and Review Commission (JLARC) published an evaluation of the State's data center incentive using confidential tax information that is not publicly available.[13]

JLARC found that up to 90 percent of the data center investment made by the companies that received the sales and use tax exemption would not have occurred in the state of Virginia without the incentive. So, the "cost" of the State data center incentive is only 10 percent of the amount of the State sales tax revenue exempted. Using the confidential tax information, JLARC estimated the economic and government budgetary impact of Virginia's data center sales and use tax exemption.[14]

JLARC determined that in 2017 (the latest year for which data was available for the evaluation) data centers generated $4.7 million more State tax revenue from construction and suppliers than the amount of sales and use tax exempted by Virginia's data center incentive.[15] In 2017, the State took in $1.09 in State tax revenue from data center-related activity for every one dollar of potential State tax revenue that was exempted from qualifying data centers.

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[13] Joint Legislative Audit and Review Commission, *Data Center and Manufacturing Incentives, Economic Development Incentives Evaluation Series*. June 17, 2019.

[14] *Appendix N: Results of economic and revenue impact analyses*.

[15] Mangum Economics, *The Impact of Data Centers on the State and Local Economies of Virginia, 2020. Also, see Appendix N: Results of Economic and Revenue Impact Analyses*.

The Potential for Future Jobs and Investment Growth in Nebraska

It is possible to estimate the potential impact on jobs and economic growth in Nebraska if the State's data center incentive program stays competitive with other states that offer an incentive.

Early in this report, we noted that just in terms of announced data center development projects, the volume of data centers in Nebraska is planned to more than double by the end of 2024. That implies a compound annual growth rate of 24 percent. That is almost the same rate of growth as has occurred in Northern Virginia between 2018 and 2021, where the total data center capacity more than doubled during that time. It is arguable as to whether Nebraska can continue to achieve such a high rate of data center growth year after year. However, if Nebraska continues to be strongly competitive for data center site selection, we can conservatively estimate that the state should see a 10 percent compound annual growth rate of data centers for 2025 through 2035, following the additional growth in data centers already announced through 2024.[16]

If data center development in Nebraska grows at a 10 percent compound growth rate from 2025 to 2035[17], then in 2035, we estimate that the data center contribution to the Nebraska economy will have grown to:

- $4.8 billion in economic output activity associated with data center operations, including:
- 2,670 onsite operational data center jobs plus 11,370 additional jobs supported elsewhere in the Nebraska economy, and
- $1.1 billion in pay and benefits for workers throughout the Nebraska economy.

[16] For comparison, Dallas-Fort Worth had a compound annual growth rate of 10 percent from 2014 to 2021.
[17] The estimates here start with the 2021 operations phase estimates in Table 1, then apply a 24 percent compound annual growth rate for 2022-2024, and then apply a 10 percent compound annual growth rate for 2025-2035.

About Mangum Economics, LLC

Mangum Economics, LLC is a Virginia-based firm that specializes in producing objective quantitative and qualitative analysis in support of strategic decision making. Much of our recent work relates to IT & Telecom Infrastructure (data centers, terrestrial and subsea fiber), Renewable Energy, Economic Development, and Tax and Regulatory Policy. Examples of our work include:

- *The Impact of Data Centers on the State and Local Economies of Virginia*, 2016, 2018, 2020, and 2022;
- *The Impact of Data Centers on the Georgia Economy, 2022;*
- *The Impact of Data Centers on the Arizona Economy,* 2021;
- *Potential Impact of the Development of the Offshore Wind Energy Industry on Hampton Roads and Virginia*, 2020;
- *The Potential Impact of a Data Center Incentive in Maryland*, 2020;
- *Opportunities for Southside Virginia to Participate in the Cloud Economy*, 2019;
- *The Economic and Fiscal Contribution that Data Centers Make to Virginia: Spotlight on Prince William County*, 2018; and
- *The Potential Impact of a Data Center Incentive in Illinois*, 2018.

POLICY ANALYSIS

Identify the intended and, more importantly, unintended consequences of proposed legislation and other policy initiatives.

ECONOMIC IMPACT ASSESSMENTS AND RETURN ON INVESTMENT ANALYSES

Measure the economic contribution that business, education, or other enterprises make to their localities.

CLUSTER ANALYSIS

Use occupation and industry clusters to illuminate regional workforce and industry strengths and identify connections between the two.

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