The Economic & Fiscal Impact of a Data Center Development in Frederick County

October 2023

MARYLAND TECH COUNCIL
ADVANCING LIFE SCIENCES AND TECHNOLOGY

SAGE | policy group

Executive Summary

The Maryland Tech Council hired Sage Policy Group, Inc. to estimate economic and fiscal impacts associated with Quantum Frederick, a data center development slated to occur on a 2,164 acre property in Frederick County, MD. Total investment will approach $30 billion over an anticipated span of approximately 15 years.

FISCAL IMPACTS

Construction of Quantum Frederick will support $25.8 million in tax revenues for Frederick County and another $248 million for the state. Upon full build out, steady-state operations will support an estimated $41 million in revenues for Frederick County each year, which translates into approximately 3.8 percent of the County's FY 2022 revenues. Another $197 million will be generated for the State of Maryland each year.

Construction Phase and Operational Fiscal Impacts

Tax Category (Millions $2023)	Construction Phase (Duration of construction)	Operating Phase (Ongoing, Annual)
Frederick County		
Income	$24.4	$3.2
Real Property	-	$37.7
Recordation	$1.4	-
Total	**$25.8**	**$40.9**
State of Maryland		
Sales (other than electricity)	$153.0	$23.9
Electricity (sales & franchise)	-	$154.3
Income	$93.7	$14.7
Real Property	-	$4.0
Transfer	$0.5	-
Total	**$247.19**	**$196.9**

ECONOMIC IMPACTS

Construction Phase Economic Impacts (2023-2038)

Direct & Secondary Impacts	Jobs	Labor Income (Millions $2023)	Economic Output (Millions $2023)
Frederick County	**48,282**	**$3,127.1**	**$10,453.6**
Remainder of Maryland	**4,043**	**$254.2**	**$1,222.9**
Statewide Total	**52,325**	**$3,381.3**	**$11,676.5**

Over the duration of the construction phase, the development will support more than 52,000 statewide jobs and $3.4 billion in associated employee compensation, the majority of which will occur in Frederick County.

Once development is complete, Quantum Frederick's operations will support approximately 1,700 jobs located directly at the facility. Including multiplier effects, more than 8,000 jobs will be supported directly and indirectly across the entirety of the state. In total, the facility's operations will support more than $516 million in employee compensation and $2 billion in economic activity each year.

Operational Economic Impacts, Full Build Out

Annual, Ongoing	Jobs	Labor Income (Millions $2023)	Economic Output (Millions $2023)
Frederick County			
Direct effects	1,708	$162.8	$1,077.3
Indirect effects	3,530	$184.3	$475.6
Induced effects	1,088	$47.0	$154.4
Total	**6,326**	**$394.1**	**$1,707.3**
Remainder of Maryland			
Indirect effects	1,022	$84.6	$222.7
Induced effects	683	$38.2	$114.2
Total	**1,705**	**$122.8**	**$336.9**
Statewide			
Total	**8,032**	**$516.9**	**$2,044.2**

CONCLUSION

This report uses extremely conservative assumptions about the Quantum Frederick development. If the development proceeds as planned, realized benefits are likely to be larger than those outlined in this analysis. Beyond the quantified impacts, agglomeration effects—a clustering of firms operating within the data center supply-chain or adjacent industries—are likely to arise in response to a development of this size, further augmenting the state's economy. This is exactly the scale of investment that was envisioned when Maryland passed a law exempting data center personal property from the sales and use tax in 2020.

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Introduction

NATURE OF THE ENDEAVOR

The Maryland Tech Council hired Sage Policy Group, Inc. (Sage) to estimate the economic and fiscal impacts associated with Quantum Frederick, a 2,164 acre data center development slated to occur in Frederick County, Maryland. This analysis measures the jobs, employee compensation, economic activity, and tax revenues that will be supported by the nearly $30 billion investment required to build the facility and the steady state operations that will occur once the facility becomes fully operational during the late 2030s.

THE CONSTRUCTION PHASE

Quantum Frederick's powered base-building—the foundation, walls, roof, common areas, etc.—is expected to total approximately 16 million square feet. Based on conversations with the developer, construction costs related to the core and shell of the facility are estimated at $125 per square foot in this analysis, meaning total building costs excluding personal property are estimated to be approximately $2 billion.

Based on publicly available data and previous Sage studies of data center developments, this is an extremely conservative cost estimate. The commercial real estate firm JLL, for instance, estimates the costs of data center core and shell construction at $125-$200 per square foot.[1] A 2017 report from the U.S. Chamber of Commerce estimated the costs at approximately $275 per square foot.[2] A report from Microsoft and Forrester estimates these costs at roughly $200 per square foot.[3]

Importantly, those estimates were all published before the rapid inflation that has occurred over the past two-plus years. With construction input costs up nearly 40 percent since February 2020, data center construction costs per square foot are now likely to be significantly higher than the $125-$275 range estimated by those sources.[4] Accordingly, realized impacts from the construction phase of this development are likely to be larger than those estimated in this report.

Note that these costs only pertain to the powered shell and not the internal infrastructure of the data center. While this report does not consider the value of that personal property—Frederick County

[1] Kerry Hawkins and Michael Restivo. "Data centers: expensive to build, but worth every penny." JLL. Accessed August 26, 2023. https://www.us.jll.com/en/views/data-centers-expensive-to-build-but-worth-every-penny#:~:text=The%20average%2Dpowered%20base%20building,of%20%24200%20per%20square%20foot

[2] Tim Day and Nam D. Pham. "Data Centers: Jobs and Opportunities in Communities Nationwide." U.S. Chamber of Commerce Technology Engagement Center. 2017. Accessed August 26, 2023. https://www.uschamber.com/assets/archived/images/ctec_datacenterrpt_lowres.pdf

[3] Jamie Angara. "The Key to Reducing Data Center Construction Costs." AKCP. June 2022. Accessed August 26, 2023. https://www.akcp.com/blog/the-key-to-reducing-data-center-construction-costs/

[4] U.S. Bureau of Labor Statistics, Producer Price Index for inputs to construction industries, Goods. Prices, as measured by the index, increased 38.3% between February 2020 and July 2023.

does not levy a personal property tax—total investment including equipment is likely to exceed $25 billion.

This development will also include a 43-mile fiber optic ring—the largest ever constructed—that will run from Leesburg to southern Frederick County. That infrastructure investment, which began in 2022 and is expected to be complete in 2024, represents an investment of approximately $125 million, about 60 percent of which will occur in Maryland. Because it is unclear what portion of that investment will occur specifically in Frederick County, this report does not endeavor to quantify the jobs, labor income, and economy activity supported by that activity.

THE OPERATING PHASE

Once operational, Quantum Frederick will support approximately 1,700 jobs each year. This parameter is derived from conversations with the developer and is based on the typical ratio between employment and a data center's size. Wages for these jobs will range from roughly $50,000 per year for security-related positions to upwards of $200,000 per year for senior level engineering-related positions. Data center staffing varies significantly based on different uses. This analysis estimates annual per employee wages at approximately $65,000 per annum for the operating phase in order to ensure that impacts are not overstated.

Because of the size and scale of the scale of the project, portions of the development will become operational while the construction phase is still ongoing. For study purposes, an estimated 8 percent of the development will be completed and become operational each year beginning in 2026 with an expected completion in approximately 2038.

ANALYTICAL METHODS

Sage used IMPLAN economic modeling software, an industry-standard platform for input-output analysis, to produce estimates of the jobs, labor income, and economic activity supported by the construction phase (impacts that occur once over the duration of construction) and upon full build out (annual, ongoing impacts). This analysis uses multiregional input-output analysis, a technique that allows direct impacts to be confined to Frederick County while also capturing secondary impacts that occur across the balance of Maryland.

Additional information regarding IMPLAN and how to interpret economic impact results can be found in Appendix A on page 13 of this report. Fiscal impact estimates put forth in this analysis are based upon official State and local tax rates, effective tax rates calculated using publicly available data from the Office of the Maryland Comptroller and the U.S. Census Bureau, economic models created by Sage using regionally specific multipliers from IMPLAN, and development-specific parameters supplied to Sage by the prospective developer.

Economic Impacts

CONSTRUCTION PHASE ECONOMIC IMPACTS

The construction phase of Quantum Frederick will support upwards of 48,000 jobs—with a job defined as one full- or part-time position that lasts for one year—in Frederick County from 2023 through 2037, or approximately 3,000 jobs/year. Once multiplier effects are considered, those jobs will be associated with more than $3.1 billion in labor income, which includes benefits and other forms of compensation, and more than $10 billion in economic activity (augmented transactional volume).

Exhibit 1: Construction Phase Total Economic Impacts (2023-2038)

	Jobs	Labor Income (Millions $2023)	Economic Output (Millions $2023)
Frederick County			
Direct effects	35,542	$2,472.3	$7,215.0
Indirect effects	4,151	$283.7	$1,296.4
Induced effects	8,590	$371.1	$1,942.2
Total	**48,282**	**$3,127.1**	**$10,453.6**
Remainder of Maryland			
Indirect effects	1,415	$107.1	$522.2
Induced effects	2,628	$147.1	$700.8
Total	**4,043**	**$254.2**	**$1,222.9**
Statewide			
Total	**52,325**	**$3,381.3**	**$11,676.5**

Source: Sage, IMPLAN *Totals may not add due to rounding

While the direct impacts will be confined to Frederick County since this model defines a job based on where the work occurs regardless of where the employee performing the work resides, the construction phase of Quantum Frederick will also support significant impacts across Maryland's other jurisdictions. Including those secondary effects that will occur across the remainder of the state, the development will support more than 52,000 jobs and $3.4 billion in statewide employee compensation over the duration of construction.

OPERATING PHASE ECONOMIC IMPACTS, FULL BUILD OUT

Once the construction phase is complete and steady-state operations are established, Quantum Frederick will support a set of annual, ongoing economic impacts that will persist for as long as the facility is operational. In Frederick County, Quantum Frederick will directly employ more than 1,700 workers. Those workers will earn approximately $163 million in annual labor income, which includes benefits and other forms of compensation.

Data centers generate larger secondary economic impacts than virtually any other industry. This is supply chain-intensive activity. Accordingly, the fully operational facility will support more than 4,600 secondary jobs each year in Frederick County. Put another way, for every one job supported at the data center itself, there will be approximately 2.7 additional jobs supported through indirect (augmented business-to-business spending) and induced (augmented consumer-to-business spending) effects.[5]

Exhibit 2: Operational Economic Impacts, Full Build Out

Annual, Ongoing	Jobs	Labor Income (Millions $2023)	Economic Output (Millions $2023)
Frederick County			
Direct effects	1,708	$162.8	$1,077.3
Indirect effects	3,530	$184.3	$475.6
Induced effects	1,088	$47.0	$154.4
Total	**6,326**	**$394.1**	**$1,707.3**
Remainder of Maryland			
Indirect effects	1,022	$84.6	$222.7
Induced effects	683	$38.2	$114.2
Total	**1,705**	**$122.8**	**$336.9**
Statewide			
Total	**8,032**	**$516.9**	**$2,044.2**

Source: Sage, IMPLAN *Totals may not add due to rounding

As was the case with the construction phase, there will be additional secondary impacts supported across the balance of Maryland. These include 1,700 jobs, more than $122 million in employee compensation, and more than $330 million in augmented economic activity.

Including secondary impacts, Quantum Frederick will support more than 8,000 jobs each year across Maryland, or approximately 0.3% of the state's current employment base. Those jobs, some of which are part-time in nature, will earn an average of $65,000 in labor income per annum.

[5] Note that this model includes security personnel within the direct impacts, though sometimes security is contracted out to a secondary firm. When that occurs, the average direct wage is significantly higher, and the employment multiplier rises to approximately 4 secondary positions supported per direct job.

ECONOMIC IMPACTS BY YEAR

Initial impacts, related solely to construction, will begin to be realized in 2023 as the Quantum Frederick development begins to ramp up. Operational impacts will start to occur once the first 8 percent of capacity comes online in 2026. These impacts are modeled as expanding linearly each year until full operational capacity is achieved—and construction is finished—in 2038. At that point, there will no longer be impacts related to construction.

Exhibit 3: Annual Impacts, Statewide, Operations and Construction, 2023-2038

	Construction Jobs	Operational Jobs	Labor Income (Millions $2023)	Economic Output (Millions $2023)
			Statewide Impacts	
2023	966	-	$62.5	$209.1
2024	1,931	-	$125.1	$418.1
2025	2,897	-	$187.6	$627.2
2026	3,380	643	$260.3	$895.3
2027	3,380	1,285	$301.6	$1,058.8
2028	3,380	1,928	$343.0	$1,222.4
2029	3,380	2,570	$384.3	$1,385.9
2030	3,380	3,213	$425.7	$1,549.4
2031	3,380	3,855	$467.0	$1,713.0
2032	3,380	4,498	$508.4	$1,876.5
2033	3,380	5,140	$549.7	$2,040.1
2034	3,380	5,783	$591.1	$2,203.6
2035	3,380	6,425	$632.4	$2,367.1
2036	3,380	7,068	$673.8	$2,530.7
2037	2,897	7,710	$683.9	$2,589.7
2038	2,414	8,032	$673.3	$2,566.9
Annual, Ongoing	**-**	**8,032**	**$516.9**	**$2,044.2**

Source: Sage, IMPLAN

Fiscal Impacts

CONSTRUCTION PHASE IMPACTS

Construction of Quantum Frederick, which will last for approximately 15 years, will generate new revenue streams for Frederick County and the State of Maryland. Construction phase impacts quantified in this report include transfer and recordation tax revenues as well as income tax collections associated with the wages of direct and secondarily supported employees. The following table supplies comprehensive construction phase fiscal impact estimates, which include more than $25 million for Frederick County and nearly $250 million for the State. Additional detail regarding distinct categories of fiscal impacts is provided below.

Exhibit 4: Construction Phase Fiscal Impacts

Tax Category	Revenues (Millions $2023)
Frederick County	
Income	$24.4
Recordation	$1.4
Total	**$25.8**
State of Maryland	
Sales	$153.0
Income	$93.7
Transfer	$0.5
Total	**$247.19**

Source: Sage

This analysis does not endeavor to estimate permitting fees to be paid to Frederick County as a result of development. While those fees will likely represent tens of millions of dollars in revenues for Frederick County over the duration of construction, there are too many uncertainties at this juncture to provide an accurate assessment.

TRANSFER & RECORDATION TAXES

Frederick County charges a recordation tax of $7.00 per $500 of consideration (1.4%), while the State charges a transfer tax of 0.5 percent. When the property was purchased for $100 million in 2022, roughly $1.4 million in Frederick County recordation taxes and $500,000 in State of Maryland transfer taxes were paid.

CONSTRUCTION-RELATED INCOME TAXES

Compensation presented in the economic impact section of this report encompasses wages and benefits. According to the U.S. Bureau of Labor Statistics, wages account for 67.1 percent of private construction compensation (the only portion of compensation subject to income tax). Accordingly,

construction will support approximately $2.3 billion in taxable income among Maryland residents (including secondary effects). Based on an estimated effective State income tax rate of 4.1 percent for state residents—calculated using data from Maryland's FY 2022 Comprehensive Annual Financial Report—construction will support $94 million in State income tax collections during development.

Some construction jobs will be held by residents of other states. Moreover, not every job held by a Marylander will be held by a Frederick County resident. Based on inflow/outflow data from the U.S. Census Bureau, 45.4 percent of jobs in Frederick County are filled by Frederick County residents. Using that parameter and an estimated effective local income tax rate of 2.6 percent, Sage estimates that the construction phase will support $24 million in income tax revenue for Frederick County.

CONSTRUCTION-RELATED SALES TAXES

To determine the sales tax impact of the construction phase, this study uses the same custom IMPLAN model used to produce economic impacts. Servers, which represent a significant portion of the overall capital expenditure associated with this development, are exempt from Maryland sales and use taxes. Based on Sage's modeling, the construction phase will support $153 million in sales taxes—including those related to secondary purchasing—over the period of development.

OPERATIONAL IMPACTS AT FULL BUILD OUT

Once Quantum Frederick is complete, steady-state operations will support annual, ongoing tax revenues at both the state and local level including income taxes, real property taxes, sales taxes, and franchise taxes on electricity usage. The development will produce an estimated $41 million for Frederick County each year, or approximately 3.8 percent of the County's FY 2022 revenues, and $197 million for the state. Additional detail regarding distinct categories of fiscal impacts is provided below.

Exhibit 5: Total Ongoing, Annual Fiscal Impacts

Tax Category	Revenues (Millions $2023)
Frederick County	
Real Property	$37.7
Income	$3.2
Total	**$40.9**
State of Maryland	
Electricity (sales & franchise)	$154.3
Sales (other than electricity)	$23.9
Income	$14.7
Real Property	$4.0
Total	**$196.9**

Source: Sage

INCOME TAXES

Once operational, Quantum Frederick will support an estimated $517 million in statewide employee compensation. In order to determine the income tax paid on that total, the figure first must be adjusted to include only wages, which on average represent 69.0 percent of total compensation. Based on that parameter and an effective state level tax rate of 4.1 percent, the development will support an estimated $14.7 million in State-level income tax revenues each year once steady-state operations are achieved.

At full build out the jobs supported in Frederick County will support an estimated $394 million in total labor income. After adjusting that figure to reflect only wages (69.0%) and to include only the workers who live in Frederick County (45.4%), approximately $152 million in income will be subject to Frederick County's income tax. Based on an effective income tax rate of 2.6 percent, the development will support $3.2 million in income tax revenue for Frederick County each year once full build out is achieved.

REAL PROPERTY TAXES

As of 2023, Frederick County levied a real property tax of $1.06 per $100 of assessed value. The State of Maryland levied a real property tax of $0.112 per $100 of assessed value. Using projected construction costs related to only the core and shell and the projected value of the land upon full build out, the assessed real property valuation of Quantum Frederick is estimated to be $3.56 billion (constant 2023 dollars).

Based on these parameters, the development will support approximately $38 million in annual real property tax revenues for Frederick County. Using FY 2022 as a base, that would represent a 10.3 percent increase in the County's real property tax collections. At complete build-out, State property tax collections would expand by approximately $4 million/annum measured in 2023 dollars.

OPERATIONS-RELATED SALES TAX (EXCLUDING ON ELECTRICITY)

To determine the sales tax impact supported by steady-state operations, this study uses the same custom IMPLAN model used to produce economic impacts. Based on Sage's modeling, Quantum Frederick's operations will support approximately $24 million in sales taxes—including those related to secondary purchasing—each year once operational. This figure excludes sales tax collected on the direct purchase of electricity, an estimate of which is discussed below.

FRANCHISE AND SALES TAX ON ELECTRICITY USAGE

Maryland levies a franchise tax applicable to public service companies calculated as 2 percent of gross receipts plus a charge of $0.00062 per kilowatt-hour delivered. Given Quantum Frederick's expected power utilization at steady state, the franchise tax will generate $51.8 million in annual revenues for the State while the per kilowatt charge will generate an additional $102.5 million from power utilization.

Conclusion

Quantum Frederick represents an investment of nearly $30 billion in Frederick County. That investment will support high-paying jobs for thousands of Marylanders while significantly augmenting both local and state level tax revenues.

During the approximately 15-year development period, Quantum Frederick will support:

- More than 35,500 jobs in Frederick County and another 4,000 across the balance of the state;
- An estimated $3.4 billion in statewide employee compensation that will generate more than $24 million in income tax revenue for Frederick County and $94 million for the state;
- $11.7 billion in statewide economy activity and nearly $250 million in State tax revenues.

Operational impacts will begin to be generated by Quantum Frederick in 2026 and will steadily ramp up until full build-out is achieved during the late 2030s. Once fully operational, Quantum Frederick will support a set of ongoing, annual impacts that recur each year for as long as the facility is operational. Those impacts include:

- More than 8,000 statewide jobs, about 6,300 of which will be located in Frederick County;
- Nearly $395 million in employee compensation in Frederick County and another $122 million across the balance of the state;
- $2 billion in statewide economy activity.

That economic activity will bolster revenues for both Frederick County and the state. Each year, Quantum Frederick's operations will generate an estimated $41 million in tax revenues for Frederick County, equivalent to 3.8 percent of the County's total FY 2022 revenues, and nearly $200 million in State of Maryland revenues.

As a final note, models used in this report to estimate economic and fiscal impacts use extremely conservative assumptions regarding Quantum Frederick's prospective impacts. If the development proceeds as planned, realized benefits are likely to be larger than those detailed in this analysis. Beyond quantified impacts, agglomeration effects—a clustering of firms operating within the data center supply-chain or adjacent industries—are likely to arise in response to a development of this size, further augmenting statewide activity. This is exactly the scale of investment that was envisioned when Maryland passed a law exempting data center personal property from the sales and use tax in 2020.

Appendix A: How to Interpret Economic Impact Estimates

To quantify the economic impacts of Quantum Frederick, Sage used IMPLAN economic modeling software and its embodied multipliers to generate estimates of employment, labor income, and output. Below is an abbreviated glossary of terms that may prove helpful in interpreting analytical findings.

EMPLOYMENT

As defined by IMPLAN, a job that lasts twelve months equals one job, two jobs that last six months equal one job, three jobs that last four months equal one job, etc. Based on this, **job-years** represents a useful term. For instance, an endeavor that supports 200 jobs for a six-month period would be considered to support 100 jobs measured in job-years. Note that IMPLAN jobs are not quite the same thing as full-time equivalents (FTEs). Each of IMPLAN's 536 unique industries has a different conversion rate between jobs and FTEs, although for almost every industry one job is equal to less than one FTE.

OUTPUT (BUSINESS ACTIVITY, ECONOMIC ACTIVITY)

Output equals the value of industry production or service provision. It might be easier to conceptualize this as total business sales or economic activity. For retail industries, it is the gross margin (not gross sales). For manufacturing, output is the quantity of total sales plus/minus the change in inventories. For the service sector, output is directly equal to sales. This is summarized by the following equation:

Output = (Manufacturing sales +/- change in inventories) + (service sector sales) + (gross margin for wholesale and retail trade)

LABOR INCOME

Worker compensation is comprised of wages, benefits, and proprietor income (money accruing to owners of businesses).

Worker Compensation = all forms of employee compensation (wages/benefits) + proprietor income

DIRECT EFFECTS

Direct effects are impacts tightly aligned with the endeavor under consideration. In this instance, direct effects are produced by construction of Quantum Frederick as well as the facility's steady-state operations.

INDIRECT EFFECTS

Indirect effects stem from business-to-business spending activity within the study area that occurs as a result of the direct effects. These can also be considered broader supply chain effects. This is a form of **secondary** effect.

INDUCED EFFECTS

Induced effects relate to household spending that occurs due to expanded levels of labor/household income. This is also a form of **secondary** effect.

About Sage Policy Group

Sage Policy Group is an economic and policy consulting firm headquartered in Baltimore, MD. Dr. Anirban Basu, Sage's chairman and CEO, founded the firm in 2004. Over a period spanning nearly two decades, Sage has managed to create a client base that encompasses more than forty states and seven countries and includes Fortune 500 companies, NFL teams, aquariums and zoos, state and local governments, insurance companies, banks, brokerage houses, major medical systems, trade organizations, and law firms, among others.

The company is especially well known for its analytical capabilities in economic impact estimation, school enrollment forecasting, economic development, economic forecasting, fiscal impact analyses, legislative analyses, litigation support, environmental economics, and industry outlooks, and has significant experience in the subject areas of construction, healthcare, energy, real estate, manufacturing, professional sports, lotteries, agriculture, tourism, entrepreneurship, government contracting, secondary and post-secondary education, and the economics of retirement. The firm is also known for its superior communications and messaging skills.

In addition to leading Sage, Dr. Basu has emerged as one of the nation's most recognizable economists. He serves as the chief economist to Associated Builders and Contractors, the Maryland Bankers Association, and the International Food Distributors Association and as the chief economic adviser to the Construction Financial Management Association. He chaired the Maryland Economic Development Commission from 2014 to 2021 and currently chairs the Baltimore County Economic Advisory Committee. He has been interviewed by CNBC, CNN, Fox Business, Axios, the New York Times, and many others.

Dr. Basu's lectures in economics are delivered to audiences across the U.S. and abroad. In recent years, he has focused upon health economics, the economics of education, and economic development. He has lectured at Johns Hopkins University in micro-, macro-, urban, and international economics, and most recently, global strategy. He is presently the Distinguished Economist in Residence at Goucher College, where he teaches History of Economic Thought.