

The Economic and Revenue Impact of Data Centers in Pennsylvania

An analysis of the potential growth of data centers in PA as a result of the proposed data center sales and use tax exemption

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Green Fig
Iron Mountain
PECO
Penn Power Group
PPL



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Executive Summary

Demand for data centers – the facilities that house the computers and equipment that power the information needs of the modern economy – is exploding as data needs and use grow. States are competing to attract data centers to their jurisdictions, using tax incentives to entice data center operators. Pennsylvania should be a strong location for data centers. PA has large data users – large business and university research communities; proximity to major business and government centers; low electricity costs; temperate weather; and a strong workforce fueled by our colleges and universities.

But Pennsylvania is falling behind. Since 2008, 25 states have created new tax incentives to attract data center investment. Most offer some form of sales and use tax exemption for computer equipment and technology. Pennsylvania’s current exemption is a rebate capped at \$5 million per year, as compared to unlimited in leaders like Virginia. Incentives have been cited as a driving factor in recent data center location decisions. Since 2008, PA’s share of data center industry employment has shrunk from 3.8 percent to 2.8 percent.

Current and Proposed Incentives for PA

Under existing law – Act 84 of 2016 – PA provides a limited sales tax refund for computer data center equipment. Eligibility requires a minimum payroll of \$1 million per year or, within first 4 years of certification, capital investments of \$25 to \$50 million (depending on county size), with a cap of \$5 million allocated pro-rated for eligible applicants.

Under the proposed legislation – SB 471 / HB 1088 – there would be a standard exemption for computer data center equipment for eligible centers and their tenants. Eligibility for the exemption requires a minimum payroll of \$1 million per year, and within first 4 years of certification, capital investments of \$35 to \$60 million (depending on county size). There would be no cap on the exemption, so exemptions would be applied through a standard exemption certificate.

The Bottom Line: Direct, Indirect, and Induced Impacts

ESI modeled two scenarios: A Status Quo Growth Scenario, which assumes PA grows at same rate as projected US industry growth; and a New Exemption Growth Scenario, which assumes PA employment grows at 16 percent annual rate (based on revenue growth implied by PA Dept. of Revenue in fiscal note for SB 471). The New Exemption Growth Scenario also assumes 4 million square feet of new data centers built by 2024, based on the same growth rate.

Economic Impact of Different Operation Scenarios

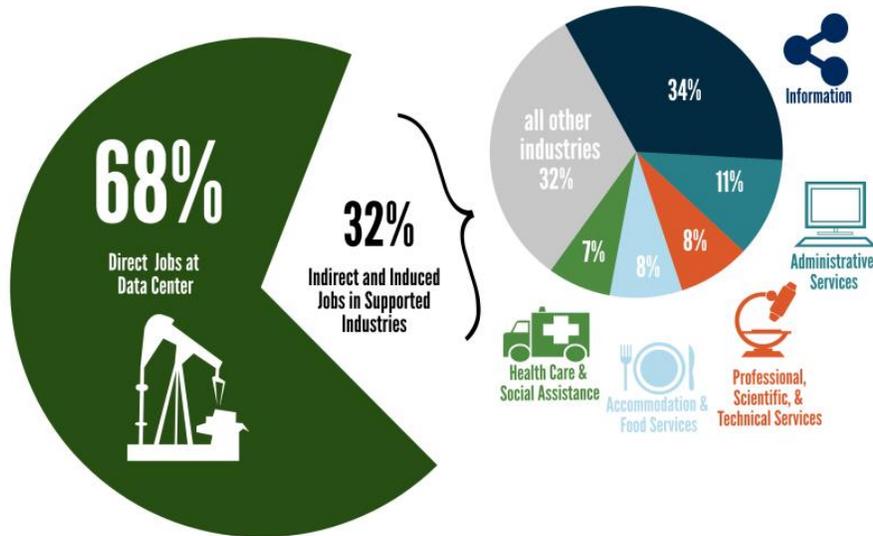
Impact of Operations	Existing Operations, 2019	Scenario 1: New Exemption Growth Scenario, 2024	Scenario 2: Status Quo Growth Scenario, 2024
Direct Output (\$M)	\$2,713	\$5,856	\$2,887
Indirect and Induced Output (\$M)	\$3,126	\$6,747	\$3,326
Total Output (\$M)	\$5,839	\$12,603	\$6,213
Annual Employment Supported	30,000	65,000	32,072
Employee Compensation (\$M)	\$1,913	\$4,128	\$2,035

Source: IMPLAN (2015)

By 2024, under the New Exemption Growth Scenario as compared to the Status Quo Growth Scenario, PA would gain:

- Over 33,000 more total jobs, including 10,000 more jobs in the sector
- Over \$6 billion more in total output
- Over \$2 billion more in total wages
- Over \$110 million more in net tax revenues in FY 24, even after the tax exemption

Employment Impact of Data Center Operations; Direct, Indirect and Induced

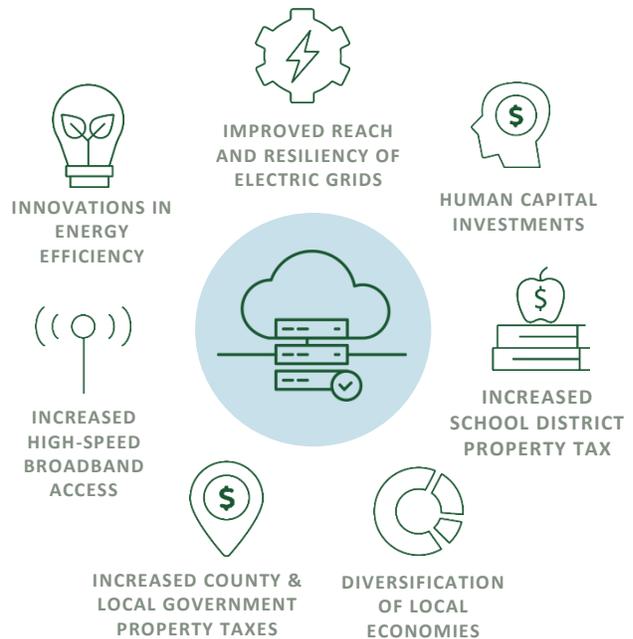


Given these estimates, even a much smaller growth rate of the industry or construction of new centers would result in a net positive revenue position for the state, along with employment and spending growth.

Additional Impacts

In addition to the significant economic impact, the expansion of data centers in PA will have additional community and economic impacts, including:

- Diversification of local economies
- Investments in human capital
- Improvements to the electric grid
- Innovations in energy efficiency
- Increased broadband access
- Increased county, municipal, and school district property taxes



About Econsult Solutions, Inc.

This report was produced by Econsult Solutions, Inc. (“ESI”). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighborhood development, planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process and extensive consulting experience.

1. Introduction

1.1. Purpose of Report

Econsult Solutions was contracted by a coalition of current and future data center operators and energy providers to estimate the economic impact of data centers in Pennsylvania and their tax revenue impacts for the commonwealth. There is proposed legislation (PA Senate Bill No. 471 / House Bill 1088) that would expand existing tax exemptions for data center owners and operators in Pennsylvania. This report will provide an assessment of the economic and tax revenue impact of data centers in the commonwealth under the proposed incentive program, as compared to the impact under the current legislation.

The report will provide a detailed description of the role of data centers in state and local economies across the U.S. and outline the tax incentive programs in place that influence decisions regarding the growth and development of data centers. The analysis in the report will outline the potential economic impacts of growth in the data center industry in PA in terms of spending, jobs, value added, wages, and taxes. Based on industry research, the narrative will explore the potential spillover benefits of data center growth for Pennsylvania communities and constituents.

1.2. The US Data Center Industry

Rapidly Increasingly Demand for Data Centers

Data centers are a critical component of the infrastructure that supports an increasingly digitally-connected world. Driven by rapidly growing demand for data and technology and a growing reliance on cloud computing, the data center industry is experiencing explosive growth.¹ Data centers are fundamental to a number of large industries that rely on the storage and transmission of data, including financial services, health care, retail, transportation, telecommunications, academia, and entertainment.² Growing industries that require access to substantial amounts of real-time and historical data from connected devices like smart city technologies and pharmaceutical and biotechnology companies are also reliant on data centers.³

A 2018 industry study found that across regions in the U.S., there was a robust and “insatiable” demand for data center space, with industry forces driving a need for new data center infrastructure and capabilities in new locations.⁴ To keep up with rapidly growing global demand, construction in the data center industry has experienced explosive growth, highlighted by a sizeable increase in investments made by major service providers in the United States like Amazon, Facebook, Google, and Microsoft.

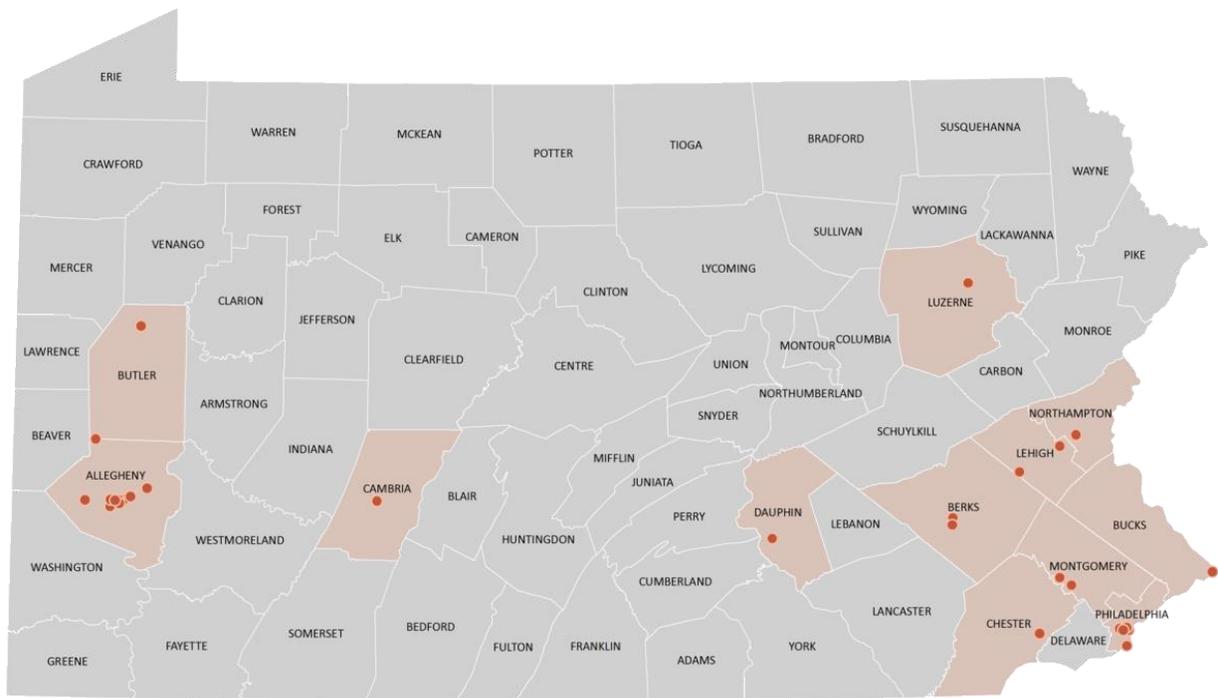
¹ CBRE Data Center Solutions, *North American Data Center Market Outlook 2019* (CBRE Inc: 2018), 2

² Mangum Economics, *Potential Impact of a Data Center Incentive in Illinois* (Mangum Economics: 2018), v

³ Mangum Economics, *Potential Impact of a Data Center Incentive in Illinois*, 2

⁴ Jones Lang LaSalle (JLL), *Global Data Center Outlook Summary* (JLL: 2018)

Figure 1:1 Data Centers in Pennsylvania by County, 2019



Source: DataCenterMap.com (2019), Various Data Center Websites (2019)

Competition for Data Centers

Given the substantial economic impact resulting from data center construction and operation, with project investments in the multi-billion dollar range, states across the U.S. are competing for data center projects.⁵ In the hopes of capturing the economic development driven by data centers, state and local governments have rolled out a variety of policies to attract investments from data center owners and operators. Data center owners seek tax and regulatory relief to improve overall project economics in their location decisions and many states have responded by adjusting their tax structures to remain competitive locations for investment.

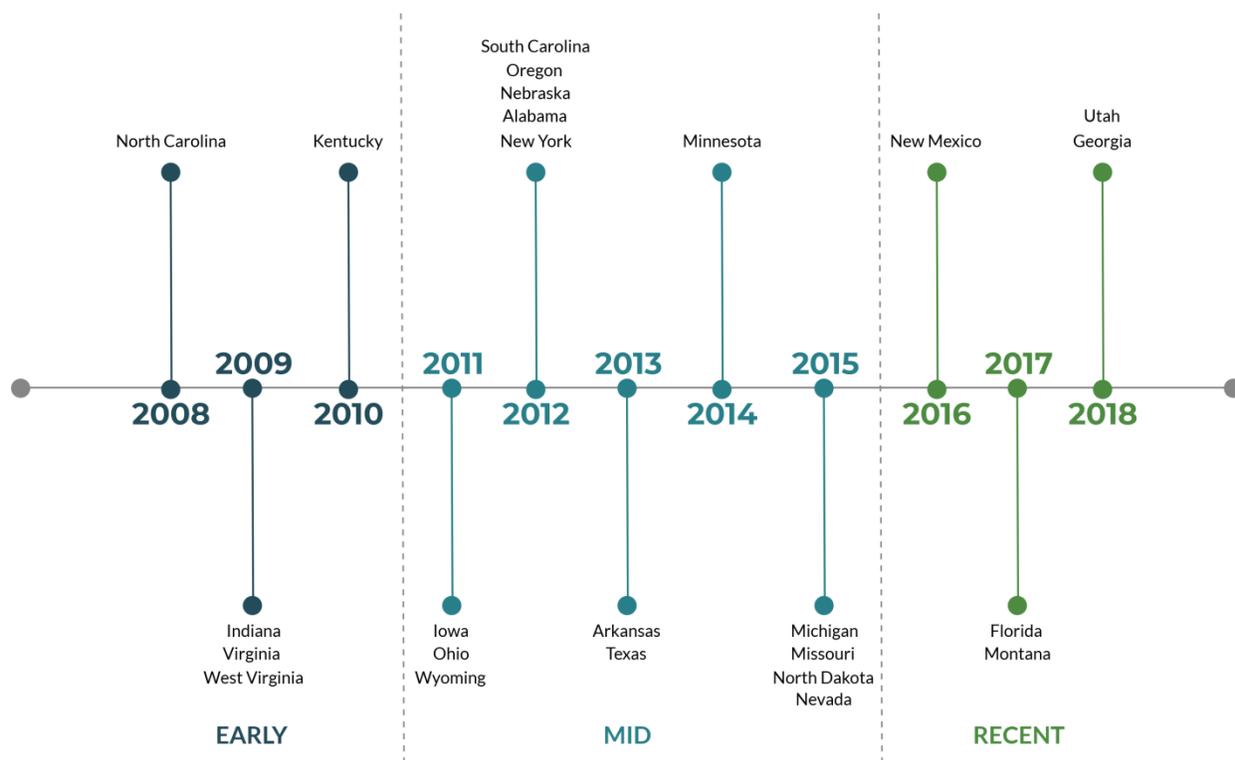
How Other States are Attracting Data Centers

In some states, data center owners and operators qualify for exemptions under existing business development legislation while in others, targeted incentive packages have been created to attract data centers specifically. Today, 30 states offer incentive packages to data center owners and operators.⁶

⁵ David Chernicoff, "US tax breaks, state by state 2016" *Data Center Dynamics*, January 6, 2016, <https://www.datacenterdynamics.com/analysis/us-tax-breaks-state-by-state/>

⁶ Mangum Economics, *Potential Impact of a Data Center Incentive in Illinois*, vi

Figure 1:3 Timeline of Tax Incentives Issued by State, 2008 - 2018



Source: Mangum Economics (2018), Data Center Knowledge (2019)

Incentives Drive Large Data Center Investments

Data center location decisions in the U.S., particularly by leaders in the technology industry, indicate that data center construction tends to follow tax incentives. Apple, for example, decided to build a \$1 billion data center in Maiden, North Carolina in 2009 after the NC state legislature passed tax incentives that secured the facility over competing state, Virginia.¹¹ In response to this loss, the Virginia National Assembly passed a sales and use tax exemption on computer equipment which promptly secured a large investment from Microsoft to build its Boydton data center campus in the state.¹² Since 2009, Virginia has seen a substantial amount of investment from the industry, with statewide capital investments by data centers averaging \$1.6 billion per year.¹³ In 2016 alone, data centers made \$2.6 billion in capital investments in VA; this investment supported the state’s construction industry with 4,167 jobs, \$254.3 million in labor income, and \$670 million in economic output.¹⁴

¹¹ Mangum Economics, *Potential Impact of Data Center Incentives in Illinois*, 21

¹² Mangum Economics, *Potential Impact of Data Center Incentives in Illinois*, 21

¹³ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, vi

¹⁴ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, vi

A tax incentive in Wyoming was critical in securing the \$250 million investment from Microsoft to expand its Cheyenne data center campus in February, 2015.¹⁵ Microsoft has now invested a total of \$750 million in the Cheyenne facility.¹⁶ The director of Cheyenne Leads, Randy Bruns, stated that without Wyoming's data center incentives, it would be at a 4 to 6 percent tax disadvantage relative to nearby states like Colorado, Utah, and Nebraska.¹⁷ After Utah legislators passed tax incentives, Facebook decided to locate its 1 million-square-foot Eagle Mountain data center in the state; the first phase of the project alone will generate \$837,000 in property taxes on land that currently generates \$66 in property tax revenue.¹⁸

These decisions by industry leaders indicate that tax incentives play a key role in location decisions for large data center investments. Examples like Utah and Wyoming highlight the fiscal case for states to incentivize these kinds of investments - data centers can bring substantial gains in local tax revenues and dramatically increase the property tax value of previously unused or underutilized land in areas that are unlikely to attract investment from other sources. Many states are working to create or update legislation regarding data center tax incentives to remain competitive players. Notably, the Illinois legislature has proposed legislation to pass data center tax incentives despite the state's long-time position as a leader in the data center industry.¹⁹ The state has remained a leader in the industry for many years due to Chicago's role as a national internet hub, but companies with data centers in Illinois have had recent trouble filling the centers due to compelling incentives offered in other states.²⁰ The move indicates that despite other factors that make a state attractive for data center investment, tax incentives play a critical role in industry decision-making.

PA Losing National Share of Industry Jobs, States with Incentives Gaining Share

As demonstrated in Figure 1:4, Pennsylvania has been steadily losing its share of national employment in the data center industry. The commonwealth's share of national jobs has dropped from 3.8 percent in 2008 to 2.8 percent in 2018. The employment share in other states, like Arizona, North Carolina, and Washington, all of which have incentives in place to attract data centers, has been rising.

¹⁵ Mangum Economics, *Potential Impact of Data Center Incentives in Illinois*, 21

¹⁶ Mangum Economics, *Potential Impact of Data Center Incentives in Illinois*, 21

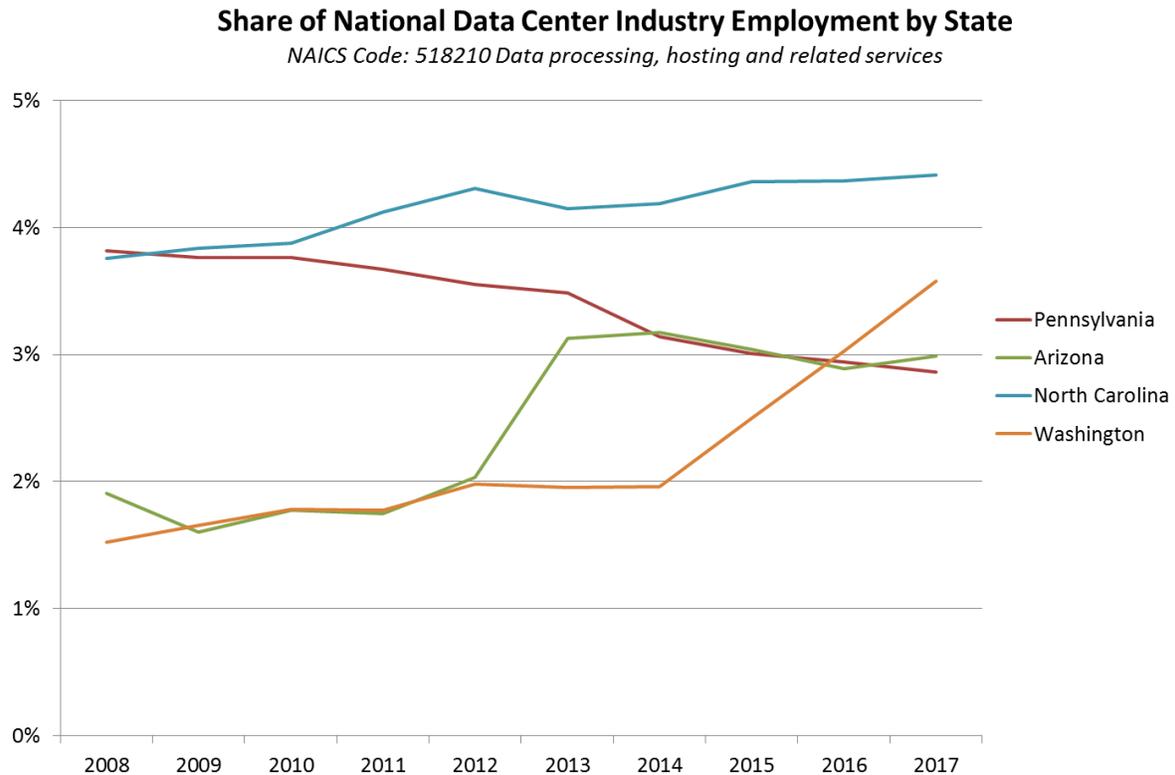
¹⁷ Mangum Economics, *Potential Impact of Data Center Incentives in Illinois*, 21

¹⁸ Mangum Economics, *Potential Impact of Data Center Incentives in Illinois*, 22

¹⁹ Rich Miller, "The Fight for Illinois Data Centers," *River Cities' Reader*, May 19, 2019, <https://www.rcreader.com/lifestyle/fight-for-illinois-data-centers>

²⁰ Miller, "The Fight for Illinois Data Centers"

Figure 1:4 Share of National Data Center Industry Employment by State



Source: Bureau of Labor Statistics, *Employment and Wages from Occupational Employment Statistics (OES) survey 2007-2017 (2019)*

Considering the tax exemption policies of the states in Figure 1:4, we can see the relationship between tax incentives and these states’ employment share over time. Prior to 2015, North Carolina offered tax abatements for data center owners and operators at a relatively high investment threshold. In 2015, in response to competition from neighboring states, North Carolina lowered its investment threshold and expanded its exemption to include tax on electricity.²¹ In 2007, North Carolina had around the same share of national employment as PA, but its share has risen steadily since then while PA’s has fallen. Washington presents a particularly interesting case – in 2014 the state chose not to extend the tax incentives it previously had in place for data centers. After losing a large Microsoft project to Iowa, the state legislature passed extended tax incentives in 2015 by a wide margin.²² Washington has seen substantial growth in its share of the national industry since. Arizona passed sales and use tax exemptions for data center owners and operators in 2013 that brought a jump in national employment share which the state has retained since.²³

²¹ Chernicoff, “US tax breaks, state by state 2016”

²² Jason Verge, “Washington State Extends Data Center Tax Breaks,” *Data Center Knowledge*, July 07, 2015, <https://www.datacenterknowledge.com/archives/2015/07/07/washington-state-extends-data-center-tax-breaks>

²³ Rich Miller, “Arizona Passes Incentives for Data Centers,” *Data Center Knowledge*, June 19, 2013,

1.3. Existing and Proposed Legislation in Pennsylvania

Existing Legislation

Currently, Pennsylvania has a limited sales tax refund for computer data center equipment purchases. Under the existing legislation in Pennsylvania, the Computer Data Center Equipment Incentive Program authorized under Act 84 of 2016, eligible data center owners, operators, and tenants can apply annually for a refund on sales and use tax paid on qualifying computer data center equipment.²⁴ Under this legislation, there is an annual cap of \$5 million on the total tax exemptions that can be offered.²⁵ To be eligible for this exemption, data center owners and operators must either have a minimum payroll of \$1 million per certification year, or, within their first four years of certification, make capital investments of \$25 million in a county with a population less than 25,000 or \$50 million in a county with a population greater than 250,000.²⁶

Tenants of data centers that meet these requirements are eligible for the program if they have a 2-year agreement with the certified data center to use 100 kilowatts of power per month.²⁷ The current \$5 million cap in the 2016 legislation requires that the sales tax exemption be implemented through a refund program rather than the standard exemption certificate. As a result, exemptions are currently allocated pro rata amongst all eligible applicants.²⁸

Proposed Legislation

The proposed legislation in Senate Bill No. 471 / House Bill 1088 proposes several adjustments to the current legislation. The new bill would increase the investment thresholds that data center owners and operators must meet from \$25 million and \$50 million to \$35 million and \$60 million respectively.^{29 30} To qualify for the program under the new legislation, data center owners and operators would need to meet both the payroll and the capital investment thresholds and would no longer be allowed to include the payroll of their tenants to meet the annual payroll threshold.³¹ The new program would no longer cap total exemptions at \$5 million. Removing this cap means that tax exemptions would be applied through a standard exemption certificate rather than a refund.³²

Figure 1:5 shows the Pennsylvania Department of Revenue's estimates for revenues lost as a result of the proposed tax incentive. The figures estimated by DOR indicate that they predict the proposed

<https://www.datacenterknowledge.com/archives/2013/06/19/incentives-passed-in-arizona>

²⁴ Pennsylvania Department of Revenue, *Computer Data Center Equipment Incentive Program*, (Pennsylvania Department of Revenue: 2017), https://www.revenue.pa.gov/GeneralTaxInformation/IncentivesCreditsPrograms/Documents/computer_data_center_equipment_program_guidelines.pdf, 3

²⁵ Pennsylvania Department of Revenue, *Computer Data Center Equipment Incentive Program*, 7

²⁶ Pennsylvania Department of Revenue, *Computer Data Center Equipment Incentive Program*, 3

²⁷ Pennsylvania Department of Revenue, *Computer Data Center Equipment Incentive Program*, 3

²⁸ Kevin Randolph, "Rep. Nesbit to introduce legislation establishing sales and use tax exemption data centers," *Pennsylvania Business Report*, March 5, 2019, <https://pennbizreport.com/news/12306-rep-nesbit-to-introduce-legislation-establishing-sales-and-use-tax-exemption-data-centers/>

²⁹ The General Assembly of Pennsylvania, *Senate Bill 471*

³⁰ The General Assembly of Pennsylvania, *House Bill 1088*

³¹ The General Assembly of Pennsylvania, *Senate Bill 471*

³² Randolph, "Rep. Nesbit to introduce legislation establishing sales and use tax exemption data centers"

exemption would lead to significant growth in data center development and purchases, hence the high projected net losses.

Figure 1:5 Estimates from the Department of Revenue on the Potential Loss of Sales and Use Tax from the Proposed Sales and Use Tax Exemption Legislation (\$M)

	SUT Impact	Adjustment for Small Firms	Impact from Repealing Data Center Tax Refund	Net Impact
2018-2019	0.0	0.0	0.0	0.0
2019-2020	-28.0	-24.6	5.0	-19.6
2020-2021	-36.2	-31.8	5.0	-26.8
2021-2022	-42.9	-37.7	5.0	-32.7
2022-2023	-50.9	-44.8	5.0	-39.8
2023-2024	-60.4	-53.1	5.0	-48.1

Source: Pennsylvania Department of Revenue (2019)

2. Methodological Approach

2.1. Developing Economic Impact Scenarios

From our review of other economic impact studies on data centers and expertise in the application of economic impact analysis, ESI developed various economic and tax revenue impact models to explore the impact of the proposed exemption as compared to the current legislation.^{33 34 35}

First, we developed the following models to demonstrate a baseline of the current economic impact of the data center industry in the commonwealth and illustrate the costs and impact of constructing a new data center in PA:

PA Data Center Baseline:

- Current operations – an estimate of aggregate data center operations as of 2019 in the Commonwealth of Pennsylvania

Construction of a New 500,000 sq. ft. Data Center:

- An illustrative model of the cost and impact of constructing a new 500,000-square-foot data center in Pennsylvania

We then modeled two future growth scenarios to demonstrate the economic and fiscal impact of data centers in PA under the proposed expanded tax exemption versus the current legislation.

Status Quo Growth Scenario:

- Economic and fiscal impact of data centers under current law from 2019 to 2024
- Assumes PA grows at same rate as projected US industry growth - using data from the Bureau of Labor Statistics, we assume an annual growth rate of 1.2 percent

New Exemption Growth Scenario:

- Economic and fiscal impact of data centers after passage of new incentive from 2019 to 2024
- Assumes PA employment grows at 16 percent annual rate (based on revenue growth implied by PA Dept. of Revenue in fiscal note for Senate Bill 471)
- Assumes 4 million square feet of new data centers built by 2024, based on same growth rate

³³ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*

³⁴ Mangum Economics, *Potential Impact of a Data Center Incentive in Illinois*

³⁵ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities*

2.2. Why use an economic impact framework?

To estimate the full range of economic and fiscal impacts associated with the proposed expanded tax exemption for data centers, ESI used IMPLAN, an industry standard, input-output modeling software program which uses geography-specific data to determine the impacts of new and existing economic activity. The purpose of input-output models is to determine the linkages across industries to calculate the magnitude and composition of the spillover impacts to all industries benefitting from spending in the subject industry.

In an inter-connected economy, every dollar spent generates two spillover impacts.

- First, some proportion of goods and services purchased gets circulated back into an economy when those goods and services are purchased from local vendors. This is the indirect effect.
- Second, some amount of the labor income gets circulated back into an economy when employees spend their earnings on various goods and services. This is the induced effect.
- The total economic impact will therefore be the sum of the direct economic activity plus the indirect and induced effects generated by that direct economic activity.

These increases in economic activity are then translated into attendant fiscal impacts using a custom fiscal model for the Commonwealth of Pennsylvania, which is developed by comparing observed levels of economic activity with observed revenue collections.

2.3. Methodology for Four Economic Impact Models

PA Data Center Baseline | *Current Economic Impact of Data Centers in PA*

Following the methodology in the Virginia and Illinois economic impact reports conducted by Mangum Economics, ESI used Bureau of Labor Statistics (BLS) data for the industry Data Processing, Hosting, and Related Services industry - NAICS code 518210 (see Figure 2:1). The Department of Revenue's analysis of the proposed sales and use tax exemption for data centers starts with the 2019-2020 tax year. To be consistent, we grew the BLS 2018 employment and earnings estimates for Pennsylvania to 2019.

Figure 2:1 BLS Employment and Wage Information for Data Processing, Hosting, and Related Services Industry - NAICS Code 518210 in Pennsylvania, 2007 through 2018

Year	All Employees	Annual Employment		Annual Wage Growth Rate
		Growth Rate	Total Annual Wages	
2007	10,001	-	\$686,861,000	-
2008	9,949	-0.5%	\$682,317,000	-0.7%
2009	9,260	-6.9%	\$642,314,000	-5.9%
2010	9,126	-1.4%	\$625,147,000	-2.7%
2011	9,001	-1.4%	\$614,812,000	-1.7%
2012	9,009	0.1%	\$651,417,000	6.0%
2013	9,252	2.7%	\$683,458,000	4.9%
2014	8,698	-6.0%	\$644,196,233	-5.7%
2015	8,921	2.6%	\$689,932,996	7.1%
2016	8,860	-0.7%	\$691,395,698	0.2%
2017	8,973	1.3%	\$726,144,447	5.0%
2018	9,431	5.1%	\$788,684,044	8.6%

Source: Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) survey 2007-2018 (2019)

Growth in the data center industry in PA has been inconsistent, whereas national growth has been more consistent / predictable. Therefore, to forecast future growth in the industry in Pennsylvania from 2018 to 2019, we used what we believe is a conservative growth rate using national data. Using the most recently released national forecast from BLS for this industry, which was from 2016 to 2026, we used the year-over-year growth rate of 1.2 percent from that forecast (see Figure 2:2).

Figure 2:2 BLS Occupations within Data Centers National Jobs Forecast from 2016 to 2026, Forecasting PA Data Center Job Growth from 2018 to 2019

Year	Jobs
National Forecast	
2016	299,600
2026	339,200
Total Forecasted Growth	13.22%
Annualized Forecasted Growth	1.25%
Forecasting Pennsylvania	
2018 Data Center Jobs	9,431
2018 Data Center Annual Wages	\$788,684,044
2019 Forecasted Data Center Jobs	9,549
2019 Forecasted Data Center Annual Wages	\$798,535,923

Source: Bureau of Labor Statistics, Employment Projections 2016-2026 (2019), Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) survey 2018 (2019)

We input the number of employees and their wages from our 2019 Pennsylvania estimates into IMPLAN to arrive at an estimated direct economic activity level. We then ran the IMPLAN model for Pennsylvania to get the indirect and induced economic activity to arrive at the total economic impact of data centers in Pennsylvania.

To arrive at the aggregate data center square footage across Pennsylvania, we researched existing data centers in Pennsylvania. We estimated nearly 3.5 million square feet of data centers in PA across 35 facilities (see Figure 2:3). The largest is 401 N Broad in Philadelphia with 1.3 million square feet.

PA Data Center Baseline – Key Findings

- 2018 Employment in Data Processing, Hosting and Related Services Industry (NAICS code 518210): 9,431
- \$789 million in 2018 wages
- BLS expected annual employment growth to 2026: 1.2%
- Total PA Data Center square footage: 3.5 million sq. ft.

Figure 2:3 Data Centers in Pennsylvania

Data Center Name	Street Address	City	Square Feet
365 Data Centers - Philadelphia	3701 Market St, 5th Floor	Philadelphia	9,000
vXchnge - Philadelphia (PA01)	1500 Spring Garden St, Suite 520	Philadelphia	72,000
833 Chestnut - Digital Realty	833 Chestnut St	Philadelphia	N/A
Netrality Data Centers/Property Trust	401 N Broad St	Philadelphia	1,300,000
Tierpoint - Philadelphia Facility	4775 League Island Boulevard	Philadelphia	25,700
Quonix Data Center	2401 Locust St	Philadelphia	N/A
Tierpoint - Allentown-TekPark	9999 Hamilton Boulevard, Building #4	Allentown	250,000
Tierpoint - Bethlehem	3864 Courtney St, Suite 130	Bethlehem	25,800
viLogics - Colocation Ebensburg	378 Industrial Park Drive	Ebensburg	15,000
Netrepid Data Center	2330 Vartan Way	Harrisburg	N/A
vXchnge - Pittsburgh (PA02)	2202 Liberty Avenue	Pittsburgh	20,000
Iron Mountain - West Pennsylvania Data Center	1137 Branchton Rd	Boyers	170,000
Management Science Associates - Evergreen Heights	Not Available (N/A)	N/A	65,000
Management Science Associates - Rock Pointe	N/A	N/A	42,000
Sierra Data Centers	2 Robinson Plaza #300	Pittsburgh	13,500
Bare Metal Pittsburgh	2140 Woodland Rd	Warrendale	N/A
Expedient - Pittsburgh-Green Tree	810 Parish St	Pittsburgh	26,000
Expedient - Pittsburgh-ACM	1 Allegheny Center Mall	Pittsburgh	26,220
aspStation	4736 Penn Avenue	Pittsburgh	N/A
CityNet - Pennsylvania	Allegheny Center Mall	Pittsburgh	N/A
DataBank - Downtown Pittsburgh	100 South Commons	Pittsburgh	15,000
EdgeConneX Pittsburgh	282 Corliss St	Pittsburgh	14,700
viLogics - Colocation Pittsburgh	322 4th Ave	Pittsburgh	N/A
Ascent Data	90 Beta Drive	Pittsburgh	N/A
TeraSwitch Networks - DC1	1016 North Lincoln Ave	Pittsburgh	10,000
IPR Reading BCC	Bernville Road (See Note)	Reading	180,000
Directlink Technologies	2561 Bernville Road	Reading	300,000
Contegix Data Center	One Meridian Blvd	Wyomissing	25,000
TierPoint - Valley Forge PA	1000 Adams Avenue	Valley Forge	125,000
Zebra Fiber 1	15 Public Sq	Wilkes Barre	N/A
TierPoint - Lehigh Valley	3494 Schelden Circle	Bethlehem	28,000
Flexential Allentown	744 Roble Rd	Allentown	46,800
Flexential Philly - Collegeville	1000 Black Rock Road	Collegeville	203,703
TrueNet	24 Hagerty Blvd	West Chester	N/A
Keystone NAP	150 Roebbling Rd	Fairless Hills	180,000
Total Square Feet			3,188,423
Median Square Feet, not including 401 N Broad, Philadelphia			27,110
Number of Data Centers without Square Feet Information			10
Estimated Total Data Square Feet in PA			3,459,523

Source: DataCenterMap.com (2019), Various Data Center Websites (2019)

In this scenario, we assume that the sales tax for the data center equipment is what the Revenue Department projected, which is \$24.6 million. We then calculated the sales tax per employee, which is around \$43,000 in assumed sales tax revenue per employee. This sales tax per employee can be applied to the sales tax projection in Scenario 1, the New Exemption Growth Scenario, to arrive at the assumed future data center employment. We also calculated data center square feet per employee, which is 367 square feet per employee. By applying the square feet per employee to the future total employment, we arrive at the amount of future data center square feet estimated to be needed to meet the Revenue Department projections.

Figure 2:4 Estimating Sales Tax per Employee and Square Feet per Employee

Specifications	Values
State Sales Tax (\$M)	\$24.6
Sales Tax Rate	6%
Sales in Data Center Equipment (\$M)	\$410.0
2019 Number of Annual Employees in PA	9,549
Sales Tax per Employee	\$42,937
Total Data Center sq. ft. in PA	3,500,000
Sq. ft. per Employee	367

Source: Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) survey 2018-2019 (2019), Philadelphia Department of Revenue (2019), Econsult Solutions (2019)

Construction of a New 500,000-Square-Foot Data Center | *An illustrative model*

We modeled the economic impact of the construction of a typical 500,000-square-foot data center in PA. According to an economic impact study by the US Chamber of Commerce Technology Engagement Center, the cost for the base building construction is \$270 per square foot, which includes architectural planning and design, building permits, local taxes, land excavation and grading, roadways, tie-ins to utilities, and the building shell.³⁶ The mechanical and electronic equipment cost is approximately \$950 per square foot, which includes computer room air conditioning units, refrigerant loops, condenser plants or chillers, water tanks, power distribution units, transformers, patch panels, UPS systems, auto transfer switches, generators, etc. Applying those costs per square foot, the total construction cost for a 500,000-square-foot data center is \$610 million.

Cabinet and Server Cost

For the purpose of this economic impact analysis, we also need to arrive at an estimate of taxes from regular construction and the refresh of cabinets and servers. Therefore, our current economic impact for construction has two components. The first is the construction activity of the data centers, including direct employees, management, administration, etc. For this, we follow the employment methodology

³⁶ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide* (US Chamber of Commerce Technology Engagement Center, 2017)

used in the Virginia and Illinois economic impact studies as discussed above. The second component is the purchase of cabinets and servers over the 10 year period.

We estimated the cost of the cabinet and server refresh by using a mix of proprietary data for a potential new data center and public data (see Figure 2:5). We assumed the following:

Figure 2:5 Cost of Cabinets and Servers

Specifications	Values
Sq. ft. per cabinet	110
Cost per cabinet	\$16,000
Number of servers per cabinet ³⁷	42
Cost per server	\$4,500
Total cost one cabinet with servers	\$205,000

Sources: Uptime Institute (2019), Confidential (2019)

We assume that the average square feet needed for one cabinet is 110, so a 500,000-square-foot data center is able to host 4,550 cabinets. By applying the average cost of one cabinet with servers of \$205,000 to the number of cabinets, we arrive at the total cabinet and server cost of around \$930 million for the entire data center. We assume that the purchase of the cabinets and servers happens over a period of 10 years, so the annual cost for purchasing cabinets and servers is estimated to be around \$93 million. By applying the sales tax of 6 percent, the purchase of cabinets and servers will generate around \$5.6 million in sales tax.

³⁷ Assuming a standard 42U rack with 42 servers

Figure 2:6 Cost of Constructing a New 500,000-Square-Foot Data Center

Specifications	Values
Total Building sq. ft.	500,000
Base Building Construction Cost per sq. ft.	\$270
Mechanical and Electrical Equipment Cost per sq. ft.	\$950
Total Base Building Construction Cost	\$135,000,000
Total Mechanical and Electrical Equipment Cost	\$475,000,000
Total Building and Mechanical and Electrical Equipment Cost Without Cabinet and Server Purchase	\$610,000,000
Sq. ft. per Cabinet	110
Number of Cabinets	4,550
Cost of One Cabinet with Servers	\$205,000
Total Server and Cabinet Cost	\$932,750,000
Server and Cabinet Installation Period (Yrs)	10
Annual Server and Cabinet Cost	\$93,275,000
Sales Tax Rate	6%
Annual Sales Tax from Server and Cabinet Cost	\$5,596,500
Total One-Time Capital Investment in Year One	\$703,275,000

Source: US Chamber of Commerce Technology Engagement Center (2019), Uptime Institute (2019), Confidential (2019), Econsult Solutions (2019)

We input the direct economic activity of the construction of a new 500,000-square-foot data center into IMPLAN to estimate the one-time economic impact that results from the construction of a new center of this size. It is important to note that we modeled the spending on base building, mechanical, and electrical costs, without cabinet and server purchase, because construction spending happens within the region where the data center is located, whereas cabinets and servers are purchased from outside the region. These direct expenditures and associated employees' salaries will generate indirect and induced impacts, which sum to the total economic output associated with the construction of a new data center of this size. It is estimated that the construction of a new 500,000-square-foot data center will generate \$1.1 billion in total output and will support 7,200 employees with \$335 million in employee compensation.

Figure 2:7 Economic Impact of Construction of a 500,000-Square-Foot Data Center

Impact of Construction	Commonwealth of Pennsylvania
Direct Output (\$M)	\$610
Indirect and Induced Output (\$M)	\$509
Total Output (\$M)	\$1,119
Annual Employment Supported	7,200
Employee Compensation (\$M)	\$335

Source: IMPLAN (2015)

The construction of a 500,000-square-foot data center will generate one-time tax revenues to the commonwealth. Income tax, sales tax, and business tax revenue estimations from this construction activity are listed in Figure 2:8. It is estimated that the construction activity will generate approximately \$16 million in one-time total tax revenues to the commonwealth from the direct, indirect, and induced economic activity.

Figure 2:8 Tax Impact of Construction of a 500,000-Square-Foot Data Center

Tax Type	Direct Tax	Indirect and Induced Tax	Total Tax
Income Tax Revenues (\$M)	\$4.3	\$3.1	\$7.4
Sales Tax Revenues (\$M)	\$3.5	\$3.2	\$6.7
Business Tax Revenues (\$M)	\$1.1	\$1.0	\$2.1
Total Tax Revenues (\$M)	\$8.9	\$7.3	\$16.2

Source: IMPLAN (2015)

Given that data centers are such large consumers of power, we also estimated the power usage and cost of power for a center of this size as well as its power tax impact. The cost of power for a 500,000-square-foot center would be \$4.4 million annually and would generate over \$500,000 in power taxes per year.

Figure 2:9 Estimating Power Usage and Power Tax Impact of a 500,000-Square-Foot Data Center

Specifications	Values
Total Data Center sq. ft.	500,000
Total Number of Cabinet	4,545
Total MW	23
MW / Hr Draw	12.5
kWh	82,125,000
Power Cost	\$4,352,625
Electric Sales Tax Rate	\$261,158
Gross Receipt Taxes	\$272,910
Total Power Taxes	\$534,067

Source: Confidential (2019), Econsult Solutions (2019)

Construction of a New 500,000 sq. ft. Data Center – Key Findings

We estimated the construction costs and associated economic and fiscal impacts for the construction of a typical new 500,000 sq. ft. data center:

- \$610 million in base building and electrical and mechanical equipment cost
- \$93 million per year in server and cabinet cost
- \$5.6 million in annual sales tax from server and cabinet purchases
- Over \$1 billion in total economic output resulting from construction activity
- \$16 million in one-time total tax revenues to the commonwealth from construction activity

Status Quo Growth Scenario | *Economic Impact under Current Legislation*

As mentioned earlier, to forecast future growth in the industry in Pennsylvania, we used the year-over-year growth rate of 1.2 percent from the last released national forecast from BLS. By applying this growth rate, the employment in the Status Quo Growth Scenario for Data Processing, Hosting, and Related Services industry employment in Pennsylvania grows to 10,160 in 2024.

Figure 2:10 Estimating Number of Employees, Salary, and Total Data Center Square Feet if PA Grows at the Current National Growth Rate

Year	Jobs
National Forecast	
2016	299,600
2026	339,200
Total Forecasted Growth	13.22%
Annualized Forecasted Growth	1.25%
Forecasting Pennsylvania	
2018 Data Center Jobs	9,431
2018 Data Center Annual Wages	\$788,684,044
2024 Forecasted Data Center Jobs	10,160
2024 Forecasted Data Center Annual Wages	\$849,672,330

Source: Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) Survey 2007-2018 (2019), Bureau of Labor Statistics Employment Projections 2016-2026 (2016), Philadelphia Department of Revenue (2019), Econsult Solutions (2019)

Employment numbers for our three operations scenarios – Existing Operation 2019, New Exemption Growth Scenario 2024, and Status Quo Growth Scenario 2024 - are summarized in Figure 2:11. Specific assumptions and inputs were held constant across all three models.

Figure 2:11 Employment Estimates of Different Operation Scenarios

Estimates	Existing Operation 2019	Scenario 1: New Exemption Growth Scenario 2024	Scenario 2: Status Quo 2024
Number of Employees	9,549	20,611	10,160
Employee Compensation	\$931	\$2,009	\$990

Source: Bureau of Labor Statistics, Employment Projections 2016-2026 (2019), Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) survey 2018 (2019), Bureau of Labor Statistics Employment Projections 2016-2026 (2016)

New Exemption Growth Scenario | Economic Impact after Passage of New Tax Incentive

The Pennsylvania Department of Revenue estimated that the projected loss of sales tax from the proposed tax exemption legislation would be \$53.1 million in 2024 (see Figure 1:5 earlier in the report).

By applying the sales tax per employee estimates we got from the PA Data Center Baseline to the sales tax projection in 2024, we arrive at an estimate for 2024 data center employment of 20,611. We then input the number of employees and their wages from the 2024 Pennsylvania estimates into IMPLAN to arrive at the total economic impact of data centers in Pennsylvania for that scenario.

In addition, by applying the square feet per employee estimate to the 2024 data center employment projection, we can project the total square feet of data centers in 2024 to be 7.6 million square feet.

Figure 2:12 Estimating Number of Employees and Total Data Center Square Feet if PA Grows at the Rate of Revenue Department's Projection

Specifications	Values
State Sales Tax (\$M)	\$53.1
Sales Tax Rate	6%
Sales in Data Center Equipment (\$M)	\$885.0
Forecasting Employee	
Sales Tax per Employee	\$42,937
2024 Number of Annual Employees in PA	20,611
2024 Total Annual Wages in PA	\$1,723,669,004
Forecasting Total Data Center sq. ft.	
Sq. ft. per Employee	367
2024 Total Data Center sq. ft. in PA	7,600,000
Sq. ft. Added from 2019 to 2024	4,100,000
Number of New Data Center with 500,000 sq. ft. Needed	8

Source: Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) survey 2018-2019 (2019), Philadelphia Department of Revenue (2019), Econsult Solutions (2019)

3. Current Economic Impact

3.1. Overview

To estimate the economic, employment, and labor income impacts associated with data centers, ESI used IMPLAN, an industry standard, input-output modeling software program, which uses geography-specific industry data to determine the impacts of new and existing economic activity. We input the number of employees and their wages from our 2019 Pennsylvania estimates into IMPLAN to arrive at an estimated direct economic activity level. Since our geographic model is Pennsylvania, we are only modeling construction spending within Pennsylvania. The spending on cabinet and server refresh is not included in the economic impact model because the cabinets and servers are not purchased within Pennsylvania, and this spending is not considered to circulate as typical expenditures through the economy.

Figure 3:1 Input for Economic Impact Modeling

Ongoing Operation Estimation	Values
Number of Employees	9,549
Employee Compensation	\$930,688,288

Source: IMPLAN (2015)

3.2. Economic Impact

Direct expenditures and associated employees’ salaries will generate indirect and induced impacts, which sum to the total economic output associated with data centers in Pennsylvania. In addition, these direct, indirect, and induced expenditures will support additional employment and related earnings within Pennsylvania. Each year, the direct operating expenditures at data centers will generate an estimated \$5.8 billion in economic impact within Pennsylvania and support 30,000 employees with \$1.9 billion in earnings.

Figure 3:2 Annual Economic Impact from Operations

Impact of Existing Operations	Commonwealth of Pennsylvania
Direct Output (\$M)	\$2,713
Indirect and Induced Output (\$M)	\$3,126
Total Output (\$M)	\$5,839
Annual Employment Supported	30,000
Employee Compensation (\$M)	\$1,913

Source: IMPLAN (2015)

3.3. Tax Revenue Impact

The increases in economic output and employment associated with the data centers’ operations also yield increases in state and local tax bases. Tax revenues result both from the set of direct taxes and from

increases in tax revenue associated with the additional income generated by operations. These revenues result not only from the direct operations and employment, but also from the impacts of the indirect and induced impacts estimated above on various state tax bases. It is estimated that the ongoing operations in PA data centers will generate \$12 million direct sales tax each year, and \$32 million direct tax in total, including income tax and business tax.

Figure 3:3 Annual Tax Revenue Impact from Current PA Data Center Operations

Tax Type	Direct Tax	Indirect and Induced Tax	Total Tax
Income Tax Revenues (\$M)	\$17	\$20	\$36
Sales Tax Revenues (\$M)	\$12	\$21	\$33
Business Tax Revenues (\$M)	\$4	\$7	\$10
Total Tax Revenues (\$M)	\$32	\$47	\$79

Source: IMPLAN (2015)

4. Future Economic Impact

4.1. Overview

Section 4 will explore the economic impact of two potential growth scenarios in Pennsylvania – one under the approval of the proposed expanded tax exemption for data centers and the other under the current legislation.

4.2. Projecting Growth

For this analysis, ESI developed two growth scenarios, which include:

- Scenario 1: Future Operations, Grow at the Rate of Revenue Department’s Projection via Proposed Tax Exemption for Data Centers = daily operations + annualized refresh of data center equipment
- Scenario 2: Future Operations, Status Quo, Remain at Current Growth Rate, No Change in Tax Incentives for Data Centers

We input the number of employees and their wages for the two growth scenario estimates into IMPLAN to arrive at an estimated direct economic activity level. The spending on cabinet and server refresh is not included in the economic impact model, but is addressed when calculating the direct tax generated by the total operation activity. The input for the economic impact modeling is shown below in Figure 4:1.

Figure 4:1 Input for Economic Impact Modeling for Two Growth Scenarios Comparing to Existing Operations

Estimates	Existing Operations, 2019	Scenario 1: New Exemption Growth Scenario, 2024	Scenario 2: Status Quo Growth Scenario, 2024
Number of Employees	9,549	20,611	10,160
Employee Compensation (\$M)	\$931	\$2,009	\$990

Source: Bureau of Labor Statistics, Employment Projections 2016-2026 (2019), Bureau of Labor Statistics, Employment and Wages from Occupational Employment Statistics (OES) survey 2018 (2019), Bureau of Labor Statistics Employment Projections 2016-2026 (2016)

For Scenario 1, the New Exemption Growth Scenario, it is estimated that Pennsylvania data centers will have 20,611 employees with salaries and benefits of around \$2 billion. For Scenario 2, the Status Quo Growth Scenario, it is estimated that Pennsylvania data centers will have 10,160 employees with salaries and benefits of just under \$1 billion.

4.3. Economic Impact of Two Growth Scenarios

These direct expenditures and associated employees’ salaries will generate indirect and induced impacts, which sum to the total economic output associated with the data centers in Pennsylvania. In addition, these direct, indirect, and induced expenditures will support additional employment and related earnings within Pennsylvania.

If Pennsylvania’s data center industry grows at the rate of the Revenue Department’s sales tax growth projection, the direct operating expenditures at data centers will generate an estimated \$12.6 billion in economic impact within Pennsylvania and support 65,000 employees with \$4.1 billion in earnings.

If Pennsylvania’s data center industry grows at the current national growth rate, the direct operating expenditures at data centers will generate an estimated \$6.2 billion in economic impact within Pennsylvania and support 32,000 employees with \$2.0 billion in earnings.

Figure 4:2 Economic Impact of Different Operation Scenarios

Impact of Operations	Existing Operations, 2019	Scenario 1: New Exemption Growth Scenario, 2024	Scenario 2: Status Quo Growth Scenario, 2024
Direct Output (\$M)	\$2,713	\$5,856	\$2,887
Indirect and Induced Output (\$M)	\$3,126	\$6,747	\$3,326
Total Output (\$M)	\$5,839	\$12,603	\$6,213
Annual Employment Supported	30,000	65,000	32,072
Employee Compensation (\$M)	\$1,913	\$4,128	\$2,035

Source: IMPLAN (2015)

Economic Impact of New Exemption Growth Scenario vs. Status Quo Growth Scenario

By 2024, when compared to the Status Quo Growth Scenario, the New Exemption Growth Scenario would have:

- Over 10,000 more employees in industry and over 33,000 more total jobs (direct, indirect, and induced)
- Over \$2 billion more in employee compensation
- Over \$6 billion more in total economic output

4.4. Operations Tax Impact of Growth Scenarios

For the New Exemption Growth Scenario, it is estimated that the future operations of existing PA data centers will generate \$26 million direct sales tax each year, and \$70 million direct tax in total including income tax and business tax. For the Status Quo Growth Scenario, it is estimated that the future operations of existing PA data centers will generate \$13 million direct sales tax each year, and \$34 million direct tax in total including income tax and business tax.

Figure 4:3 Tax Impact of Different Operation Scenarios (\$M)

Tax Type	Existing Operations, 2019			Scenario 1: New Exemption Growth Scenario, 2024			Scenario 2: Status Quo Growth Scenario, 2024		
	Direct Tax	Indirect and Induced Tax		Direct Tax	Indirect and Induced Tax		Direct Tax	Indirect and Induced Tax	
		Total Tax	Total Tax		Total Tax	Total Tax		Total Tax	
Income Tax Revenues	\$17	\$20	\$36	\$36	\$43	\$79	\$18	\$21	\$39
Sales Tax Revenues	\$12	\$21	\$33	\$26	\$45	\$70	\$13	\$22	\$35
Business Tax Revenues	\$4	\$7	\$10	\$8	\$14	\$22	\$4	\$7	\$11
Total Tax Revenues (\$M)	\$32	\$47	\$79	\$70	\$102	\$171	\$34	\$50	\$84

Source: IMPLAN (2015)

Estimating Operations Tax Impact of Potential Exemption

By 2024, when compared to the Status Quo Growth Scenario, the New Exemption Growth Scenario would result in:

- \$40 million more in total income tax revenue
- \$35 million more in sales tax revenues
- \$11 million more in business tax revenues

4.5. Total Tax Impact of Growth Scenarios

Using the growth rate projected by the PA DOR under the proposed tax exemption, we arrive at a projection of 7.6 million square feet of data centers in Pennsylvania in 2024. For this analysis, it is assumed that each year, 820,000 square feet of data center facility would be constructed to arrive at this total. We modeled the economic impact of the construction of 820,000 square feet of data center in PA based on the input shown in the table below. It's estimated that an 820,000-square-foot data center will need a one-time capital investment of around \$1.15 billion, including \$1 billion in construction of the base building and mechanical and electrical equipment and \$150 million in server and cabinet purchase. The spending of server and cabinet purchase is not included in the economic impact model but is addressed when calculating the direct tax generated by the total operation activity.

Figure 4:4 Input for Economic Impact Modeling for a Typical Data Center Construction

Construction Cost Estimates	Values	Modeled
Total Base Building Construction Cost	\$221,400,000	\$221,400,000
Total Mechanical and Electrical Equipment Cost	\$779,000,000	\$779,000,000
Construction Cost Before Cabinets and Servers	\$1,000,400,000	\$1,000,400,000
Total Server and Cabinet Cost	\$152,725,000	\$0
Total Cost	\$1,153,125,000	1,000,400,000

Source: US Chamber of Commerce Technology Engagement Center (2019), Uptime Institute (2019), Confidential (2019), Econsult Solutions (2019)

Construction will have a one-time economic impact within the commonwealth. It is estimated that the \$1 billion in modeled construction costs will yield a total, one-time economic impact of \$1.8 billion within Pennsylvania; supporting 11,900 direct, indirect, and induced jobs with \$550 million in earnings over the construction period.

Figure 4:5 Annual Economic Impact from Construction

Impact of Construction	820,000 sq. ft. of Data Center
Direct Output (\$M)	\$1,000
Indirect and Induced Output (\$M)	\$834
Total Output (\$M)	\$1,834
Annual Employment Supported	11,900
Employee Compensation (\$M)	\$550

Source: IMPLAN (2015)

The construction of 820,000 square feet of data center capacity will generate one-time tax revenues to the commonwealth. The tax revenues modeled include income, sales, and business taxes. In total, construction activity will generate approximately \$5.7 million in direct sales tax and \$27.4 million in one-time total tax revenues to the commonwealth from the direct, indirect and induced economic activity.

Figure 4:6 Annual Tax Revenue Impact from PA Data Center Construction

Tax Type	Direct Tax	Indirect and Induced Tax	Total Tax
Income Tax Revenues (\$M)	\$7.1	\$5.8	\$12.9
Sales Tax Revenues (\$M)	\$5.7	\$5.3	\$11.0
Business Tax Revenues (\$M)	\$1.8	\$1.7	\$3.5
Total Tax Revenues (\$M)	\$14.6	\$12.8	\$27.4

Source: IMPLAN (2015)

We assume that each year, 820,000 square feet of new data center capacity will be constructed annually from 2020-2024, and the purchase of the cabinet and server equipment will happen over a period of 10 years. The sales tax generated by adding new data center capacity is outlined in Figure 4:7. In 2024, the

construction of new data center capacity and the server purchase of the data centers construction since year 2020 will generate an annual sales tax of \$45.8 million.

Figure 4:7 Tax Estimates of Adding New Data Center Capacity

	2019	2020	2021	2022	2023	2024
New Data Center Capacity Added (sq. ft.)	0	820,000	820,000	820,000	820,000	820,000
Tax from New Data Center Capacity Added (\$M)	\$0	\$9.2	\$9.2	\$9.2	\$9.2	\$9.2
Tax from New Data Center Continuous Construction within 10 Yr Period (\$M)	\$0	\$0	\$9.2	\$18.3	\$27.5	\$36.7
Total Tax from Data Center Capacity Added (\$M)	\$0	\$9.2	\$18.3	\$27.5	\$36.7	\$45.8

Source: Uptime Institute (2019), Econsult Solutions (2019)

The total tax impact is the composition of the direct and indirect tax from the new data center construction activity, the sales tax from the data center cabinet and purchase, and direct and indirect tax from the existing data center operations. We project the tax impact year by year for the New Exemption Growth Scenario and the Status Quo Growth Scenario in Figures 4:8 and 4:9.

Figure 4:8 Total Tax (Income/Sales/Business Tax) Projection by Year for New Exemption Growth Scenario (\$M)

Year	Direct Total Tax from New Data Center Capacity	Direct Total Tax from Construction Activity	Indirect and Induced Total Tax from Construction Activity	Direct Total Tax from Operation	Indirect and Induced Total Tax from Operation	Tax Exemption	Net Tax Revenue
2019	\$0.0	\$0.0	\$0.0	\$32.3	\$47.1	\$5.0	\$74.4
2020	\$9.2	\$14.6	\$12.8	\$37.6	\$55.0	\$24.6	\$104.6
2021	\$18.3	\$14.6	\$12.8	\$43.9	\$64.1	\$31.8	\$121.9
2022	\$27.5	\$14.6	\$12.8	\$51.2	\$74.8	\$37.7	\$143.2
2023	\$36.7	\$14.6	\$12.8	\$59.7	\$87.2	\$44.8	\$166.2
2024	\$45.8	\$14.6	\$12.8	\$69.6	\$101.7	\$53.1	\$191.5

Source: IMPLAN (2015)

Figure 4:9 Total Tax (Income/Sales/Business Tax) Projection by Year for Status Quo Growth Scenario (\$M)

Year	Direct Total Tax from New Data Center Capacity	Direct Total Tax from Construction Activity	Indirect and Induced Total Tax from Construction Activity	Direct Total Tax from Operation	Indirect and Induced Total Tax from Operation	Tax Exemption	Net Tax Revenue
2019	\$0.0	\$0.0	\$0.0	\$32.3	\$47.1	\$5.0	\$74.4
2020	\$0.0	\$0.0	\$0.0	\$32.7	\$47.7	\$5.0	\$75.4
2021	\$0.0	\$0.0	\$0.0	\$33.1	\$48.3	\$5.0	\$76.4
2022	\$0.0	\$0.0	\$0.0	\$33.5	\$48.9	\$5.0	\$77.4
2023	\$0.0	\$0.0	\$0.0	\$33.9	\$49.5	\$5.0	\$78.4
2024	\$0.0	\$0.0	\$0.0	\$34.3	\$50.2	\$5.0	\$79.5

Source: IMPLAN (2015)

Under the New Exemption Growth Scenario, net tax revenue to the Commonwealth, after accounting for DOR projected exemption, would grow by over \$100 million - to over \$190 million by 2024. Under the Status Quo Growth Scenario, net tax revenue to the Commonwealth, after accounting for the current \$5 million annual refund exemption, would grow by \$5 million – to nearly \$80 million by 2024. By 2024, the New Exemption Growth Scenario would grow to over \$190 million (after accounting for the DOR projected exemption).

Tax Impact of New Exemption Growth Scenario

Combining construction and operations, under the New Exemption Growth Scenario, net tax revenue to the Commonwealth, after accounting for the DOR projected exemption, would grow to over \$190 million by 2024.

Tax Impact of Status Quo Growth Scenario

Under Status Quo Scenario, net tax revenue to the commonwealth, after accounting for current \$5 million annual refund exemption, would grow to nearly \$80 million by 2024.

We then calculated the total tax net difference between the two growth scenarios. In 2024, the New Exemption Growth Scenario would be expected to result in a net increase of over \$110 million in net tax revenues for the commonwealth.

Figure 4:10 Difference in Tax between New Exemption Growth Scenario and Status Quo Growth Scenario (\$M)

Year	Income Tax Net Difference	Sales Tax Net Difference	Business Tax Net Difference	Total Tax Net Difference
2019	\$0.0	\$0.0	\$0.0	\$0.0
2020	\$18.5	\$5.6	\$5.1	\$29.2
2021	\$25.1	\$13.4	\$7.0	\$45.5
2022	\$32.9	\$23.6	\$9.2	\$65.8
2023	\$42.1	\$33.9	\$11.8	\$87.8
2024	\$52.9	\$44.3	\$14.8	\$112.0

Source: IMPLAN (2015)

Difference in Tax Revenues between New Exemption Growth Scenario and Status Quo

In 2024, if the growth assumed under the New Exemption Growth Scenario occurs, the *state would gain over \$110 million in net tax revenues for the commonwealth* over what would be expected under the Status Quo Growth Scenario.

5. Additional Benefits of Data Centers in PA

5.1. Local Fiscal Impact

Data centers generate significant property and income tax revenues for state and local governments.³⁸ Revenue streams include personal income taxes from construction and permanent jobs, real estate taxes on newly constructed and renovated buildings, as well as property taxes.³⁹ Data Centers present interesting opportunities to municipalities in that they can occupy abandoned commercial and manufacturing sites. The re-use of these sites or taking otherwise vacant sites and turning them into a more productive use, can substantially add to local real estate tax bases. While adding significantly to local tax revenues, data centers do not create a strain on school districts, as data centers do not bring large numbers of school children to a district the way new housing developments do. Therefore, data centers can bring positive fiscal impacts to both municipalities and school districts.

There have been reports that state and local economic development officials and utility providers have been approached by several companies interested in building hyperscale data centers in Pennsylvania. Hyperscale data centers tend to serve large cloud platforms like Google, Facebook, and Amazon that require an unprecedented amount of data center capacity to support their growth. On average, the scale of these data centers is measured in the tens of thousands of servers.⁴⁰ As their name indicates, these hyperscale data centers require large amounts of space and large infrastructure and construction investments. These hyperscale data center projects in particular can substantially increase the tax base in regions while not placing a strain on local services like schools, police, roads, and fire departments.

5.2. Importer of Company Activity to the Commonwealth

Indirect and Induced Job Support

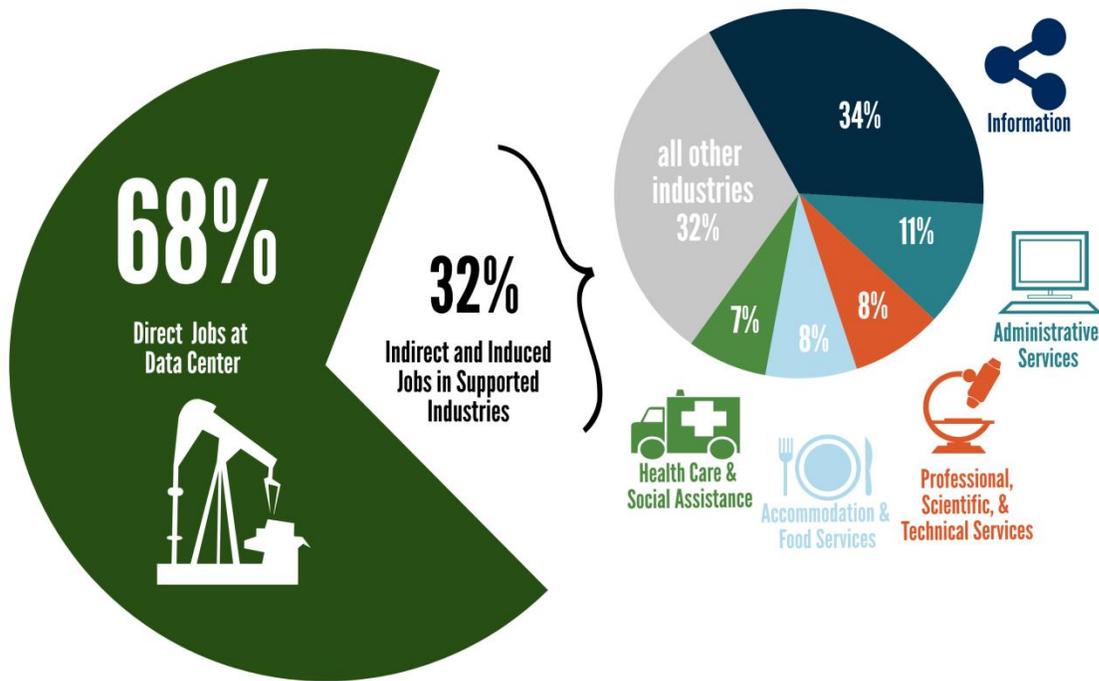
Under the New Exemption Growth Scenario – considering the direct, indirect, and induced impacts – the data center industry will support 65,000 employees with \$4.1 billion in earnings in 2024 (See Figure 4:2). 68 percent of the jobs are direct jobs from data center operations, while 32 percent of the jobs are indirect and induced jobs in supported industries. While the largest number of jobs supported will fall within the Information industry, a significant portion of the employment impact occurs across a range of industries. Direct, indirect, and induced jobs are supported in Administrative Services; Professional, Scientific, and Technical Services; Accommodation and Food Services; and Health Care and Social Assistance. Figures 5:1 and 5:2 demonstrate the direct, indirect, and induced employment impact under the New Exemption Growth Scenario in 2024.

³⁸ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 8

³⁹ John Lenio, "The Mystery Impact of Data Centers on Local Economies Revealed," *Area Development*, 2015, <https://www.areadevelopment.com/data-centers/Data-Centers-Q1-2015/impact-of-data-center-development-locally-2262766.shtml>

⁴⁰ Yevgeniy Sverdlik, "Research: There are Now Close to 400 Hyper-Scale Data Centers in the World," *Data Center Knowledge*, December 22, 2017, <https://www.datacenterknowledge.com/cloud/research-there-are-now-close-400-hyper-scale-data-centers-world>

Figure 5:1 Top Industries of Employment Generated by Data Center Operations



Source: IMPLAN (2015); Piktochart(2019)

Figure 5:2 Top Ten Industries of Employment Generated by Data Center Operations

Industry	Direct, Indirect, and Induced FTEs	Employment Impact (%)
Information	21,864	33.6%
Administrative and Support and Waste Management and Remediation Services	7,467	11.5%
Professional, Scientific, and Technical Services	5,162	7.9%
Accommodation and Food Services	5,007	7.7%
Health Care and Social Assistance	4,725	7.3%
Other Services (except Public Administration)	3,306	5.1%
Finance and Insurance	2,486	3.8%
Retail Trade	2,238	3.4%
Real Estate and Rental and Leasing	2,133	3.3%
Transportation and Warehousing	1,856	2.9%

Source: IMPLAN (2015)

High-Wage Jobs

The type of employment that the data center industry supports makes the industry compelling for states seeking to propel economic development. Data centers are a high performance industry and states that have successfully attracted data centers, like Virginia, have seen both employment and wage growth. In Virginia, from 2011 to 2016, data centers experienced employment and wage growth that was four times the average across all private sector industries in the commonwealth.⁴¹ In 2016, the data center industry in VA paid a statewide average private sector weekly wage of \$2,336 which is more than double the statewide average of \$1,044 across all private sector industries.⁴² Based on data from BLS outlined earlier in this report in Figure 2:1, we calculated that the average annual employee wage in the data center industry in Pennsylvania in 2018 was \$83,626. This is substantially higher than the average private sector employee wage across industries in the commonwealth, which was \$53,672 in 2017.⁴³ Under the New Exemption Growth scenario, as outlined in Figure 4:1, the average annual employee wage in the data center industry in PA would grow to \$97,472 by 2024.

A Pipeline for Economic Activity in Related Industries

Data centers invest resources in training local workers and this pool of local, skilled workers gives communities an advantage in attracting future economic activity. Human capital is a critical need for the technology industry, and consequently, businesses with similar workforce requirements tend to cluster together to take advantage of a common pool of skilled workers.⁴⁴ In Ohio, Central Washington, and Virginia, this trend has already been observed.⁴⁵ In Northern Virginia, a region that has become a data center hub, industries related to the Data Processing, Hosting, and Related Services Industry have an employment footprint that is substantially larger than what one would expect based on statewide norms.⁴⁶ These jobs in related industries that overlap with key occupations in the Data Processing, Hosting, and Related Services Industry also tend to be high-wage jobs.⁴⁷ In Virginia, the industries that most heavily draw from the same pool of skilled workers as the Data Processing, Hosting, and Related Services Industry pay wages that range from 136 to 236 percent above the VA average private sector wage.⁴⁸

Data centers tend to group together geographically and the building of a data center can create a pipeline of construction - for new data centers that want to locate close to existing infrastructure and for the future expansion of existing data centers. This trend has been observed in Oregon, where there is no sales tax and data centers are offered exemptions on property taxes. Google built its first corporate data center in Dalles, Oregon in 2006 and then in 2016, acquired another 74 acres of land in order to expand the data center. Google's investment in the expansion is estimated to be approximately \$600

⁴¹ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia* (Mangum Economics: 2018), 22

⁴² Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, 22

⁴³ Bureau of Labor Statistics, *Employment and Wages from Occupational Employment Statistics (OES) survey 2007-2017 (2019)*

⁴⁴ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, 28

⁴⁵ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 14

⁴⁶ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, 31

⁴⁷ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, 29

⁴⁸ Mangum Economics, *The Economic and Fiscal Contribution that Data Centers Make to Virginia*, 30

million which will bring its total investments in data centers in the area to \$1.8 billion.⁴⁹ In Pineville, Oregon, Facebook and Apple data centers have brought over \$1 billion in investments and have helped the local economy to diversify.⁵⁰ Economic activity in other states demonstrates the potential for tax incentives to bring a long-term pipeline of economic activity to the commonwealth, in both the data center and related industries.

A Potential Solution to Pennsylvania's Broadband Problem

The construction of data centers may present an opportunity for Pennsylvania to expand broadband access across the commonwealth. Major service providers, Facebook in particular, have accompanied data center construction with investments in new fiber infrastructure to connect facilities to the global network.⁵¹ Facebook is now selling excess bandwidth along these fiber routes to local and regional carriers who can build local networks connected to the routes and sell high-speed internet access to local homes and businesses.⁵² When Iron Mountain built out its data center in Butler County, PA, it funded the installation of fiber from Pittsburgh to its facility and allowed its communications vendor to lay additional fiber for sale to others.⁵³

These improvements in local network infrastructure and the potential to widen access to high-speed internet connections could be hugely beneficial to rural regions of the commonwealth. A recent study conducted by Pennsylvania State University researchers found that there is a severe lack of connectivity to high-speed broadband in much of Pennsylvania. The study estimates that nearly 11 million people across the state lack access to a broadband connection that meets the FCC's definition of "high-speed."⁵⁴ Wider access to high-speed internet could support local economic activity and diminish barriers for rural Pennsylvanians in terms of telemedicine, online education and job training, and telecommuting jobs.^{55 56}

5.3. Intersecting with PA's Energy Producers

The proposed legislation would incentivize data centers to set up across the commonwealth, creating the opportunity for Pennsylvania energy producers and data center owners to build mutually beneficial relationships and implement improvements that would have positive spillover effects.

⁴⁹ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 14

⁵⁰ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 14

⁵¹ Yevgeniy Sverdlik, "Facebook to Sell Bandwidth on Its New Inter-Data Center Fiber Routes," *Data Center Knowledge*, March 6, 2019, <https://www.datacenterknowledge.com/facebook/facebook-sell-bandwidth-its-new-inter-data-center-fiber-routes>

⁵² Sverdlik, "Facebook to Sell Bandwidth on Its New Inter-Data Center Fiber Routes"

⁵³ Per discussion with Iron Mountain executives

⁵⁴ Min Xian, "Penn State study says most of Pa. lacks access to high-speed broadband," *Witf*, December 5, 2018,

<https://www.witf.org/news/2018/12/penn-state-study-says-most-of-pa-lacks-access-to-high-speed-broadband.php>

⁵⁵ Sarah Paez and Lauren Muthler, "More than an inconvenience, PA's broadband crisis affects education, medicine, and more," *Centre Daily Times*, April 10, 2019, <https://www.centredaily.com/news/local/article228780844.html>

⁵⁶ "Data Center & High Speed Internet Infrastructure," *DeepWater Desal Monterrey Bay Regional Water Project*, <https://www.deepwaterdesal.com/data-center-and-high-speed-internet-infrastructure.htm>

Mutually Beneficial Partnerships between Energy Providers and Data Centers

In terms of operating costs, the largest expenditure for data centers is power – to power both the running of IT equipment and to maintain a climate-controlled interior.⁵⁷ Depending on the data center tier, energy source, and region, power expenditures tend to constitute between 40 and 80 percent of the overall cost of operation for a data center.⁵⁸ Data centers can benefit from PA’s deregulated electric market that allows local energy producers to vie for supplying data centers at competitive prices.

Partnering with Rural Providers to Improve Infrastructure

The proposed legislation would likely incentivize data center construction in rural regions of the commonwealth where data centers would require infrastructure improvements to ensure access to consistent and reliable energy sources. There is thus a high likelihood that Pennsylvania energy providers, like rural electrical coops, would work with data centers to improve electrical grids and their resiliency. Given their high usage of energy, data centers have focused resources on innovating to improve energy efficiency. These infrastructure improvements and innovations would have positive spillover effects for local businesses and constituents.

Utilizing Decommissioned or Underutilized Sub-Stations

Another potential intersection of data centers and energy producers in PA is the potential location of data centers at or near decommissioned or underutilized sub-stations. With the infrastructure already available for the data center, municipalities can actively market these sites to data centers. In addition, data centers can induce the upgrade and/or capacity increase of sub-stations to make sure the energy needs of the data center and any other nearby local users are met through the local energy distribution network.

Investments in Renewable Energy in PA

The data center industry also presents an opportunity for Pennsylvania to attract innovation and investments in renewable energy. Data center owners have worked actively with local utility and energy companies across the U.S. to develop and purchase clean and renewable energy. Major service providers like Google and Facebook have been leaders in innovating and seeking local wind, solar, and micro-hydro resources to power their operations.⁵⁹ These industry leaders forged the path for energy innovation at data centers and shared their strategies and processes, making it more accessible for data center owners and operators of all sizes to source renewable energy.⁶⁰

The proposed incentive would likely attract data center investments from companies who are committed to powering their centers with some portfolio of renewable energy sources, creating opportunity for local renewable energy companies. For example, Iron Mountain Incorporated – a storage and information management company – signed a 15-year wind power purchase agreement in

⁵⁷ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 8

⁵⁸ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 8

⁵⁹ US Chamber of Commerce Technology Engagement Center, *Data Centers Jobs and Opportunities in Communities Nationwide*, 15

⁶⁰ Voices of the Industry, “The Story of Renewable Energy in the Data Center Industry,” *Data Center Frontier*, April 23, 2018, <https://datacenterfrontier.com/renewable-energy-data-center-industry/>

2016 in which it committed to purchasing two-thirds of the power produced by a Pennsylvania wind turbine farm in Ringer Hill.⁶¹ Over the 15-year period, the company's wind power purchase will exchange 30 percent of its North American electricity footprint with renewable energy.⁶² This commitment to renewables is in line with Governor Wolf's administration's stance, as outlined in Executive Order: 2019-01 – Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance. The executive order contains climate goals for the commonwealth, including achieving a 26 percent reduction of net greenhouse gas emissions statewide by 2025 from 2005 levels and an 80 percent reduction of net greenhouse gas emissions by 2050 from 2005 levels.⁶³

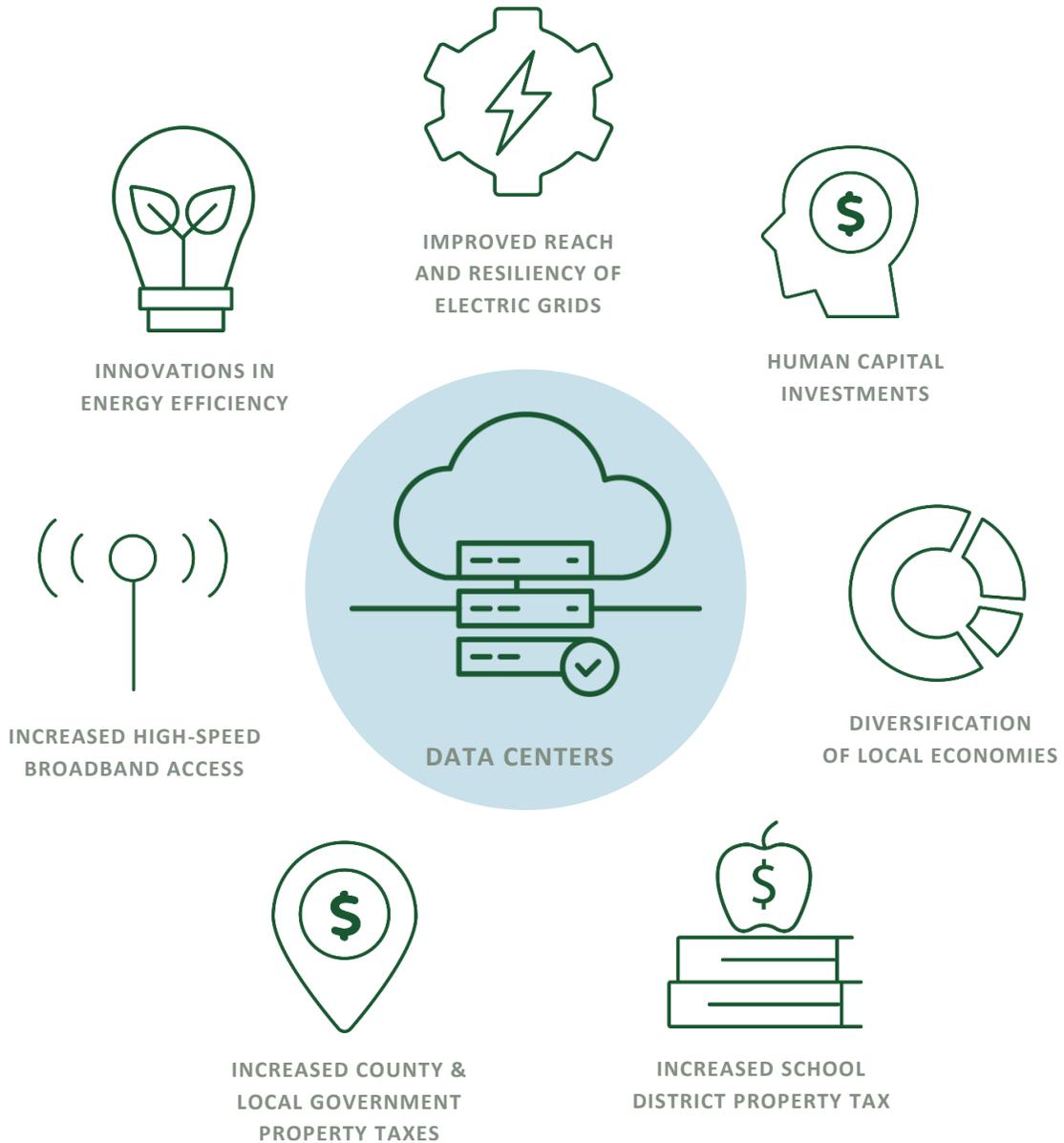
⁶¹ "New Wind Power Agreement Enables Iron Mountain to Exchange 30 Percent of North American Electricity Use With Renewable Energy, *Iron Mountain*, March 15, 2016, <https://www.ironmountain.com/about-us/news-events/news-categories/press-releases/2016/march/new-wind-power-agreement-enables-iron-mountain>

⁶² "New Wind Power Agreement Enables Iron Mountain to Exchange 30 Percent of North American Electricity Use With Renewable Energy, *Iron Mountain*

⁶³ Executive Order: 2019-01 – Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance, <https://www.governor.pa.gov/newsroom/executive-order-2019-01-commonwealth-leadership-in-addressing-climate-change-and-promoting-energy-conservation-and-sustainable-governance/>

SPILLOVER BENEFITS OF DATA CENTERS IN PA

Beyond economic and revenue impact, data centers could bring the following spillover benefits to local communities and constituents in the commonwealth.



6. Conclusion

6.1. The Bottom Line

Based on the models presented in this report, by 2024, as compared to the Status Quo Growth Scenario, under the New Exemption Growth Scenario, PA would gain:

- Over 33,000 more total jobs, including 10,000 more jobs in the sector
- Over \$6 billion more in total output
- Over \$2 billion more in total wages
- Over \$110 million more in net tax revenues in FY 24, even after the tax exemption

Given these estimates, even a much smaller growth rate of the industry or construction of new centers would result in a net positive revenue position for the state, along with employment and spending growth.

6.2. Industry Leaders Investing in States with Tax Incentives

As outlined in Section 1.2, data center investments follow tax incentives. Recent data center location and investment decisions by the major service providers in the technology industry in the U.S. highlight this trend – large investments in data centers are being made overwhelmingly in states that offer tax incentives to owners and operators. Apple, for example, announced in 2018 that it would invest \$10 billion in US data center construction over the next five years.⁶⁴ Apple will expand its data centers in North Carolina, Arizona, and Nevada (all states with tax incentives for data centers) and will build new centers in Iowa and Texas (also states offering tax incentives for data centers).

Similarly, Microsoft announced in 2019 the planned expansion of their data center in Boydton, Virginia, where Microsoft will receive sales and use tax exemptions.⁶⁵ Since 2016, Microsoft has also made sizeable investments in data center construction or expansion in Washington, Wyoming, and Iowa, all states where the company receives tax incentives.^{66 67 68}

⁶⁴ Yevgeniy Sverdlik, "Apple to Spend \$10B on US Data Center Construction Over Five Years," *Data Center Knowledge*, December 14, 2018, <https://www.datacenterknowledge.com/apple/apple-spend-10b-us-data-center-construction-over-five-years>

⁶⁵ Yevgeniy Sverdlik, "Microsoft Is Expanding Its Virginia Data Center Footprint, But Not in Ashburn," *Data Center Knowledge*, January 10, 2019, <https://www.datacenterknowledge.com/microsoft/microsoft-expanding-its-virginia-data-center-footprint-not-ashburn>

⁶⁶ Matthew Patane, "West Des Moines' data center will be Microsoft's 'largest' in U.S.," *Des Moines Register*, July 22, 2016, <https://www.desmoinesregister.com/story/tech/2016/07/22/new-west-des-moines-data-center-gets-475m-incentives/87406160/>

⁶⁷ "Wyoming: Microsoft Expansion Of Cheyenne Data Center Underway," *Business Facilities*, October 8, 2018, <https://businessfacilities.com/2018/10/wyoming-microsoft-expansion-cheyenne-data-center-underway/>

⁶⁸ Christine Hall, "Generator Permit Indicates Microsoft Plans Big Quincy Data Center Expansion," *Data Center Knowledge*, Aug 03, 2018, <https://www.datacenterknowledge.com/microsoft/generator-permit-indicates-microsoft-plans-big-quincy-data-center-expansion>

Google's recent announcements follow suit; the company announced in 2018 it would make an investment of \$2.5 billion in 5 new or expanded data centers in Alabama, Oregon, Tennessee, Virginia, and Oklahoma (all states that offer tax incentives).^{69 70}

6.3. Potential Lost Economic Opportunity in Pennsylvania

The approval of the proposed sales and use tax exemption would make Pennsylvania a very attractive location for data center investment. If the proposed legislation is passed, Pennsylvania should see a marked increase in the number and size of data centers across the commonwealth. Pennsylvania has many attributes that data center owners seek in their location decisions. Compared to other states, Pennsylvania has relatively low-cost energy given the potential to draw from its vast energy resources. Additionally, land costs outside of the metropolitans in the state are relatively affordable. Pennsylvania has a moderate climate which is ideal for data center operation and the commonwealth's location between the financial and government centers of the U.S. puts it in a prime position to host data centers. The commonwealth is home to large data users like large businesses and university research communities. PA's high-caliber colleges and universities provide a strong pool of local talent for the industry. Pennsylvania has many attributes that make it a compelling location for data center investment, however, with the substantial tax breaks data centers receive in other states, the current tax structure for data centers makes Pennsylvania uncompetitive.

⁶⁹ Sundar Pichai, "New and expanding locations across America," *The Keyword*, February 16, 2018, <https://www.blog.google/inside-google/company-announcements/new-and-expanding-locations-across-america/>