



Department of Commerce

State of the Data Center Industry

*An Analysis of Washington's Competitiveness
In This Fast-Growing High-Tech Field*

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Executive Summary

The data center industry is experiencing explosive growth globally and nationally. Although data centers do not create many direct jobs, studies show that a vibrant data center cluster stimulates job growth in related information and communications technology (ICT) industries. This, in turn, drives significant local economic growth.

In recent years Washington has captured relatively little new business. As recently as 2011 Washington was considered the data center hub of the Pacific Northwest, but that is no longer true.

To better understand what happened, the Washington State Department of Commerce (Commerce) was directed in the 2017-19 Operating Budget (SSB 5882, Section 128, Subsection 44) to “conduct a study on the current state of the data center industry in Washington and whether changes to existing state policy would result in additional investment and job creation in Washington as well as advance the development of the state’s technological ecosystems.”

Key Findings

The national data center market has been booming since 2012, both in terms of new construction and global demand. Profit potential for data center owners remains strong and margins are better than those available for other kinds of commercial construction, including Class A office space. Market competitiveness and improving technologies have made it more cost-effective for enterprises to move their workloads off-premise into independently operated data centers. Explosive growth in cloud computing has radically increased the size and economic impact of data center investments made by the four major service providers (Amazon, Facebook, Google, Microsoft) in the United States.

Growth in the Washington data center market has been on the low end of the market, both in terms of new construction and in terms of measurable gross business income.

The Seattle market has grown at about 3 percent year-over-year (YoY), which is essentially no growth given that market’s unique demand for retail co-location next to the Seattle Internet Exchange (SIX) for interconnection purposes.

Three probable causes for Washington’s lagging growth are identified: (1) lack of aggressive promotion of the state’s data center economy and opportunities compared to other states; (2) historic confusion in the market about Washington’s data center incentives, which may no longer be that competitive; and (3) concession of the urban data market to Oregon because the Seattle market is not competitive on the basis of sales tax.

Conclusions

- Data center growth in rural Washington is at the lower end of the growth rate experienced by other major competitive markets. The competition among states for data center projects has increased dramatically and, if the state desires to attract more projects, Washington should improve its promotional strategy for this industry segment and reexamine the competitiveness of its overall incentives strategy.
- Urban Washington counties that do not have access to sales and use tax exemptions for data centers are at a competitive disadvantage to other urban data center markets such as Portland that either do not have sales tax or that offer tax incentives that abate the sales tax.

Introduction

The data center industry is experiencing explosive growth but Washington has captured relatively little new business.

To better understand this issue, the Washington State Department of Commerce (Commerce) was directed in the 2017-19 Operating Budget (SSB 5882, Section 128, Subsection 44) to:

conduct a study on the current state of the data center industry in Washington and whether changes to existing state policy would result in additional investment and job creation in Washington as well as advance the development of the state's technological ecosystems

Report Organization

This report provides an update on current data center economics to explain how data center markets now operate and what motivates its primary actors. It then provides an overview of measures of data center market health. Data center market trends and recent deal flows for the United States are presented along with a benchmark growth metric for a healthy data center market. The Washington data center markets are described and evaluated vis-à-vis that benchmark growth metric, followed by analysis. Appendices provide additional insight into the regional competitive situation with Oregon.

Data Center Economics

There are two perspectives important to understanding data center economics. First, there is that of the data center owner, typically also the operator, who views the data center much like any other real estate investment. They are motivated by the overall profit that can be obtained from the project, so they are focused on their return on investment (ROI). Second, there is the data center tenant, the customer that leases space, power, and telecommunications interconnect from the data center owner. The data center tenant is motivated by their total costs of ownership (TCO).

A variant of these is the off-premise enterprise data center, such as those run by Microsoft or Amazon, where the owner and the tenant are one and the same. These operate as cost centers to the enterprise, so their operators are focused on TCO, but at construction the enterprise data center is also motivated by the same capital-cost issues that data center owners have.

There is an important caveat to any treatment of a data center economy. Data center owners and tenants treat their customers, finances, contracts, and construction data as confidential information. While local economic development authorities, site selectors, and government officials do release data center project information to the public, often that information is incomplete.

Moreover, there is no consistent repository for this information nor are there any consistent set of reporting metrics. Even the physical size of a data center can be misconstrued, as there is a difference between the amount of space available for housing servers (i.e., the data center floor) and the overall size of the building, which includes space for offices, HVAC, and other operations – and companies are not always clear about or consistent in what they report. In short, there is an inherent lack of precision in the data. This imprecision follows also in state of Washington data, where “data center” is not its own North American Industry Classification System (NAICS) category. This report thoughtfully distills and presents what is salient; while the narrative is accurate, there is some inherent roughness in the data.

The Data Center Owner

Many data center owners started as real estate development companies that branched into data centers. In Washington, examples of this would include the Sabey Corp. and Centeris. Others are global real estate investment trusts that specialize in data centers, such as Equinix and Digital Realty Trust. Data center owners can also be telecommunications companies (e.g., CenturyLink) or enterprises (e.g., Apple or Google).

Data centers require high-capital investments to build, not just for the buildings themselves but for the roads, power, fiber, water, HVAC, fire suppression, and other infrastructure costs that must be incurred. Customers demand sophisticated designs and services, so data center

owners have to stay current on globally accepted criteria such as the ANSI/TIA-942 standard.¹ These standards evolve over time,² so to stay certified data center owners have to continually invest in upgrading their equipment and processes. Thus, the ROI calculation used by data center owners includes a large initial outlay of capital at the beginning of the project and upgrades to the infrastructure on a perpetual three- to five-year cycle.

The economically productive life span of a typical data center is 10-15 years, so this defines the ROI horizon of these projects.³ Aging data centers do not capture the premium rents that newer and more efficient data centers command, so the data center ROI profile is not dissimilar to that of Class A office space.

Data center owners are as knowledgeable and sophisticated as large-scale commercial builders. As such, their investment decisions are based on complex models that take into account as many as a hundred decision attributes. The critical decision criteria that most impact their ROI are:⁴

- Land costs.
- Power costs.
- Net taxes (after incentives).
- Construction costs.
- Equipment costs, especially costs specific to a particular geography.
- Labor availability and cost.
- Regulatory and operating environment.

The data center owner is also going to account for customer proximity, geographic and weather stability, geographic accessibility (airports, roads, etc.), fiber density, and other risk factors. However, the criteria bulleted above are the most economically significant. Facility construction and infrastructure provisioning average about 71 percent of overall project costs. Power and taxes account for about 22 percent of project costs, while land acquisition and labor costs account for the rest.⁵ Land costs, construction costs, equipment costs, and labor costs do not greatly vary among potential sites outside of very large metropolitan areas, so power costs and net taxes tend to be the most significant economic differentiators.⁶

Despite very high capital costs, data center owners have a capitalization rate of around 6.5 percent, compared to 3.3 percent for Class A office space.⁷ The higher returns are due to

¹ http://www.tia-942.org/content/162/289/About_Data_Centers

² <http://www.datacenterknowledge.com/design/data-center-standards-wheres-value>

³ <http://www.itwatchdogs.com/environmental-monitoring-news/data-center/determining-a-data-centers-lifespan-40042593>

⁴ <https://www.cbre.us/research-and-reports/Site-Selection-Strategies-for-Enterprise-Data-Centers>

⁵ <http://www.us.jll.com/united-states/en-us/Research/US-data-center-outlook-jan-2017.pdf>

⁶ <https://www.cbre.us/research-and-reports/Site-Selection-Strategies-for-Enterprise-Data-Centers>

⁷ <http://www.cushmanwakefield.sg/en-gb/research-and-insight/2017/data-centres-report/>

increasing demand for data center co-location capacity⁸ and data center services.⁹ In order to compete for capital and investors, data center owners are extremely sensitive to the key variables in project economics.¹⁰

A recent shift in the data center market is an appetite for mega-data centers (aka, hyperscale) that can handle large tenants and can capture scale efficiencies. Where a 150,000 square foot data center used to be considered large, now “large” is 600,000 to 1,000,000 square feet.¹¹ Projects that were in the \$120 million range are now being upsized to over \$1 billion.¹² The hyperscale project economics are even more sensitive to power costs and net taxes, but they also need prodigious fiber densities and proximate access to transoceanic cable to improve the customer attractiveness of these very large data centers.¹³

Data center owners not only use business complex models to determine site selection, they’ve also gotten aggressive in seeking tax and regulatory relief to improve overall project economics.¹⁴ Many states have responded by expanding their incentives to attract these very large projects.¹⁵ Jobs, taxes, and local infrastructure improvements are what motivates the states and municipalities to respond to these incentive requests.¹⁶

Similarly, electricity rates are an important tenant location consideration, and nationally power costs can vary market-to-market by as much as 300 percent. Data center owners will seek lower electricity rates in markets where that is negotiable or subsidizable.¹⁷

The data center market is extremely competitive and is undergoing a historic wave of merger and acquisition activity.¹⁸ However, while competition does effect lease rates, the compounded annual growth rate (CAGR) for data center capacity has resulted in market pricing stability. In other words, while increasing capacity might be expected to decrease lease rates, offsetting growth in demand is actually keeping lease rates stable.

⁸ <http://www.businesswire.com/news/home/20171206006138/en/76.37-Billion-Data-Center-Colocation-Market>

⁹ <http://www.businesswire.com/news/home/20171201005221/en/Global-Data-Center-Services-Market---Expected>

¹⁰ <https://www.cbre.us/research-and-reports/H1-2017-US-Data-Center-Trends>

¹¹ <https://www.constructiondive.com/news/why-data-center-construction-is-where-the-action-is/511024/>

¹² <http://www.datacenterknowledge.com/archives/2013/04/29/the-billion-dollar-data-centers>

¹³ https://pilotonline.com/news/local/science/technology/virginia-beach-s-new-data-center-park-expects-to-draw/article_ef8d5899-e5d4-5e36-b890-5e78b5d1725c.html

¹⁴ <https://www.digitalrealty.com/blog/the-basics-of-data-center-site-selection/>

¹⁵ <http://www.datacenterdynamics.com/content-tracks/design-build/us-tax-breaks-state-by-state/95428.fullarticle>

¹⁶ <https://www.nytimes.com/2016/04/27/realestate/commercial/texas-lures-data-centers-not-for-jobs-but-for-revenue.html>

¹⁷ <http://www.datacenterknowledge.com/amazon/amazon-wants-energy-discount-it-builds-12-more-ohio-data-centers>

¹⁸ <http://www.us.jll.com/united-states/en-us/Research/US-Data-Center-Outlook-2017-JLL.pdf>

Data center owners can be retail, such as Equinix, which specialize in smaller-tenant configuration (e.g., one rack), or wholesale, which specialize in providing services to tenants that consume 150 kW or more. A number of data centers provide both wholesale and retail services. It is also common for a retailer to lease from a wholesale owner in markets where the retailer does not have its own physical presence (e.g., Equinix leasing space from Digital Realty in a market where Equinix has a customer, but Equinix has no facilities and Digital Realty does). Retail tenants pay higher lease rates than do wholesale tenants. The services model for retailing differs somewhat from wholesale, but the ROI model for a data center owner is the same regardless of sales model.

The Data Center Tenant

A data center is one of the most expensive assets of any organization.¹⁹ As with any costly asset, enterprises routinely confront the build or buy decision. Increasingly, enterprises are choosing to outsource some or all of their data center functions to a data center operator, which are referred to as a co-location facility.²⁰ Co-location is where the enterprise controls its own servers, racks, routers, etc., and the data center owner provides the facilities, including cooling, power connects, telecommunication interconnects, and security. Tenants pay for the network connectivity they consume from any number of third-party providers, such as CenturyLink, Wave, or Comcast. Tenants also usually pay for the actual electricity they use.

Overall infrastructure costs are shared across all co-location tenants. Moreover, the co-location operator is able to offer management, maintenance, and security services in the aggregate that would otherwise be expensive for enterprises to staff on their own. The largest data centers can often attract better deals for power, connectivity, and resiliency, which also adds to co-location economic dynamics and could result in savings opportunities that are passed along to tenants.

Data center tenants have a wide variety of economic motivators for choosing where they co-locate. Some key non-monetary concerns are geography (proximity to headquarters, airports), environment (weather, natural disasters, cooling, green energy), and telecommunications (fiber density and redundancy, latency). They might even look at the long-term impacts of climate change.²¹ Data center resiliency is measured in “tiers,” and enterprises will try to match their needs to the offerings of the data centers they are considering for co-location.²²

After solving for these variables, tenants look at lease rates (typically expressed as \$/kW but actually is a proxy for how much space and reserved power the tenant requisitions from the

¹⁹ <http://docshare01.docshare.tips/files/14605/146050683.pdf>

²⁰ <https://www.gartner.com/doc/3587245/infrastructure-delivery-strategies-primer->

²¹ <https://www.bizjournals.com/seattle/news/2017/12/17/amazon-hq2-cities-climate-change-vulnerability-uw.html>

²² <https://www.colocationamerica.com/data-center/tier-standards-overview.htm>

data center), electricity expenses, management costs, and taxes.²³ Thus, tenant co-location models tend to focus on an overall TCO for occupancy.²⁴ The single largest cost born by tenants are for the one-time purchases of their servers and related infrastructure. As these costs tend to be constant regardless of location, sales tax become an important TCO differentiator.²⁵ Similarly, personal property taxes are a consideration. Servers and related equipment tend to need replacement every three years or so, and taxes are a recurring operating cost for tenants. On a \$10 million equipment deployment, sales taxes can add \$1 million or more in costs to a tenant in each re-stock cycle. To improve competitiveness, many states have begun offering incentives to co-location owners and tenants, particularly around sales tax and property tax abatements.

The Off-Premise Enterprise Data Center

The off-premise enterprise data center is a remote facility wholly owned and operated for the benefit of an enterprise, such as those for Microsoft, Amazon, Facebook, Google, and Apple. These off-premise enterprises data centers usually house enormous cloud or online services. The \$1.5 billion National Security Agency data center in Bluffdale, Utah, is unique in its scale for a government facility,²⁶ but similar in design and purpose to any off-premise enterprise data center.

Cloud and online enterprises are making very large data center investments (\$1 billion is common), and they tend to look at construction costs just like any other data center owner, but focus on TCO for their post-construction economics (as opposed to profit). It is also common that a data center owner will lease an entire facility to a dedicated enterprise, which puts a predictable profit twist on the off-premise enterprise data center's post-construction economics.

²³ <http://www.areadevelopment.com/data-centers/Q1-2014/data-center-incentives-tax-breaks-primer-272101.shtml>

²⁴ <https://www.cloudstrategymag.com/articles/85463-cios-tco-challenge-build-vs-colocation-vs-cloud>

²⁵ <http://www.areadevelopment.com/data-centers/Q1-2014/data-center-incentives-tax-breaks-primer-272101.shtml>

²⁶ <https://nsa.gov1.info/utah-data-center/>

Measuring Data Center Market Health

The key metrics used to determine the health of a local data center market are new construction and absorption. Data center owners (co-location or enterprise) are solely responsible for new construction, which the market describes in megawatts, square footage, or gross project construction value; industry insiders tend to talk in terms of megawatts, which is a more accurate depiction of a project's customer service capacity. Absorption is a count of how much of the net available data center capacity is claimed via new lease or expansion in a given period, usually measured in megawatts. While tenants drive absorption, this activity is constrained by the amount and type of available capacity.

New data center construction is a function of ROI, as previously described, and the availability of suitable land, fiber density, and power. It is not unusual that market demand for new construction runs ahead of an area's ability to provide the required resources, be it land preparation, the addition of new fiber capacity and operators, or the construction of new power substations. In these cases, data center construction will lag but eventually recover, assuming target ROI. At some point it is possible for the pricing of constrained resources to sour an area's ROI for data center investment. Ultimately, it is also possible for an area to run out of capacity because one of the resources is no longer economically or physically available. Prineville, Oregon, to cite one such case, is reportedly close to running out of the electricity needed to fuel new data center growth.²⁷

Lags in data center construction ultimately will negatively impact absorption. Conversely, lags in absorption will negatively impact data center construction, as data center owners are keenly sensitive to the dynamics of supply and demand. That said, new construction projects can take two years to bring online while absorption demand can shift dramatically in months, so data center supply/demand dynamics always have an inherent timing issue.

Data center incumbents in a given market can discourage new entrants by controlling, through purchase or option, the most desirable building sites or the available power. The fiber density in a particular area can become fully subscribed, but that would likely motivate the service providers to add more capacity, so this supply imbalance is usually short-term. It is altogether rare for an area to run out of labor or capital, assuming an appropriate ROI. A "broken" market is rarely publicly documented as such, although they are discussed anecdotally by site selectors.

Tax incentives also have a substantial impact on market health, both for data center owners and for tenants. Data center cite locators working for owners and for tenants will often describe a market as favorable or unfavorable in terms of its tax incentives.²⁸ In some states,

²⁷ http://www.oregonlive.com/silicon-forest/index.ssf/2017/01/prineville_is_running_out_of_e.html

²⁸ <http://www.areadevelopment.com/data-centers/Data-Centers-Q1-2017/credit-and-incentive-trends-in-landing-a-data-center-KPMG.shtml> and <https://www.bna.com/sales-tax-slice-b57982083252/>

incentives are provided for purchases of electricity and backup fuel,²⁹ which also enter into the overall assessment of market potential. Where state or municipal tax incentive programs are not predictable or reliable, the impacts on data center market health are generally viewed as negative.³⁰

Two other local constraints can be the amount of available environmentally sustainable water (for cooling) or, as when demanded, a particular kind of renewable energy (e.g., solar, wind, or hydro). Where there is an abundance of renewable power sources in a particular market, its data center market can develop a reputation as “green,” which for some owners or tenants is particularly desirable.

²⁹ <https://lifelinedatacenters.com/data-center/rich-miller-guide-to-data-center-tax-incentives/>

³⁰ <http://opportunitywa.org/data-center-prospects-demonstrate-importance-of-tax-incentives/>

Data Center Market Trends

Historically, enterprises used to own and operate their own data centers, typically operating them on premise or locally, close to where there was a distributed business campus. During the dot-com era, companies began to consider getting out of the data center business either by outsourcing the location of their hardware directly to a co-location data center or by moving IT workloads to a service provider, such as Salesforce or Concur. The total number of enterprise data centers worldwide recently peaked at about 8.6 million.³¹ The absolute number of enterprise data centers is now in permanent decline as on premise facilities are consolidated into hyperscale data centers run by third parties and by the rapid rise in cloud computing.

When talking about the data center market today, the focus is on co-location providers and on cloud providers. The global data center market is very healthy, adding about 360 million square feet of new construction over the last five years.³² Demand for new capacity is expected to stay strong as digital content, social media, and the Internet of Things (IoT) couple with dramatically improving broadband speeds to push data center market capacity.³³

The explosive growth of cloud computing has had a dramatic impact on data center design and construction over the last seven years. As recently as five years ago, a 100,000 square feet / 5 MW project was considered large. Today it is not uncommon to see a hyperscale announcement for 1 million square feet and 100 MW of dedicated power.³⁴ China is the market leader for data centers with over 3.5 million square feet (they have six plus one more under construction), while the U.S. has just one (SuperNap in Las Vegas) of that size. About a half-dozen U.S. projects of a million square feet or more have been announced this year. These large-scale projects are also being driven by scale economics in the wholesale co-location sector, where corporate customers have large power and data transmission requirements.

Absorption rates have reached record highs in the U.S. and international markets, and the trend is expected to continue through at least 2020 as the major cloud providers triple their infrastructure investments.³⁵ The latest market outlook for co-location centers predicts revenue growth for that segment will almost triple as well with a CAGR of 17 percent from 2016 to 2022.³⁶ The high absorption rates will continue to fuel data center construction.

One important current trend is a rush to industry consolidation in the data center market, where in excess of \$18 billion dollars has been spent in 21 M&A deals in 2017.³⁷ Seattle's own

³¹ <https://lifelinedatacenters.com/data-center/emerging-data-center-trends/>

³² Ibid.

³³ <http://www.datacenterjournal.com/industry-outlook-state-data-center-market/>

³⁴ <https://info.siteselectiongroup.com/blog/largest-north-american-and-global-data-center-projects-of-2017>

³⁵ <http://www.us.jll.com/united-states/en-us/Research/US-Data-Center-Outlook-2017-JLL.pdf>

³⁶ <http://www.businesswire.com/news/home/20171206006138/en/76.37-Billion-Data-Center-Colocation-Market>

³⁷ <http://www.datacenterknowledge.com/deals/data-center-investment-us-year-already-beats-all-records>

KOMO Plaza data center was sold this year to GI Partners for \$276 million. This M&A activity, combined with a push for better operating economics from the new hyperscale data centers, is creating significant capital and operating barriers to new market entrants. Nevertheless, as the remaining large players compete for tenants, the leasing rates are staying competitive.³⁸ It is uncertain what the long-term effects of industry consolidation might be on new construction or net absorption rates, but analysts are bullish.³⁹

The U.S. Data Center Market

The data center market in the U.S. is currently booming, as measured both by new construction and by absorption. Double-digit annual growth rates are the norm, and CAGR projections in the 14 percent to 17 percent range are common.⁴⁰ Northern Virginia (NoVA) is the largest data center market in the nation, outpacing its nearest rivals by more than 100 percent in scale and in the magnitude of new growth (see Table 1).⁴¹

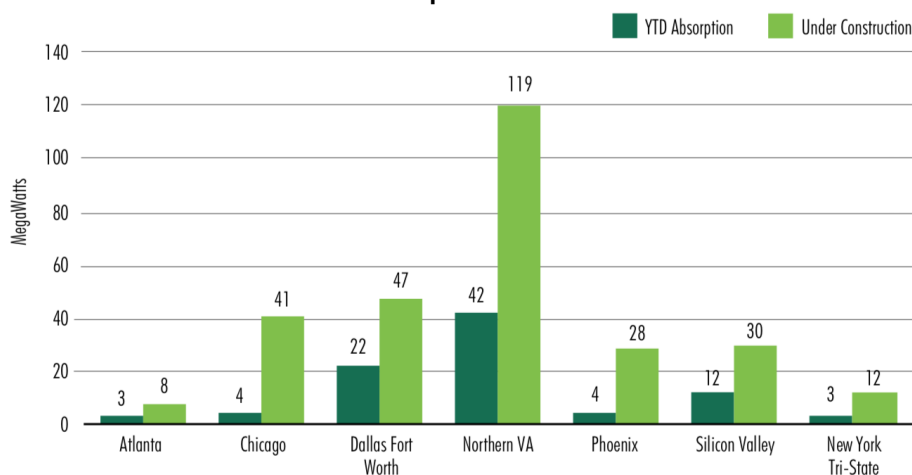
Table 1: H1 2017 Data Center Wholesale Market Fundamentals

Market	Inventory	Vacancy	H1 Net Absorption	Rental Rates (kW/mo)
Northern Virginia	608 MW	5.8 %	41.5 MW	\$120-\$145
Dallas/Fort Worth	231 MW	16.8 %	22.0 MW	\$120-\$145
Chicago	188 MW	2.1 %	4.2 MW	\$130-\$145
Phoenix	169 MW	8.8 %	3.8 MW	\$120-\$135
Silicon Valley	169 MW	5.3 %	12.0 MW	\$145-\$165
New York/New Jersey	155 MW	18.2 %	2.9 MW	\$130-\$150
Atlanta	117 MW	9.2 %	3.0 MW	\$120-\$135
Seattle	107 MW	18.8 %	2.2 MW	\$120-\$150
So. California	88 MW	16.3 %	1.9 MW	\$130-\$160
Boston	60 MW	24.4 %	1.0 MW	\$150-\$180

Table 1 also shows that in the first half of 2017, the absorption rates in NoVA, Chicago, and Silicon Valley were tracking to consume their remaining available inventory by year’s end. Table 2 shows the construction pipelines for the top seven wholesale data center markets in megawatts.

³⁸ <https://datacenterfrontier.com/equinix-were-ready-to-pursue-larger-cloud-deals/>
³⁹ <http://www.us.jll.com/united-states/en-us/Research/US-Data-Center-Outlook-2017-JLL.pdf>
⁴⁰ <http://www.cushmanwakefield.us/en/research-and-insight/2017/us-q2-data-center-snapshot/>
⁴¹ <https://www.datacenterhawk.com/blog/northern-virginia-data-center-market-growth-continues>

Table 2: Data Center Market Net Absorption Vs. Under Construction



Source: CBRE Research, H1 2017.

It takes about 24 months from start to finish for newly constructed capacity to enter the market. As capacity comes online it skews the vacancy rate, so the interplay between construction and absorption has timing effects that make it difficult to snapshot the health of any particular data center market.

As described above and depicted in Table 4 below, there is an increasing trend towards the hyperscale data center in the major markets such as NoVA, Phoenix, Oregon, and Dallas. The four hyperscale cloud operators (Amazon, Google, Microsoft, and Facebook) are continuing to drive the high growth rates in U.S. data center construction.⁴² The hyperscale cohort, which used to lease in some markets from wholesale co-location providers, is increasingly building out their own global capacity and transferring workloads away from the wholesale providers they were using.⁴³

Regardless, new co-location capacity continues to come into production to serve new cloud vendors and enterprises in the more traditional 40,000 to 350,000 square foot projects. These co-location projects are spread across the various data center markets, although, as discussed below, NoVA, Dallas, and Phoenix are the market leaders in co-location growth.⁴⁴

REITs tend to focus on co-location investments, so they provide an important indicator of corporate data center demand that is distinguishable from that of the hyperscale cloud providers. Data from the six publicly traded data center REITs (Table 3) show they activated most of their new 2016 inventory in a limited set of markets. Further growth in Silicon Valley is constrained by a lack of available real estate and, of the 30 MW under construction there, 100

⁴² <https://datacenterfrontier.com/the-year-in-cloud-amazons-growth-in-data-center-markets/>

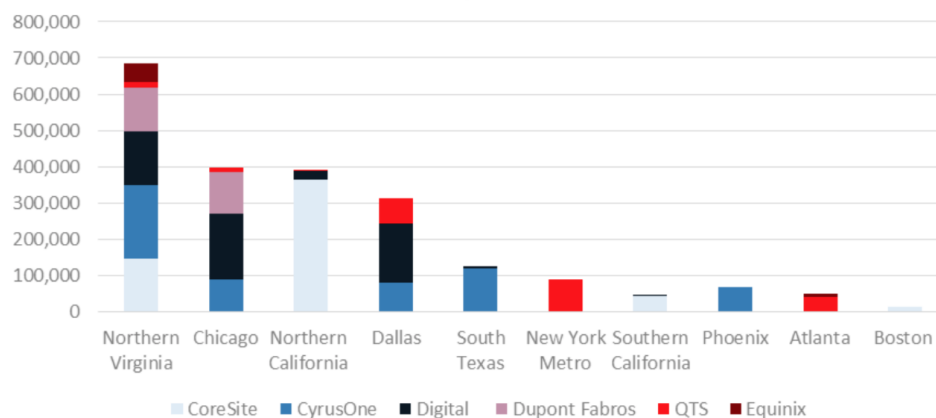
⁴³ <http://www.datacenterknowledge.com/asia-pacific/wholesalers-singapore-feel-squeeze-cloud-giants-build-own-data-centers>

⁴⁴ <https://datacenterfrontier.com/2018-data-center-colocation-projections/>

percent of that is already committed to customers.⁴⁵ Some of the expansion in the Dallas-Fort Worth pipeline is being delivered on a speculative basis as a destination alternative to the Silicon Valley.

Table 3: 2016 REIT Data Center Additions

OPERATIONAL SQUARE FEET ADDED | 2016



cushmanwakefield.com

Source: <http://www.cushmanwakefield.us/en/research-and-insight/2017/us-q2-data-center-snapshot/>

CBRE Group Inc. identifies North Carolina and Minneapolis as rapidly growing secondary data center markets. Although their modest total inventory numbers keeps them out of the top 10, they actually ranked fourth and fifth, respectively, in their absorption rate since 2016. CBRE calls out Columbus, Ohio, as the “market to watch” because of its proximity to long-haul transmission networks and favorable tax climate.

Table 4 provides a summary of the major data center projects announced in the 2016-2017 timeframe across the U.S. These announcements include major expansions of existing facilities. Note that deal flow is sometimes announced in square footage, project valuation, or megawatts – there is no standard report format or registry for announcements.

CBRE estimates that 284 MW of wholesale capacity is under construction in the primary data center markets, and that 46 percent of that capacity is already pre-leased.⁴⁶ More than \$20 billion has flowed into the data center market over the last two years, and at least that much investment is expected in the coming two years.

⁴⁵ <https://www.cbre.us/research-and-reports/H1-2017-US-Data-Center-Trends>

⁴⁶ <https://www.cbre.us/research-and-reports/H1-2017-US-Data-Center-Trends>

Table 4 – New Data Center Projects Announced in the U.S., 2016-2017

Location	Owner	Valuation	Square Footage	MW	Date of announcement
Prineville, OR	Facebook		900,000		Q4 2017
Hillsboro, OR	Peak 10 + Via West		114,000		Q4 2017
Phoenix, AZ	QTS Data Centers	\$1B			Q4 2017
Loudoun County, VA	Amazon		500,000		Q4 2017
Richmond, VA	Facebook	\$1B			Q4 2017
Dallas, TX	CyrusOne		340,000		Q4 2017
Garland, TX	RagingWire		250,000	16.0	Q4 2017
Plano, TX	T5 Data Centers			10.75	Q4 2017
Los Lunas, NM	Facebook	\$1B	1,800,000		Q3/Q4 2017
3 Ohio sites	Amazon			160.0	Q3 2017
San Francisco, CA	Fifteenfortyseven CSR		187,000	24.0	Q3 2017
Ashburn, VA	Vantage Data Centers	\$1B		108.0	Q3 2017
San Jose, CA	Microsoft		437,000		Q3 2017
Columbus, OH	Facebook	\$750M	900,000		Q3 2017
Garland, TX	Digital Realty	\$350M		50.0	Q3 2017
Waukee, IA	Apple	\$1.3B			Q2 2017
Papillion, NE	Facebook		900,000		Q2 2017
Atlanta, GA	Switch	\$2.5B	1,000,000		Q2 2017
Reno, NV	Apple	\$1B			Q2 2017
Wall Township, NJ	NJFX		80,000		Q1 2017
Hillsboro, OR	OVH		150,000		Q1 2017
Santa Clara, CA	Vantage Data Centers			15.0	Q1 2017
Phoenix, AZ	DuPont Fabros	\$2B			Q1 2017
Ashburn, VA	QTS Data Centers		700,000	140.0	Q4 2016
Santa Clara, CA	CoreSite		230,000		Q4 2016
Santa Clara, CA	Vantage Data Centers			69.0	Q4 2016
Manassas, VA	Iron Mountain		375,000		Q3 2016
Chicago, IL	Digital Realty Trust		660,000	54.0	Q3 2016
Altoona, IA	Facebook		1,000,000		Q3 2016
Ashburn, VA	CoreSite	\$500M	232,000		Q3 2016
Pittsburgh, PA	Involta		40,000		Q3 2016
Ashburn, VA	Sabey		900,000		Q2 2016
Chandler, AZ	CyrusOne		360,000		Q2 2016
West Des Moines, IA	Microsoft	\$2B	1,700,000		Q2 2016
Ashburn, VA	DBT		600,000		Q2 2016
Ashburn, VA	RagingWire		140,000	14.0	Q2 2016
Manassas, VA	CloudHQ			43.8	Q2 2016
Las Vegas, NV	Switch		350,000	40.0	Q1 2016
Ashburn, VA	Digital Realty	\$300M		29.6	Q1 2016
Ashburn, VA	DFT ACC 7,9		210,000	33.7	Q1 2016
Grand Rapids, MI	Switch	\$400M	225,000		Q1 2016
Ashburn, VA	Equinix	\$1B			Q1 2016
Hillsboro, OR	Infomart Data Centers			16.0	Q1 2016

Source: Various trade publications and press releases

The data center economy evolves very quickly, and there are a number of eventualities that could change the growth rates of future data center projects.⁴⁷ The Financial Accounting Standards Board (FASB) has implemented changes to how capital leases (versus operating leases) are reported, which will have impacts that will not be understood for several years. The impact of newer service models, such as Power Based Building (PBB) pricing, are still not well understood.

Technology improvements are driving data center construction costs down to \$5 million per MW (from a standard of \$7 million), while new chip and server technologies are squeezing more performance per kW. At the same time, cooling technologies are improving so that server densities can be increased. The proliferation of renewable energy sources could alter electricity cost dynamics. The emergence of micro data centers to support IoT has yet to gain acceptance by tenants, but has potential.⁴⁸ And any number of FCC net neutrality or EU privacy rulings could accelerate or slow data center growth, depending on unknown outcomes.

Data Center Market Health Metrics

Based on an amalgamation of the industry criteria provided by JLL, CBRE, and Cushman-Wakefield, a “healthy” data center market should have been growing, year-over-year, by at least 10 percent since 2012. Over time, that 10 percent annual growth rate target would apply to new data center construction and to net absorption as they come into balance. This 10 percent target is actually below the average growth rate reported above, but it is, according to industry experts consulted, sufficient to indicate that a market is doing well enough.⁴⁹

There is considerable press and notoriety around the announcement of any hyperscale data center project. Nothing yet indicates that the presence of a hyperscale project makes or breaks a data center market’s attractiveness, although it is clear that announcements about the larger projects are generating more headlines.

⁴⁷ <http://nadatacenters.com/2017-real-estate-forecast/>

⁴⁸ <http://www.datacenterknowledge.com/archives/2017/03/27/whats-fueling-the-rise-of-micro-data-centers/>

⁴⁹ Consulted with: CBRE, JLL, Centeris, Sabey

The State of Washington Data Center Market

Washington has two primary data center markets, one in the Seattle area and one located in north central Washington anchored by the city of Quincy. The Seattle market is a mix of retail and wholesale data centers, but is commonly thought of as a retail co-location market. The Quincy market is predominantly wholesale and tends to attract off-premise enterprise data center owners.

The Seattle market is inexorably tied to the Seattle Internet Exchange (SIX), one of the world's major sites where service providers exchange internet traffic. Located in the Westin Exchange Building, the SIX is a tax-exempt organization that provides its members with large-scale, high-speed, low-latency connectivity to the world at a peak capacity of 855 Gbps. The SIX attracts fiber density and retail tenants that find economic value in proximity to where internet traffic is exchanged at scale (e.g., Netflix, which pulls content through the SIX and distributes it customers locally) or where high-speed access to Asia or Canada is essential.

Seattle is also home to a large number of commercial enterprises that want to locally co-locate some or all of their core IT infrastructure as retail tenants in a data center where their people can be hands-on. Even the large players like Microsoft, with hyperscale data centers all over the world, want some local presence where their engineers can get physical access to projects that are developmental or experimental.

The Quincy market tends to attract data center owner/operators such as Microsoft or wholesale providers such as Oath or Sabey. The reasons for their attraction to Quincy are varied, but are consistent with a preference both for low TCO. Central Washington is not inherently convenient for a retail tenant that needs occasional hands-on access to their equipment. Mountain passes that close for snow exacerbate the access problem. And it is often difficult for retail tenants to take their own customers out to central Washington for required data center tours. Wholesale tenants have more at stake in the proposition and are less bothered by the convenience factor.

Seattle and Quincy also present very different ROI profiles to data center investors. The Quincy market has access to inexpensive land, lower construction costs, water, and much less expensive power costs. In addition, there is a sales and use tax exemption available to eligible data center owners.⁵⁰ CBRE describes Quincy as a category leader in the "low cost" rural data center markets.⁵¹ By contrast, Seattle is in a more expensive urban market, and does not enjoy the sales and use tax exemptions available in the Quincy market.

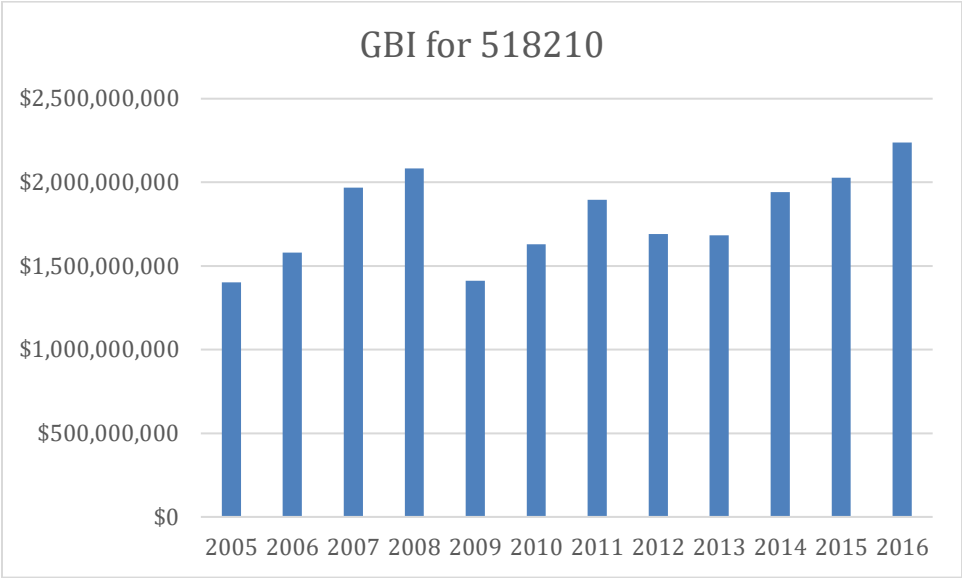
⁵⁰ RCWs 82.08.986, 82.12.986. <http://leg.wa.gov/ilarc/taxReports/2016/DataCenterEquipment/f/print.htm>

⁵¹ <https://www.cbre.us/research-and-reports/Site-Selection-Strategies-for-Enterprise-Data-Centers>

Performance Metrics, Washington Data Center Market

As mentioned previously, data centers do not report into a single NAICS category, and the primary category in which they do report (518210 – Data Processing, Hosting, and Related Services) has a lot of other components. However, the state departments of Revenue, Commerce, and Employment Security use 518210 as a directional indicator for analyzing the data center market. Looking at Gross Business Income (GBI) for 518210 in Table 5, it is apparent that disruptions in growth were concurrent with times in which the data center tax preferences were not available; the decline in 2009 has effects from the recession as well.

Table 5: WA GBI for NAICS 518210, 2005 - 2016⁵²



Source: Department of Revenue

Due to limitations in how the data are reported, the GBI numbers for Seattle versus the Quincy markets cannot be separately filtered, and 2017 data are not available. Table 5 suggests that GBI losses from the recession of 2009 were not recouped until 2016, although it is not ascertainable as to whether that result came from vacancy, price compression, loss of market capacity, or other external factors.

The year-over-year (YoY) growth in GBI for NAICS 51820 is shown in Table 6. Since 2014, GBI YoY growth has been positive. The reports from JLL⁵³ and Cushman-Wakefield⁵⁴ indicate that 2017 GBI growth rate should also be positive.

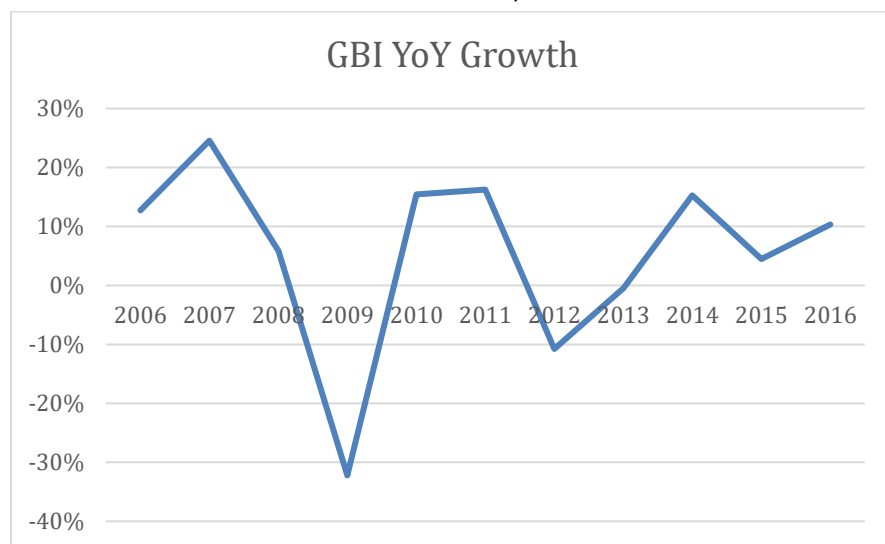
⁵² This data is not be effected by the application of any tax preference or other incentives

⁵³ <http://www.us.jll.com/united-states/en-us/Research/US-Data-Center-Outlook-2017-JLL.pdf>

⁵⁴ <http://www.cushmanwakefield.us/en/research-and-insight/2017/us-q2-data-center-snapshot/>

Although Seattle and Quincy GBI data cannot be disaggregated for this report, the GBI data combined with the Pacific Northwest deal flow data from Appendix A suggests that the Seattle data center market is economically stagnant.

Table 6: WA GBI YoY Growth as a Percent, NAICS 518210



NAICS 518210 does not provide useful insights for employment data because in King County there are thousands of companies reporting under this classification that have nothing to do with data centers. However, Employment Security data for Grant County is more accurate, and the 2017 Q1 data annualizes there to \$8.6 million in payroll.⁵⁵ Trend data is not available, although this was studied by the state Joint Legislative Audit and Review Committee (JLARC) in 2016.⁵⁶

Washington’s Advantage: Electricity Costs

Washington’s north central data center market enjoys the lowest power costs in the nation, absent subsidies in other jurisdictions.⁵⁷ A megawatt of power in Washington can be less than a third the cost of what it would cost in California – that difference is worth approximately \$800,000 per year per megawatt. On a 5 MW project, that differential is worth \$4 million per year. Data center owners also look at reliability, and Washington’s hydropower is considered to be highly reliable. Where, as in virtually all competitive markets, sales taxes are not levied on data center equipment, power represents about 70 percent of a data center owner’s operating costs, and are therefore a key market differentiator.

⁵⁵ <https://esd.wa.gov/labormarketinfo/covered-employment>, 2017 Q1 Preliminary, recovered November 30, 2017

⁵⁶ <http://leg.wa.gov/jlarc/taxReports/2016/DataCenterEquipment/f/print.htm>

⁵⁷ <https://info.siteselectiongroup.com/blog/power-in-the-data-center-and-its-costs-across-the-united-states>

Sales Taxes

Where sales taxes are levied, 5 MW represents approximately \$80 million of tenant server equipment,⁵⁸ which at a 10 percent sales tax rate would be \$8 million, spread across the two or three years of usable life for that equipment. In other words, the power cost advantage the Quincy market enjoys would be largely offset by sales taxes, were it not for the sales tax sales and use tax exemption that tenants can qualify for in eligible Quincy data centers.

Tax preferences are not available in the Seattle market.

The Quincy Data Center Market

The data center market in the north central Washington counties was seeded by the opening of Yahoo's data center in Wenatchee in May 2006. Microsoft and Yahoo opened much larger data centers in Quincy in 2007, and launched the area onto the national data center scene.⁵⁹ Market expansion through 2013 was vigorous (Table 8), although there was a construction lull in 2010 resulting from uncertainty regarding expiring tax preferences.⁶⁰ The Quincy market has long been considered one of the nation's most attractive because of low overall costs – particularly its power costs – when the tax preference are included.⁶¹

Table 8: Data Centers in North Central Washington, 2006 – 2013

Firm	Location	Year Opened	Square Feet
Yahoo	Wenatchee, Chelan Co.	2006	45,000
Titan/Ask.com	Moses Lake, Grant Co.	2006	--
Microsoft	Quincy, Grant Co.	2007	500,000
Yahoo	Quincy, Grant Co.	2007	180,000
Intergate.Columbia	East Wenatchee, Douglas Co.	2009	430,000
Intuit	Quincy, Grant Co.	2009	240,000
Red Sea TITAN	Moses Lake, Grant Co.	2009	60,000
Microsoft Expansion	Quincy, Grant Co.	2011	144,000
Yahoo Expansion	Quincy, Grant Co.	2011	151,000
Dell	Quincy, Grant Co.	2012	350,000
Sabey Intergate	Quincy, Grant Co.	2012	134,000
Vantage Data Center	Quincy, Grant Co.	2013	133,000

⁵⁸ Calculated using http://www.apc.com/salestools/NRAN-8FL6LW/NRAN-8FL6LW_RO_EN.pdf and <https://www.quora.com/How-many-servers-does-a-typical-data-center-house>

⁵⁹ <http://researchcouncil.org/wp-content/uploads/theeconcontribfullreport.pdf>

⁶⁰ <https://washingtonstatewire.com/data-center-fumble-costs-jobs-in-washington-state-and-maybe-big-money/>

⁶¹ <https://www.cbre.com/about/media-center/2014-data-center-report>

Source: Washington Research Council⁶²

In 2014, Vantage's second phase build-out in Quincy added 4.5 MW to its data center, although it does not appear to have increased the square footage.⁶³ In 2015, Sabey announced an addition of 135,000 square feet and 10.5 MW to its Quincy site. Oath (Verizon, formerly Yahoo) added 25 MW in 2017. Microsoft has been actively expanding its Quincy footprint in phases since 2007, although it has not disclosed the size and value of the expansion. Sabey is planning a 12 MW expansion in Quincy, and CyrusOne is planning to build a 20 MW facility. The Port of Quincy reports that site selector interest in Quincy remains high.⁶⁴ Deal flow, however, is limited.

The data is incomplete and there are some apples and oranges comparisons between MW and square footage, but using a \$7 million per megawatt rule of thumb,⁶⁵ the recent and planned expansions represent about \$250 million in new construction from 2015-18, not including Microsoft. It is difficult to estimate Microsoft's investments as they've been using Quincy to experiment with new data center designs and they aren't publicly disclosing specifics, but its Generation 5 project apparently uses 42 MW.⁶⁶ This suggests an outlay of about \$300 million for the current project, and as much as an additional \$800 million if they complete all four zones of the project. Allowing for 5th Generation design efficiencies that lower the cost per MW to \$5.5 million, the Microsoft values would adjust to \$231 million and \$693 million, respectively.

Taken together, the ongoing data center investments in the Quincy would be about \$762 million in from 2015-18, assuming Microsoft completes two of the Gen 5 zones by the end of 2018. The Quincy market probably approximately meets the 10 percent growth rate target for a healthy data center market, assuming that level of investment equates to, by 2018, adding approximately 800,000 square feet of capacity since 2015.⁶⁷

It is concluded, then, that the Quincy data center market is probably generally healthy vis-à-vis the 10 percent annual growth rate target, although just marginally so.

The Seattle Data Center Market

The Seattle data center market has been stagnant since 2012 except for expansion directly related to the SIX, which focuses on data exchange and not data processing. Exact numbers on additional capacity are difficult to obtain because of competitive opaqueness, but the data

⁶² <https://researchcouncil.files.wordpress.com/2013/08/datacenterssept2013.pdf>

⁶³ <https://cloudandcolocation.com/datacenters/vantage-data-centers-quincy-data-center/>

⁶⁴ Conversation with Patrick Boss, Port of Quincy, November 2017

⁶⁵ <http://www.datacenterknowledge.com/archives/2017/05/22/dck-investor-edge-how-cyrusones-data-center-design-slashes-cost-delivery-time>

⁶⁶ <https://www.nextplatform.com/2016/09/26/rare-tour-microsofts-hyperscale-datacenters/>

⁶⁷ Interpolating the data from Table 4 to arrive at this figure

center expansion that makes the Pacific Northwest a major data center market is happening in Oregon and to a lesser extent in Quincy – not in Seattle.⁶⁸ Other than two openings in 2013 (the 51,000 square foot Equinix expansion⁶⁹ and the 126,000 square foot 2020 Data Center completed by Clise⁷⁰) there wasn't any significant construction activity in Seattle until H5 modestly expanded its Seattle footprint in 2017.⁷¹ These new Equinix, Clise, and H5 facilities were designed specifically to provide retail tenants high-speed access to the SIX.

By all accounts, Seattle is inherently an attractive urban data center market because of the SIX, connectivity to Asia, the density of tech firms in the area, and large available workforce. On most cost metrics, Seattle compares favorably to other urban data center markets, such as Silicon Valley, New York, and Chicago. But data center growth is not happening in Seattle, although it is in these other urban markets.⁷²

The primary reason that the Seattle data center market has experienced meager growth and high vacancy rates is because Hillsboro, Ore., has emerged as a very attractive alternative.⁷³ A profile on Hillsboro's competitive advantage over Seattle is provided in Appendix A (as such analysis was not central to the directive for this report), but Oregon's lack of a sales tax and its local property tax exemptions has made the Portland suburb an extremely attractive alternative to Seattle. The Hillsboro and Seattle markets have approximately the same lease rates⁷⁴ and similar power costs (McCullough, Appendix B), plus the relative geographic proximity of Hillsboro to the SIX does not impose a significant latency penalty. The key differentiator for a tenant in these two markets is the sales tax applied to their equipment purchases and deployments, which favors Hillsboro by a cost factor of 10 percent. According to data center site selectors, this difference matters greatly.⁷⁵

451 Research's December 2016 Seattle datacenter market report suggests that Seattle market growth has been negatively impacted by aggressive competition from Oregon and by the underlying economic disadvantages of not having sales tax incentives.⁷⁶ As their report notes, the Seattle market's supply growth continues to lag other markets, even though Seattle has built-in advantages from the SIX, from a robust ICT economy, and particularly from its growing cloud economy.

⁶⁸ <http://www.us.jll.com/united-states/en-us/Research/US-Data-Center-Outlook-2017-JLL.pdf>, conversations with JLL's Conan Lee in October and December 2017.

⁶⁹ <https://www.geekwire.com/2011/60-million-data-center-slated-downtown-seattle/>

⁷⁰ <http://www.cliseproperties.com/mp3/properties/2020-data-center>

⁷¹ Note: Digital Fortress, TierPoint, and CenturyLink added minor expansions during the 2013-2015 period

⁷² <http://www.us.jll.com/united-states/en-us/Research/US-data-center-outlook-jan-2017.pdf>, p. 11

⁷³ <http://www.govtech.com/dc/articles/Hillsboro-Ore-Becoming-Regional-Hub-for-Data-Centers.html>

⁷⁴ <http://www.us.jll.com/united-states/en-us/Research/US-Data-Center-Outlook-2017-JLL.pdf>, conversations with JLL's Conan Lee in October and December 2017.

⁷⁵ <http://www.areadevelopment.com/data-centers/Q1-2014/data-center-incentives-tax-breaks-primer-272101.shtml>

⁷⁶ 451 MTDC Seattle 2016 Report, December 2016, <https://451research.com/report-long?icid=4122>

451 Research estimates the Seattle market as having 981,800 square footage of retail and wholesale data center inventory. They estimate the data center supply growth rate for Seattle as 3 percent CAGR from 2013-18, a performance that badly lags the national average.

As detailed in Appendix A, since 2013 virtually all data center site locators looking for an urban location ultimately arrive at a Hillsboro versus Seattle decision. Because of the sales tax differential between them, the deal flow overwhelming favors Hillsboro. As a result, the Seattle data center market now has an 18.8 percent vacancy rate and is underperforming on absorption (Table 1).

An additional outcome of the explosive growth of Hillsboro as a data center market is that it has motivated the state of Oregon to aggressively seek and attract to the Oregon coast every new transpacific submarine cable built in Pacific Northwest over the last 10 years. These submarine cables make Oregon even more attractive compared to both Washington data center markets.⁷⁷

Microsoft and its cable consortium partners have built their New Cross Pacific (NCP) sub-sea cable fiber to land in Hillsboro. The NCP provides state-of-the-art optical amplifier technology to connect Hillsboro to China, South Korea and Japan,⁷⁸ and is already attracting numerous Asian service providers to the Hillsboro market.⁷⁹ Amazon quickly followed Microsoft by making its own investment in a new transpacific cable that will also land in Oregon, and will support Amazon's growing data center investments in eastern Oregon.⁸⁰

The Northwest Access Exchange (NWAX) in Portland is on a growth trajectory to eventually challenge the SIX as the preeminent internet exchange point in the region. Were this to happen, growth in the Seattle data center market could completely stall, even with its heavy concentration of local tech companies.

⁷⁷ <https://www.capremedia.com/major-submarine-fiber-optic-cable-landings-making-business-friendly-oregon-increasingly-attractive-data-centers>

⁷⁸ http://www.oregonlive.com/hillsboro/index.ssf/2015/05/microsoft_plan_would_build_und.html

⁷⁹ http://www.telecomreviewna.com/index.php?option=com_content&view=article&id=1843:microsoft-new-cross-pacific-subsea-cable&catid=3:newsflash&Itemid=131

⁸⁰ <http://www.datacenterknowledge.com/archives/2016/05/13/amazons-cloud-arm-makes-first-big-submarine-cable-investment>

Analysis

The state of Washington is underperforming many other data center markets. The reasons for this boil down to three likely causes:

- Lack of aggressive promotion.
- Quincy market incentives have suffered from historical confusion, and are now marginally competitive with incentives at the national level.
- Seattle market has a structural disadvantage to Hillsboro, Quincy, and some other areas, because of sales taxes.

Attention to remediating any of these causes would likely strengthen Washington's competitiveness in its two data center markets.

Promotion

A number of states are aggressively promoting their data center economies. In Virginia, Gov. Terry McAuliffe has been courting data centers,⁸¹ and announced this activity in his top economic development accomplishments.⁸² Loudoun and Henrico counties have made substantial investments in public relations and at trade shows promoting investment opportunities in their respective areas. The state also has a private-industry consortium that, through the Northern Virginia Technology Council, promotes investment and expansion of Virginia's data center industry.⁸³ The state's Economic Development Partnership directly promotes its data center industry.⁸⁴

New Mexico Gov. Susana Martinez has been road-showing her state to data center companies, including a trip to California that cemented their Facebook win, and a recent trip to Seattle to meet with business leaders to recruit new investment.⁸⁵ Iowa Gov. Kim Reynolds has been personally promoting his state's wind-generated electricity and generous incentives to the hyperscale cohort; Iowa has recently landed all four of the cohort.⁸⁶ Texas Gov. Greg Abbott and the mayors of Dallas and Fort Worth have been active recruiters for their data center

⁸¹ <https://governor.virginia.gov/newsroom/newsarticle?articleId=21430> and <https://wtop.com/business-finance/2017/09/iron-mountain-opens-first-phase-350m-manassas-data-center/>

⁸² <https://governor.virginia.gov/top5/archive/governors-top-5-october-6th-2017/>

⁸³ <http://www.nvtc.org/community/datacenter.php>

⁸⁴ <http://www.yesvirginia.org/KeyIndustries/DataCenters>

⁸⁵ <https://www.bizjournals.com/albuquerque/news/2017/11/08/partnership-pays-for-governors-trip-to-seattle.html>

⁸⁶ <https://venturebeat.com/2017/08/24/apple-to-build-data-center-in-iowa-joining-microsoft-facebook-and-google/>

market.⁸⁷ Wyoming Gov. Matt Mead has a data-center recruitment fund and the state's economic development agency has a grant program for data centers.⁸⁸

Washington hasn't kept up. The ports of Douglas and Grant counties have been locally aggressive, but they lack the national visibility or profile other states are providing. Washington's Department of Commerce does have a business relocation generalist who can assist site selectors who make inquiries, but there is no budget to promote Washington to site selectors or at data center trade events.

Stability of Incentives

Two factors have impacted the Quincy market. First, the data center tax initiatives offered by the state went through a period of uncertainty that hurt the reputation of the state and drove business elsewhere. Quoting directly from Virginia's promotional material:⁸⁹

Washington state's experience with data center incentives is also illustrative, but in a different way. Washington is home to Microsoft's corporate headquarters in Redmond. In December 2007, Washington's Attorney General ruled the state's data center incentives invalid. Microsoft and Yahoo immediately halted construction on data center facilities in rural Quincy, Washington, and Microsoft subsequently chose to move its Windows Azure cloud computing service to another state. Facebook and Amazon also cited state and local taxes as an important consideration in their decisions to construct new data center facilities in neighboring Oregon.

Washington's data center incentives were legislatively re-enacted in April 2010, sparking a construction boom and up to \$2 billion in new private investment in the state. But, in June 2011 the incentives were allowed to lapse, which once again halted data center growth in Washington and drove a \$1 billion investment boom in nearby Oregon as Adobe, Apple, Fortune Data Centers and NetApp all announced that they would be building data centers there rather than Washington. In May 2012, Washington again re-enacted their data center incentives, only to fail to reauthorize them during the 2014 legislative session. Microsoft subsequently cited that lack of reauthorization as a motivating factor in its decision to build a new \$1.1 billion data center in West Des Moines, Iowa, rather than Washington. Washington then re-enacted its data center incentives yet again in July 2015.

As Virginia points out, the market abhors uncertainty, and predictable competitive tax incentives are a critical component of the competition between states for data centers. JLARC's

⁸⁷ <http://www.star-telegram.com/news/business/article114187393.html>

⁸⁸ http://trib.com/news/state-and-regional/govt-and-politics/new-microsoft-data-center-coming-to-cheyenne/article_2083e6e0-6a72-51f0-a198-992793fd0a15.html

⁸⁹ http://www.nvtc.org/documents/advocacy/NVTC_DataCenter_Report_011316_final_lowres.pdf

2016 recommendation to continue the tax preference⁹⁰ provided stability for the Quincy market, and has led to expansion of the Microsoft footprint as well as interest from Cyrus One.⁹¹ However, market momentum was lost and now must be regained.

While the Quincy market now benefits from more predictable tax incentives, those incentives themselves are not as competitive as they once were. In 2009, only seven states had incentives. Today 27 states offer incentives specifically targeted to data centers. Most incentives provide sales and use tax exemptions, but some offer construction subsidies⁹² and property tax exemptions.⁹³ At least one state is considering the subsidization of electricity rates.⁹⁴ Thirteen states since 2012 have lowered the investment threshold to \$100 million or less, ostensibly to attract smaller data centers. States with incentive packages in place are updating them to stay competitive.⁹⁵

Seattle Competitiveness

Washington is almost the only state that limits its sales and use tax exemptions to specific rural counties. The data center market has changed dramatically since the state of Washington formulated its thinking. The projects are larger, the stakes are bigger, and there are three times as many states competing for these deals.

The urban data center market in geographies outside of hurricane zones are flourishing, except for the Seattle market. Hillsboro will continue to grow at Seattle's expense until and unless there is economic parity.

The economic and business models for data centers means that the Seattle and Quincy data center markets do not compete with each other. It is largely eastern Oregon versus Quincy, and Hillsboro versus Seattle.

Urban Washington counties that do not have access to sales and use tax exemptions for data centers will continue to be at a competitive disadvantage to other urban data center markets, such as Portland that either do not have sales tax or that offer tax incentives that abate the sales tax.

⁹⁰ <http://leg.wa.gov/ilarc/taxReports/2016/DataCenterEquipment/f/print.htm>

⁹¹ <https://cyrusone.com/data-center-locations/washington/>

⁹² <http://www.revenue.nebraska.gov/incentiv/Summary.pdf>

⁹³ <http://www.in.gov/legislative/bills/2012/SE/SE0302.1.html>

⁹⁴ <http://www.dispatch.com/news/20170906/who-will-pay-if-amazon-gets-aep-break-on-data-center-electricity>

⁹⁵ http://www.nvtc.org/documents/advocacy/NVTC_DataCenter_Report_011316_final_lowres.pdf

Closing Observations

Analysts and other experts are uncertain as to when the data center boom might slow down. Future growth is tied to the emergence of new technologies that might need to be hosted in data centers, such as artificial intelligence, autonomous vehicles, robotics, and global healthcare. Future growth is also tied to which business enterprises shutter their own data centers in favor of retail or wholesale tenancy, or move their workloads to a cloud vendor, a trend that is expected to accelerate but that may be held hostage to growing nationalistic concerns about data sovereignty. Growth could also be constrained by the availability of suitable and affordable land, connectivity, and power.

States have started to talk less about job creation and more about data centers as a source of taxation and local economic development.⁹⁶ There are also derivative outcomes from having fiber density, land use improvements, and cutting-edge investments in new power, chip, and HVAC technologies. Data centers also create tremendous economic value without putting any significant burden on roads or service infrastructures. There are legitimate concerns about a “rush to the bottom” outcome from tax incentives, but the consensus is that, if one looks beyond just direct employment, the outcome for competitive states appears to be robust.⁹⁷

⁹⁶ http://www.mdjonline.com/neighbor_newspapers/west_georgia/news/douglasville-approves-tax-incentive-plan-for-data-center-construction/article_9baeaac6-cefa-11e7-9f69-53aecb4fea23.html and <http://www.datacenterknowledge.com/archives/2017/02/28/idaho-considering-data-center-tax-breaks> and <http://www.datacenterknowledge.com/archives/2013/04/29/the-billion-dollar-data-centers> - to cite just three of many articles on this topic.

⁹⁷ http://www.nvtc.org/documents/advocacy/NVTC_DataCenter_Report_011316_final_highres.pdf and http://opportunitywa.org/wp-content/uploads/2015/01/OpportunityWA_Research.pdf

Appendix A: Urban Competitiveness, Hillsboro vs. Seattle

This Appendix presents research conducted by the Department of Commerce to understand why urban Oregon has been so successful -- and the economic benefits the state has reaped. Also analyzed are the state and local policies that appear to have had the greatest impact in supporting Oregon's fledgling data center industry. The research team focuses on the Hillsboro, the suburban city that has been the epicenter for the Portland area's growth in data centers. Findings are based upon quantitative data analysis as well as interviews with industry and economic development experts.

Key Findings

Washington's urban data center cluster at one time was considered to be a world leader both in capital investment and in innovation; it also was ranked among the top-10 data center markets in the world. Thanks to Boeing, Microsoft, the Seattle Internet Exchange, the Sabey Tukwila Intergate, McKinstry, and numerous other innovative infrastructure investors, urban Western Washington's data center ecosystem was the easily the leader in the Pacific Northwest.

Since 2009, however, capital investment in Washington's urban data center cluster has slowed to a crawl as the urban market fled south to the Portland area. Although Western Washington is still an important historical player and Seattle remains one of the world's key exchange points for internet traffic, a fiercely competitive market between data center providers has made the economic advantages of urban Oregon too compelling for new investment[s in urban Western Washington. Thus, Washington has lost out on over \$700 million in new capital investment and close to \$1 billion in overall economic benefits that flowed instead to Oregon.

Oregon's success in building its own urban data center cluster has paid off handsomely, creating 1,360 local jobs and a robust infrastructure that continues to enhance urban Oregon's natural competitive advantage over urban western Washington. Oregon now has six trans-Pacific submarine fiber optic cable landings compared to the one that started operation in Washington back in 2001. Because of its recent data center construction activity, urban Oregon's connectivity infrastructure is newer and can accommodate more growth than what urban Washington can offer.

What accounts for urban Oregon's success? The regional data center industry is hyper-sensitive to the cost of building and operating a facility. Here Oregon has two key advantages:

- Oregon does not have a sales tax. In contrast, Washington sales tax adds as much as 10.1 percent to data center costs.
- Tax incentives in Oregon are much stronger than Washington. They include an Enterprise Zone Program that offers 100 percent property tax abatement for up to five years.

One other advantage Oregon possesses over Washington is its Oregon4biz program. This initiative provides substantially greater coordination between state and local government in responding to a potential development than our state's Choose Washington program.

Washington does have one advantage that could be built upon. Our state has stronger connections to East Asia, which is a potential source of leverage in building our digital economy. Existing international trade missions, memoranda of understandings, and changing international data sovereignty laws require Asian enterprises to have a physical nexus in Pacific Northwest data centers to expand their markets.

Why Focus on Urban Data Centers?

This report focuses on urban data centers because those in the rural parts of the state are already competitive with Oregon because they receive a sales tax abatement through the Rural County/Community Empowerment Zone program. Urban growth does not come at the expense of rural Washington because data centers located in urban and rural parts of the state serve different – and even complementary – markets.

Data centers in urban areas typically provide co-location or multi-tenant services to a variety of enterprises. These customers are referred to as “server huggers” because they prefer close and daily access to their facilities, which they lease from the data center providers. This approach lowers cost and risk. These tenants choose locations such as the Westin Exchange Building in downtown Seattle. Co-location data centers need these tenants in order to build in a high-cost urban location.

Rural data centers, in contrast, serve a single large, enterprise-scale company, such as Google or Facebook, which build their own facilities. Large enterprise data centers can usually afford to move into a rural location to take advantage of lower power and real estate costs and are able to better mitigate the cost of risk and emergency access.

These contrasting needs have resulted in two separate data center markets in the Pacific Northwest: western-urban (typically co-location) and eastern-rural (typically enterprise). Urban data centers are rarely in competition with rural data centers because their functions are complementary. Many companies choose to put some of their operations in an urban co-location data center and a larger dedicated data center in a rural area. Companies that build in this manner will usually choose to locate all of their facilities in one state instead of two.

How the Data Center Industry Has Benefited Oregon

The data center industry is experiencing explosive growth globally and nationally.⁹⁸ The drivers for this expansion include a voracious demand for cloud services and an emerging business need to improve geographic distribution of its data centers to improve resiliency and regulatory compliance.⁹⁹ Cloud services alone will double the growth of the data centers industry in the coming five years. Globally, the data center market is growing at compound rate of 12.1 percent; the U.S. represents 44 percent of that total market. The U.S. market is also the most competitive.

The five primary data center siting variables are the 1) cost of electricity, 2) cost of construction, 3) taxes, 4) geography, and 5) access to trans-Pacific submarine cables. The Pacific Northwest is considered

⁹⁸ Data Center Outlook: Strong Demand, Smart Growth North America, 2016, JLL.

⁹⁹ Ibid.

an attractive location because it scores well on many of these variables. Indeed, our region is the nation's fifth-largest data center market -- and the sixth-largest in the world.¹⁰⁰

Since 2009, 20 data centers that could have landed in urban western Washington have instead been built in urban Oregon.¹⁰¹ Indeed, the Portland metropolitan area has become the go-to regional hub for urban data centers in the Pacific Northwest while growth in urban western Washington has languished. As a result, Oregon has won approximately a billion dollars in positive economic outcomes.¹⁰²

While it is true data centers do not create many direct jobs, studies show that a vibrant data center cluster stimulates job growth in related Information and communications technology (ICT) industries. This, in turn, drives significant local economic growth. As a case in point, the data center cluster in the Portland-area suburb of Hillsboro has created a permanent construction and facilities engineering presence in addition to project-based jobs and materials. The data centers also generate numerous secondary jobs related to what they need to consume in utilities and professional, scientific, and technical services.

Average annual job growth in Hillsboro has exceeded 5 percent in the data center cluster since 2009.¹⁰³ Data centers are responsible for creating 55 percent of the new jobs in Hillsboro during this time. According to city officials, Hillsboro's sustained economic boom is directly attributable to its booming data center cluster.

The total capital investment by the data center cluster in Hillsboro since 2009 has been approximately \$700 million.¹⁰⁴

Impact on Urban Western Washington

By size, the Seattle Internet Exchange (SIX) is the world's 12th-largest hub where internet traffic is exchanged between the world's telecommunications providers. The SIX is the world's largest single-city internet exchange point. Because speed is an important feature for internet traffic, it is natural to assume that the area's data center footprint would increase as operators look to get quick access to the SIX. However, dramatic improvements in fiber optics technology allow Portland-based data centers to get their data traffic to the SIX in sufficiently good time.

What this means is that physical proximity to the SIX is no longer a meaningful differentiator when it comes to data center siting. As with many infrastructure projects, taxes, and tax incentives now significantly influence where capital investments are going to be made. The data presented in this report show that urban Western Washington is no longer competitive when compared to urban Oregon. Consequently, urban Western Washington's data center cluster has attracted almost no new recent investment capital. The state has also failed to attract any new trans-Pacific submarine fiber cables that would land in Washington's rural coastal communities.

¹⁰⁰ <http://www.us.jll.com/united-states/en-us/Research/US-data-center-outlook-jan-2017.pdf>

¹⁰¹ Data Center List, City of Hillsboro, 2017.

¹⁰² Technical Memo: IMPLAN Analysis of Hillsboro and Data Center Industry, ECONW, 2016.

¹⁰³ Economic Opportunities Analysis (Oregon Statewide Planning Goal 9) September 30, 2016.

¹⁰⁴ Technical Memo: IMPLAN Analysis of Hillsboro and Data Center Industry, ECONW, 2016.

While the major data center operators and designers are heavily invested in developing eastern Washington's data center cluster, these same groups are developing facilities in urban Oregon rather than urban western Washington. An immediate outcome of this is the state is seeing little expansion of data center footprints in Puyallup, Tukwilla, Lynwood, and Everett. Even in Seattle, where the permits have been issued, the comparative economic advantages of Oregon have led developers to allow those permits to expire rather than build.

How this Appendix is organized

This Appendix examines why urban Oregon has been so successful. Of particular interest is what state and local policies appear to have had the greatest impact in supporting Oregon's fledgling data center industry. The research team focuses on the Hillsboro, the suburban city that has been the epicenter for the Portland area's growth in data centers. Findings are based upon quantitative data analysis as well as interviews with industry and economic development experts.

The next section will compare and contrast the growth in data centers in urban Washington and Oregon. Then the research team delves more deeply into what Hillsboro has done to become a magnet for data centers.

Data Center Growth in Urban Washington and Oregon

Western Washington is home to 33 data center facilities and 58 data center service providers.¹⁰⁵ This part of the state has historically benefited from a strong connection to the Asia-Pacific region and low data transfer delay to large financial centers like New York, Chicago, and San Francisco. Likewise, the region benefits from dense connectivity from the Westin Exchange Building, the KOMO Center, Verizon,

¹⁰⁵ Seattle: Multi-Tenant Datacenter Market Rick Kurtzbein, Research Analyst, 451 Research, December 2016.

CenturyLink, AT&T, and others. As shown in Figure 1 below, the urban data center core in western Washington runs from Everett to Puyallup.

Figure 1: Western Washington’s Data Center Core



Source: Seattle MTDC report, 451 Research (reprinted with permission)

Washington’s urban data center footprint has seen marginal growth over the last seven years. Only two new data centers have opened (Equinix and EdgeconneX), adding just 24,450 square feet of brand new facility space.¹⁰⁶ In addition, absorption of this new supply has been slow due largely to regional competition with Hillsboro. There are no plans for any development in 2017.

¹⁰⁶ Ibid

Hillsboro, in contrast, has seen the opening of twenty new facilities in the last seven years, with a total square footage of 259,587 – more than 10 times the development in western Washington (see Figure 2).

Deal Flow in Favor of Oregon

Most data center site locators have considered western Washington, but chose Hillsboro. These companies included Adobe, T5, Riot, Comcast, Infomart, LinkedIn, and NetApp. In addition, a number of international operators are now in their site deliberation phase, including Alibaba, Baidu, Tencent, China Telecom, China Unicom, and China Mobile. Preliminary indications are these deals will also land in Oregon.¹⁰⁷ The current deal flow in favor of Hillsboro has had a significant impact on new investment in urban western Washington.

Figure 2: Significant Hillsboro deals since 2009

Company	Capital Investment (millions)	DC Size Power and Sqft (thousands)	Implied or Explicit Reason	Construction Time (months)	Comments	Co-location or Enterprise	Location
Dupont	\$500 (projected)	500SF 50MW	Tax Incentives	Yet to commence	Land acquisition; intent to develop \$500 million facility	Colocation	Hillsboro
T5	\$100	60SF 6MW	Tax Incentives	15	Now building second facility	Colocation	Hillsboro
Comcast	\$100	60SF 6MW	Tax Incentives	18	Under lease from T5	Enterprise	Hillsboro
Infomart	\$200	180SF 24MW	Tax Incentives	16	Expansion for LinkedIn	Colocation	Hillsboro
LinkedIn	\$100	100SF 10MW	Tax Incentives	12	Now MSFT	Enterprise	Hillsboro
Riot Games	\$10	10SF 2MW	Tax Incentives	9	Growing tenant of Infomart	Enterprise	Hillsboro
Adobe	\$120	100SF 10MW	Tax Incentives	18	Owner user	Enterprise	Hillsboro
NetApp	\$115	45SF 8MW	Tax Incentives	15	Owned by Digital Realty,	Enterprise	Hillsboro

¹⁰⁷ Interview: Simon Lee, Sapience.

					NetApp under lease		
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Source: JLL Research

Hillsboro as Burgeoning Data Center Hub

Hillsboro started to become a hub for the data center industry in 2009. A variety of factors have driven the city’s growth, including deliberate local and state efforts to develop this sector that promoted the area’s favorable infrastructure, taxes, low-cost green power, cool climate, physical security, as well as access to skilled labor and key IXPs (Internet exchange points). These data centers have brought at least 1,360 jobs to the area between 2009 and 2015.^{108,109} The new data center projects are presented below.

Figure 3: New Data Centers in Hillsboro since 2009

Xerox (ACS)	Adobe Systems	Comcast
LinkedIn (hosted by Infomart)	Intel JSF1	Oregon Health Sciences Center
Umpqua Bank	Verizon	Equinix
ViaWest	Riot Games	NetApp
EdgeConnex	Digital Realty Trust	Opus Interactive
T-5 @Portland	Infomart	Tata Communications
Dupont-Fabros	OVH	

Source: IMPlan Analysis Hillsboro and Data Center Industry, JLL Research, Hillsboro Office of Economic Development

After considering Washington, OVH, the large French cloud services and hosting provider announced in February 2017 that it was building its new data center in Hillsboro.¹¹⁰ OVH plans to house approximately 80,000 servers in a 112,500 square-foot facility.

LinkedIn also recently opened a new 100,000 server data center in Hillsboro after passing on Washington.¹¹¹ The company stated that its new facility “is the most technologically advanced and highly efficient data center in our global portfolio, and includes a sustainable mechanical and electrical system that is now the benchmark for our future builds.”¹¹²

Meanwhile, a recently announced DuPont Fabros data center could capture as much as \$500 million in new capital investment.¹¹³

¹⁰⁸ Economic Opportunities Analysis (Oregon Statewide Planning Goal 9) September 30, 2016.

¹⁰⁹ Technical Memo: IMPLAN Analysis of Hillsboro and Data Center Industry, ECONW, 2016.

¹¹⁰ <https://data-economy.com/heres-know-ovhs-new-us-data-centre/>

¹¹¹ https://engineering.linkedin.com/blog/2016/11/linkedin_s-oregon-data-center-goes-live

¹¹² Ibid

¹¹³ <http://investors.dft.com/phoenix.zhtml?c=214717&p=irol-newsarticle&ID=2149356>

Figure 4: Where Data Centers are Located in Hillsboro



Economic Impact of the Data Center Industry in Hillsboro

This section aims to examine Hillsboro as a data center hub, based on its increasing number of establishments, capital investment, and job growth. Also examined are multiplier effects, economic and fiscal impact, wages, purchasing power, industry clusters, and forecasted growth.

This case study is largely based on Hillsboro's internal IMPLAN report, and the *City of Hillsboro Economic Opportunity Analysis: Oregon Statewide Planning Goal 9* of 2016. The report drew upon CBP NAIC data to provide a five-year snapshot of the economic impacts for operations of 12 out of 16 data centers. Additionally examined was whether the abstracted data center cluster and subsectors grew in parallel, and how many jobs can be attributed to the cluster.

Data centers in Hillsboro have had significant economic impact on the city and state, as attested to by city officials and third-party consulting firms like *ECONW*.¹¹⁴

IMPLAN Analysis 2010-2015

The IMPLAN analysis found that between 2010 and 2015, the data center industry accounted for 740 construction jobs in Hillsboro. *ECONW* estimated construction in Hillsboro averaged 82 full-time jobs annually during this period, with 95.8 percent being local hires. These jobs generated \$41.8 million in local wages over the five-year period.¹¹⁵

Data center investments in servers and equipment actually is several times what is invested in buildings. Thus, capital investment in Hillsboro during the 2010-2015 time period totaled \$695 million, of which \$452 came from servers and equipment and \$243 million from construction; servers will be replaced approximately every three years, so capital spending never stops. Of the \$695 million, \$101.8 million went directly to Oregon businesses.¹¹⁶

Impact via Operations 2015

Data center operations in 2015 accounted for a total of 213 jobs in Hillsboro, 97 directly at the centers and another 116 indirect and induced jobs in the city, with a total of \$14.3 million in worker's wages and benefits.¹¹⁷ Hillsboro data centers supported \$17.8 million in compensation for dependent jobs located elsewhere in Oregon.

¹¹⁴ Economic Opportunity Analysis: Oregon Statewide Planning Goal 9. *ECONW* analyzed the impact of the industry in Hillsboro in 2016, published as an internal IMPLAN memo.

¹¹⁵ Technical Memo: IMPLAN Analysis of Hillsboro and Data Center Industry, *ECONW*, 2016.

¹¹⁶ *Ibid*

¹¹⁷ *Ibid*

Multiplier Effects and Economic Output

The multiplier effect measures the number of additional jobs created by each direct data center job and its spending on services such as utilities, electrical contractors, and technical experts. There is likewise a multiplier effect through the purchase of related goods and services. In turn, these goods and service providers buy from others.

In 2015, Hillsboro's data centers had total business expenditures of \$16.2 million, with another \$6.5 million from employees and contractors, from the data centers and vendors, and to local businesses.¹¹⁸ In total, Hillsboro economic output was \$51.5 million, with \$28.8 million of that from data center-related economic activity.¹¹⁹ For Oregon as a whole, economic output as a result of Hillsboro's data center industry was \$65.2 million. It should be noted that this includes owners and operators of data centers and not tenants.¹²⁰ For example, the electrical consumption of tenants was approximately \$35.3 million in 2015. Economic output does not include the fiscal revenue for local and state government.

Fiscal Impact

Data centers yielded fiscal benefits for all levels of government. In 2015, Hillsboro's data center industry paid \$5 million in state and local taxes.¹²¹ This estimate includes direct data center taxes, direct data center employee taxes, and indirect employee taxes. Though there are property tax abatements through the enterprise zones and an absence of a statewide sales tax, data centers still pay taxes via community service fees, franchise fees, and payroll. Similarly, data center employees pay income and property taxes. Co-location and multi-tenant data center owners and tenants both pay franchise fees.

Hillsboro collected another \$3.47 million in 2015, largely from land property and structure taxes, on top of the \$5 million from direct data center taxes, direct data center employee taxes, and indirect employee taxes.¹²² This includes employees paying income and property taxes, estimated as a percentage of Washington County personal revenue. Indirect employees paid roughly \$700,000 in property and income taxes. When combined, data centers, direct employees and indirect employees contributed \$4.98 million in fiscal revenue for FY2015, with \$3.5 million directly from data centers, and \$1.5 million from employees. \$2.8 million went to the City of Hillsboro, \$1.03 went to the state, and \$1.13 went to schools. Wages are not only a source of fiscal impact, but also communal economic health via purchasing power and attracted capital.¹²³

¹¹⁸ Ibid

¹¹⁹ Ibid

¹²⁰ Ibid

¹²¹ Ibid

¹²² Ibid

¹²³ Ibid

Labor, Wages, and Economic Trends

Hillsboro is a net importer of labor, with 23,000 more workers coming daily into the city than outgoing. Eighty percent of Hillsboro’s workforce resides within 25 miles of the city.¹²⁴ Eastern Washington County, Bethany, Cedar Mill, Rock Creek and Portland’s close-in neighborhoods feed into Hillsboro employers.

The presence of higher-wage industries boosts the wages in Washington County beyond the regional average. More granularly, local labor wages are higher between certain sectors, and the highest wages are in manufacturing, information, and wholesale trade. Overall the local and regional wages are increasingly different.¹²⁵

The *City of Hillsboro Economic Opportunity Analysis: Oregon Statewide Planning Goal 9* projects average annual employment growth rate at 2 percent, with a total growth of 40,000 jobs to 2035.¹²⁶ The forecast assumes the computer and electronics manufacturing sector continues to outperform national trends, emphasizing the city’s persistent and active support for local targeted industries. The analysis predicts an “exceedingly positive” information sector, built on software, data processing, and data centers.¹²⁷

Increased Purchasing Power Translates Into New Development

Hillsboro outperforms the Portland metropolitan area on wages, with 42 percent of households earning \$75,000-plus annually versus 38 percent for the region. Naturally, higher wages lead to greater purchasing power, attracting higher-end commercial tenants, greater amenities and development.¹²⁸ As a result, Hillsboro has seen an influx of commercial centers and developments, including:

Reed’s Crossing – 1,400 acres in South Hillsboro that will house 20,000 residents. Plans include 8,000 homes by 2035, along with 286 acres of new parks and 15 miles of new multi-use trails. This will push Hillsboro past Gresham to become Oregon’s fourth-largest city. Two elementary schools and one middle school will be added to the area. A \$300 million transportation package proposed to accommodate the growing needs of the community.

Orengo Station – A new transit-oriented community of 1,800 homes, with a town center, along with office and retail space. The PDX Max Light Rail will service this community.

Hillsboro Majestic Business Park – A new 73-acre business park, including TopGolf’s first Pacific Northwest location and a 200,000 square foot data center in this business park.

¹²⁴ Ibid

¹²⁵ Ibid

¹²⁶ Ibid

¹²⁷ Ibid

¹²⁸ Ibid

Candlewood Suites – A 92-room hotel opening in Spring 2017. The number of Hillsboro’s hotel rooms has almost doubled from 1,225 in 2013 to 2,394 rooms in 2015, including Residence Inn and Holiday Inn in 2016.

Crescent Park Greenway – In development stages to build a 16-mile greenway loop around the city.

Economic Resiliency Parallel with Data Center Influx

Not only are wages and purchasing power higher because of the influx of data centers, but Washington County is also more economically resilient. During the recession, the county experienced a decline in job growth only through 2009. In contrast, Oregon as a whole experienced a downturn through 2010. In addition, Washington County now has 11,000 more jobs than before the recession.¹²⁹

¹²⁹ Ibid

Attributes and Key Factors in Data Center Siting

Overview

Excluding tax incentives, there are few differences between Hillsboro and urban western Washington. Costs of power, construction, and operation are comparable.¹³⁰ The talent pool is similar. Geographic risk is virtually identical.

According to site locators, sales taxes and tax incentives are typically the deciding factor in an urban Washington versus urban Oregon location decision. Oregon's enterprise zones provide 100 percent property tax abatement for up to five years. This abatement, when combined with Oregon's lack of a sales tax, saves data center developers and owners 10 percent to 30 percent of total project and equipment-replacement costs. These savings in capital costs are driving the growth of co-location and multi-tenant data centers in Oregon.

Tax Incentives

"Why would I build a data center for \$220 million in Washington, when I could build it for \$200 million in Oregon?"— John Sheputis, CEO of Infomart

John Sheputis regards the tax structure in Oregon, with its lack of a sales tax and the Hillsboro Enterprise Zone property abatements to be far more attractive to developers than Washington's. Indeed, he calls it a "no brainer."

Oregon's tax structure is among the most business-positive in the country, ranking at 10th nationwide. The state has no specific data center tax exemption. However, through the Enterprise Zone Program, there are 69 (15 urban and 54 rural) locations that allow for 100 percent property tax abatement for three-to-five years. Additional incentives are offered, including Construction-in-Progress, locally-developed incentives, and the right to lease or purchase state-owned property for authorized use. These incentives are explored in greater detail in Appendix B.

Sheputis says it costs him as a co-location developer roughly \$1,000 per square foot, with 20 percent of that the building, and the remainder being high-end, specialty electronics and mechanisms. Sales and property tax range add between \$200 and \$400 per square feet. He states that data centers are not simple warehouses, but are built by the same mission-critical engineering firms that construct hospitals. Redundancy and system monitoring are key components of a data center location, where no device is left to chance.

¹³⁰ Site Selection Strategies for Enterprise Data Centers: Taxes, Incentives, Power Costs and Facility Construction Costs Drive Cost-Effective Site Selection in US Markets, CBRE, December 2015.

Furthermore, ongoing capital costs are costly. The equipment that goes into the center must be replaced every three-to-five years, as devices age or new technology comes out. A single server rack for a tenant can easily contain equipment costing in the \$200,000-to-\$300,000 range, with hundreds or even thousands in a single data center.

In light of these high ongoing capital costs, the prospect of unstable tax laws could potentially result in added costs ranging from tens to hundreds of millions of dollars, spread over the 20- to 30-year lifespan of a facility.

Sheputis's perspective on risk and access are connected. Data center operators and tenants view data as "money in a vault" that requires protection. This protection comes in the form of being able to maintain continuous operational integrity and connectivity without fail. This necessitates potential access at all times, not only for routine work, but also in the case of disasters. He uses the example of hurricanes striking Miami, which is home to a data center which much of South America relies upon.

Accessibility relates also to proximity to IT hubs and redundant fiber networks. For a co-location operator, a robust customer base is more likely to be found in an urban area with an IT hub. Enterprise data centers such as Facebook or Google can afford their own rural data centers since they have no need for tenants but Sheputis says, "I'm not Google."

Matt Mochary, CEO of Fortune Data Centers, explicitly states on the combined matter of taxes and urban accessibility: "When we did the math, sales and property tax equals one-third of the operating cost of a data center...those added up to Oregon and the Portland area because it's a whole lot easier to get to than any other part of the state."¹³¹

Similarly, Thom Bryant, NetApp's vice president of workplace resources says: "Our objective for this new facility was to obtain the most efficient and cost-effective data center possible, in the shortest time feasible."¹³²

John Sabey Jr., CEO of Sabey Datacenter Properties, echoes his colleagues on the subject. Sabey, who is one of Washington's largest co-locations, stated that he has no plans for further expansion or development in western Washington and is considering Hillsboro. The primary reason is taxes.¹³³

¹³¹ <https://www.bizjournals.com/portland/print-edition/2011/10/21/hillsboros-data-center-surge.html?page=all>

¹³² <http://investor.digitalrealty.com/investor-relations/news-and-events/news/news-details/2011/Digital-Realty-to-Build-Custom-Data-Center-For-NetApp/default.aspx>

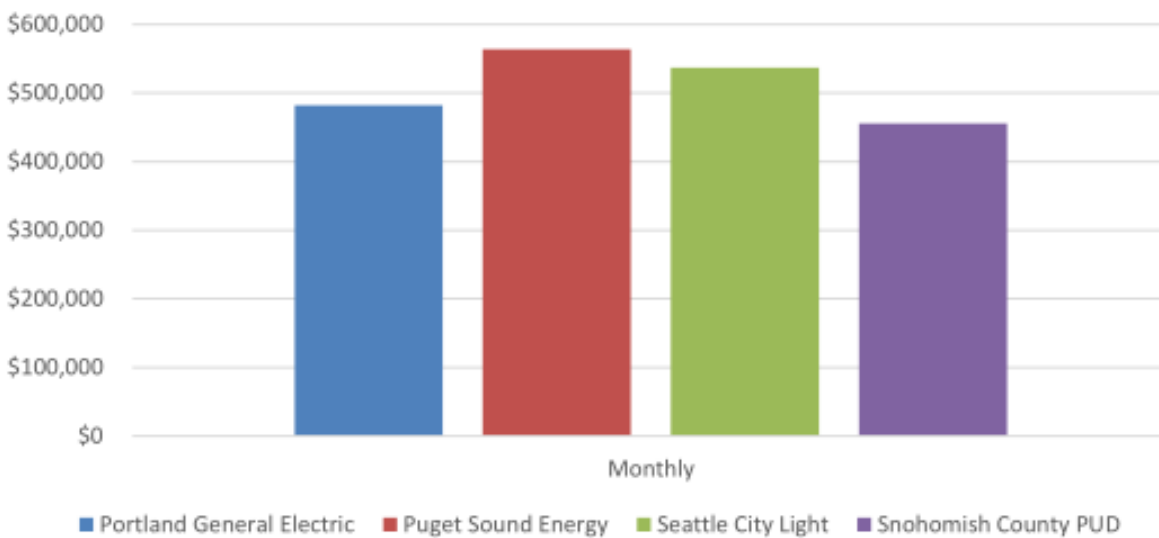
¹³³ Phone Interview: John Sabey, Jr.-Moh Kilani, 2017.

Cost of Power

While power consumption and cost are major considerations for the siting of data centers the cost is nearly the same in Hillsboro and greater Seattle, according to McCullough Research.¹³⁴ What follows is a summary of a more indepth memo located in Appendix B.

Portland General Electric charges \$.066/KWh, Puget Sound Energy charges \$.077/KWh, Seattle City Lights charges \$.074/KWh, and Snohomish County Public Utility District charges \$.062/KWh.

Figure 5: Monthly Electricity Cost for a 10-Megawatt Data Center



Source: McCullough Research

They also note that Seattle has four times the number of data centers, but seven times the population. They conclude: “Given nearly equal electricity rates, similar quality digital infrastructure, and similar electrical reliability, the only major difference between Oregon and Washington, with regard to data centers, is different tax policies.”

Regardless of high power usage, consistent equipment life cycles, and high cost of capital investment across the industry, none of the evidence seen in the course of this research suggests power costs to be significant factors in shifting data center investment from Washington to Oregon.

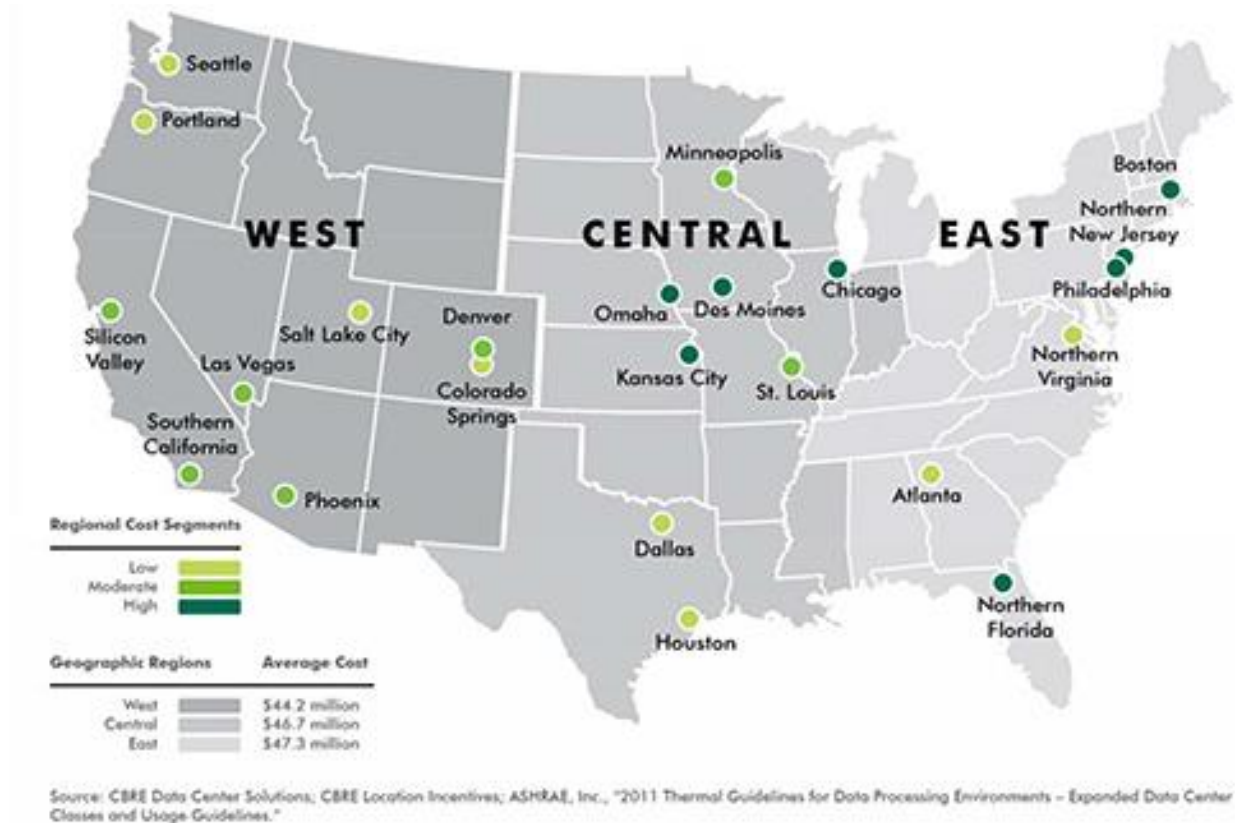
¹³⁴ Data Center Electricity Costs: McCullough Research, 2017.

Cost of Labor, Land, and Wages

Reports by JLL, CBRE and interviews with industry experts such as Sheputis¹³⁵ found that the cost of labor, land, and wages are considered too similar throughout the Pacific Northwest to be a major factor in a siting decision.

Both Western Washington and Oregon are considered to be low-cost destinations for the co-location industry, with the one major cost differential being taxes.¹³⁶ Country-wide, there can be significant cost variance in these attributes, but for the Pacific Northwest, they are considered to be low cost and similar enough to not warrant great concern.^{137,138}

Figure 6: Market Costs by Cost Segment and Region



Source: CBRE (reprinted with permission)

¹³⁵ Site Selection Strategies for Enterprise Data Centers: Taxes, Incentives, Power Costs and Facility Construction Costs Drive Cost-Effective Site Selection in US Markets, CBRE, December 2015.

¹³⁶ Ibid

¹³⁷ Ibid

¹³⁸ Direct Conversations with Sabey, Sheputis, and others.

Asian-Pacific Proximity

The sheer number and potency of Chinese digital financial firms is a potential leverage point for western Washington, which already has strong and enduring ties with China. In particular, hyperscale cloud providers are considering various locations in western North America, including Vancouver, B.C.¹³⁹

Alibaba, Tencent, and Baidu were previously mentioned as examples of Chinese companies still in deliberation about where to site their respective Pacific Northwest data center footprint. The potential for these companies to enter further into agreements would be great boon to the regional technological ecosystem.

Urban Western Washington has cultivated significant relationships with China in the last few years, as evidenced by memoranda of understandings with Shenzhen and Hangzhou. This raises the possibility of creating multiple Hillsboro-like data center hubs in other urban parts of Western Washington such as Tacoma or Everett.

Trans-Pacific Submarine Cables

Oregon has six submarine cables, with another one on the way. Hillsboro itself has three submarine cables, with a new one planned with Microsoft as a partner. In contrast, the entire state of Washington has only one submarine cable.

In addition, Oregon's cables are newer, ranging from last year to 1999. Washington's cable infrastructure is from 1999.

This technology is the lifeblood of connectivity and Oregon has a clear advantage.

Governmental Responsiveness to Site Locators

Another factor that can influence the location of a data center is the assistance provided in developing a facility. The Oregon4biz program emphasizes strategically recruiting companies outside of the state to fill supply chain gaps. A wide range of services are provided, including access to capital, infrastructure development, and workforce development.

Oregon's program has similarities to our state's Choose Washington program. One major difference is that Oregon4biz displays considerably greater coordination between state and local government. In contrast, Washington's most significant recent attempt to cultivate vertical integration, the Innovation Partnership Zones program, provides no funding to local and corporate participants. The main benefit for the zone is using state recognition in marketing.

¹³⁹ <http://www.jll.ca/canada/en-ca/Research/CAN-Western-Canada-Data-Center-Outlook-H1-2017-JLL.pdf>

Detailed Analysis of Tax Incentives in Hillsboro

Oregon's tax structure is among the most business-positive in the country, ranking at 10th nationwide. Oregon has no specific data center tax exemption. However, through Oregon's Enterprise Zone Program, there are 69 (15 urban and 54 rural) locations that allow for 100 percent property tax abatement for three-to-five years. There are additional potential incentives including Construction-in-Progress, locally-developed incentives and the right to lease or purchase state-owned property for authorized use.

This is in addition to the absence of a statewide sales tax. There are two special designations within the enterprise zone rubric including Rural Renewable Energy Development Zones (RREDZ) and Long-term Rural Facility Incentives that differ in abatement time, required investment and nature of business.

There are both State requirements, as well as local zone sponsor requirements. Cities, ports, counties and tribal governments or a combination can be enterprise zone sponsors. Currently there are 30 counties, two tribes, 11 ports and 122 cities in the program. There are 10 cities, eight other ports and three other counties with joint, overlapping sponsorship. Enterprise Zone policy intends to attract business that does not compete significantly within the local economy, in order to attract new income.

Tax Incentive Eligibility Requirements

Business Eligibility

State requirements are applicable to a wide range of businesses. Eligibility encompasses businesses that provide "goods, products, services...not limited to manufacturing, processing, shipping, assembly, and fabrication." It also includes clerical and back-office processes.

Excluded from the enterprise zone are health care, entertainment, finance, professional services, childcare, housing, property management, construction, and retailing goods or services. Ineligible business may qualify for eligible activities if specific employees spend 90 percent of their hours on eligible operations, like administration. This also applies to equipment and property.

There are a few exceptions to the eligibility rules that include E-Commerce, Call Centers, Headquarters, and Hotel & Resort destinations.

E-Commerce business primarily transacting online may qualify in an E-Commerce Enterprise Zone. These zones also provide a 25 percent state income tax credit. Call centers providing mainly financial and retail services are eligible if a) if requests are only by phone, internet, computer, or similar telecommunications and b) 90 percent of customers are in an area that would incur long distance long distance phone charges.

Corporate headquarters maybe exempt if they are "administrative, design, engineering, research, or other centralized facilities serving company operations over a statewide or larger region." Local zone managers must formally attest to the site's significance and regional scope. Additionally, counted jobs are only on-site and not regional.

Employment Requirements

Businesses must increase full time jobs either by one employee, or 10 percent, annually during the abatement period. There cannot be job losses in the remainder of Oregon, at the outset of application. Furthermore, businesses must enter into first sources agreements with local publicly funded job training providers during the abatement period.

The above requirements are for the first three years. To extend the abatement into years four and five, there must be local approval by written agreement with the zone sponsor, including any new local requirements. Additionally, the Standard Exemption Handbook states:

“Except in a Salem or Portland-area urban enterprise zone, employees whose job or position is first created between the submission date of the authorization application and December 31 of the first exemption year, must satisfy two requirements.

1. In the extra one/two years, their wages on average must equal or exceed the then most recently available final figure for the county in which is located the qualified property.
2. During all five years, average annual compensation for the new employees must be at least 130 percent or 150 percent of the county average annual wage, for which:
 - a) Wage level is set at the time of authorization and typically will not change.
 - b) “Compensation” includes not only wages and other taxable income but also financial or fringe benefits, such as health insurance or pensions that the employees receive (but excluding mandatory expenses like workers’ compensation or payroll taxes).
 - c) Minimum is 130 percent of wage level, if at the time of written agreement, the zone is (at least partly) in a county that has a general property tax rate of 1.3 percent or greater and is outside a metropolitan statistical area.”

Property Eligibility

Property must be new, within the zone and constructed, modified, or installed for income generation. The applying business must own the property, and it must be on leased or owned property. Machinery must either be new acquisitions or newly transferred into the county.

New buildings or modifications and heavy, immovable equipment should amount to \$50,000 or more. Similarly, movable personal property should amount to \$50,000 or more, while if used for tangible production or e-commerce it must be a minimum of \$1,000.

Incentives

The standard tax abatement is 100 percent on eligible property and equipment for three years, extendable to five if businesses qualify through local sponsor agreement. The Construction-in-Process incentive allows for exemptions for two years during construction of a non-utility, non-hotel and non-resort property. In addition to these, local sponsors can apply their own incentives in the form of waivers, credits, fee reductions, regulatory flexibility and enhanced public services.

Hillsboro's Local Policy Modifications

Hillsboro requires that average wage meets the minimum wage, \$14.75 per hour, during the initial three years. During years four and five, wages must be 102 percent of the minimum, and the average wage must be 125 percent of the minimum. Training and advancement must be provided to employees, while benefits must be at least the national average.

Figure 10: Hillsboro's Two-Tier Tax Incentive Policy

E-Zone Community Service Fee (CSF)	Criteria	Annual CSF (% of total Abated Taxes in that Year)				
		Year 1	Year 2	Year 3	Year 4	Year 5
Tier 1 CSF	< \$20,000 abatement per job created	0%	0%	0%	25%	25%
Tier 2 CSF	≥ \$20,000 abatement per job created	33%	33%	33%	50%	50%

Source: Oregon4biz

Local policy also requires an area-dependent minimum investment, an application fee of 0.1 percent of investment (max. \$50,000) and that the property location be annexed to the city. In the North Industrial Area, the minimum is \$1 million while in the Downtown and South Industrial areas the minimum investment is \$100,000. Additionally, business must have a procurement plan that purchases from local business, at an increasing annual rate of 10 percent.

Hillsboro applies a two-tiered Community Service Fee, based on abated taxes in relation to on-site job growth. More employment leads to a lower fee per year, with a maximum of 33 percent during the initial three years, and 50 percent during the extension years.

In addition to the property tax abatement, Hillsboro also has an absence of local sales, inventory, worldwide unitary, motor vehicle, city or county business income tax and "direct levies on intangible properties."

Conclusion

The inescapable conclusion of this research is that urban western Washington has ceded its leadership in the data center cluster to urban Oregon. Hillsboro has experienced dramatic growth in construction, capital investment, jobs, and income that would likely have flowed to Washington in part or in total if the competitive impacts of Oregon's tax and tax incentive advantages could have been neutralized.

The growth in demand for data centers shows no sign of abating, so there is still an opportunity for urban western Washington to get back in the game, so to speak. It is beyond the scope of this report to balance all the demands on the public purse. However, it is clear that without expansion of the current rural Washington tax abatement regime to urban Washington the latter will continue to lose capital,

jobs, and income to urban Oregon. The OVH and Dupont Fabros deals recently announced for Hillsboro suggest that another billion dollars of economic benefit are in play for the Pacific Northwest in the coming decade.

Appendix B: Report on Electricity Cost Comparison

Date: October 4, 2017

To: Washington Department of Commerce

From: Robert McCullough
Eric Shierman
Robby Gottesman

Subject: Data Center Electricity Costs

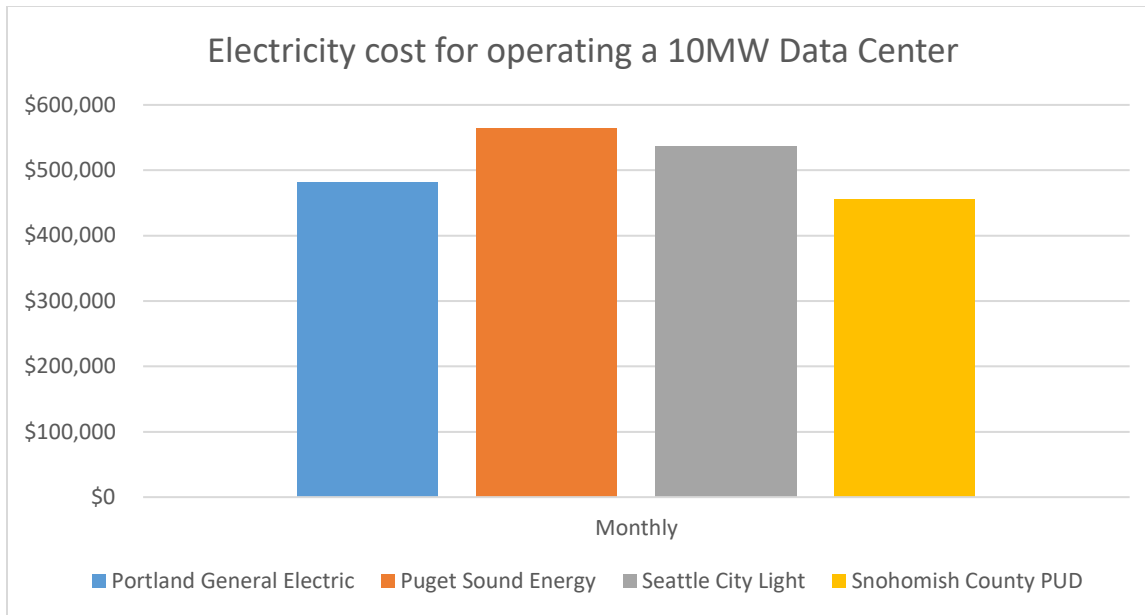
There is not a huge difference between Oregon and Washington's urban electricity costs industrial power. Oregon's costs are on average slightly higher than Puget Sound Energy and Seattle City Light but slightly higher than Snohomish County's public utility district.

Using data from Baxtel.com, a data center information site, we compiled a list of urban server farms for which Baxtel had electricity data for in the Washington counties of King, Pierce, Snohomish, Clark, and Spokane as well as their Oregon counterparts in Multnomah and Washington counties.¹⁴⁰

The average power need per urban server farm is fairly similar in both states. Washington data centers need on average 9 MW of power. Oregon data centers average 8 MW of demand.

Given these similar figures, and considering a 10 MW facility, we can compare prices by utility. Washington's urban server farms fall under three utilities: Puget Sound Energy, Seattle City Light, and Snohomish County Public Utility District. All of Oregon's data centers fall under the purview of Portland General Electric.

¹⁴⁰ <https://baxtel.com/>. Date Accessed: October 2.



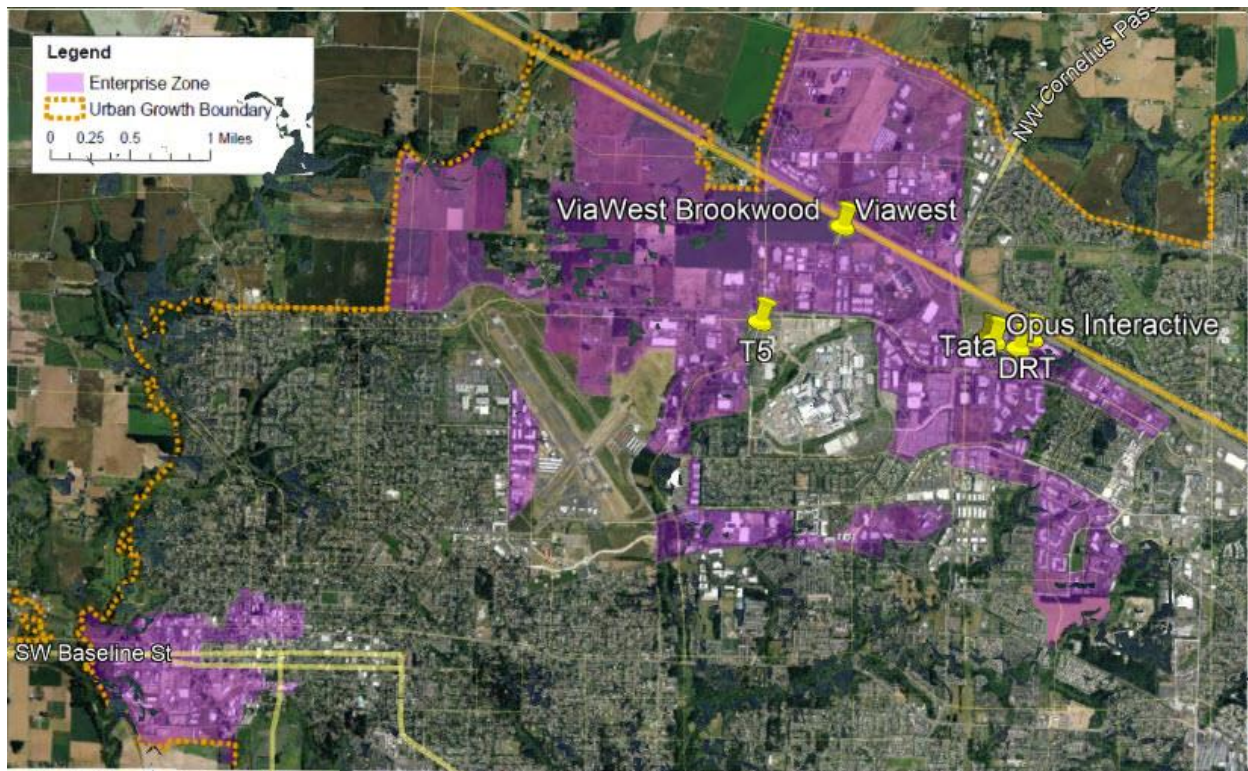
Excluding the flat, basic rate that most utilities charge, Portland General Electric charges \$.066/KWh, Puget Sound Energy charges \$.077/KWh, Seattle City Lights charges \$.074/KWh, and Snohomish County PUD charges \$.062/KWh.

All of these rates are similar, so we would expect that datacenters are opening in Oregon and Washington with equal frequency. This isn't the case however. Hillsboro, Oregon is currently experiencing a data center renaissance, while Seattle is expanding datacenters at a slower rate.¹⁴¹ Seattle only has four times the number of data centers as Hillsboro, but over seven times the population.

Why then does Portland seem to have an advantage? The first answer to this question springs from the nature of these urban server farms' business model. Only a fraction of their sales are in cloud storage for businesses far away. Much of what Portland based data centers do is rent out space to local businesses that want redundant servers at an alternative location with tight security. These are local customers more interested in easy access than the lowest price of electricity many hours away in rural areas. The map below gives us a hint as to why so many companies are building datacenters in Hillsboro.

¹⁴¹ Mike Rogoway. "LinkedIn joins data center rush into Hillsboro." November 23, 2015. Accessed October 4, 2017.

Figure 1: Map of selected datacenters and Hillsboro's "enterprise zone"¹⁴²



All of Hillsboro's data centers are located in its "enterprise zone," which was earmarked by the city to provide property tax abatements to firms that locate there. In addition, Oregon has no sales tax at either the state or local level, and the property tax rate in Hillsboro is currently \$16.75 per \$1,000 of assessed value. Locating in the enterprise zone caps taxing the property to the pre-development assessed value for nearly five years. These tax benefits draw in big players. Last year, DuPont Fabros bought up 47 acres in Hillsboro for what will be Oregon's largest urban server farm, a 500,000 ft² facility that will require 50 MW of power, half of which will be for Microsoft and Facebook's cloud storage.¹⁴³

We interviewed Valerie Okada, a Business Development Coordinator at the City of Hillsboro's Economic Development Department. In pitching Hillsboro to us, she cited the quality of its fiber network, noting there are nine providers and four cable land stations that terminate in Hillsboro. Okada also mentioned the high reliability of its electric substations that do not have the dips and outages other cities have because their infrastructure is up to semiconductor industry standards due to Intel's long presence since they days when they were just a small town. But it is doubtful these features are significantly better than Seattle.

It is the enterprise zones that really incentivize datacenters to locate to Oregon. Oregon's largest urban server farm in operation today, an 11.9 MW, 180,000 ft² facility run by Infomart saves \$769,000 a year

¹⁴² Hillsboro Enterprise Zone Program. <http://208.71.202.105/index.aspx?page=1045>. Accessed October 3, 2017.

¹⁴³ Hammill, Luke, Rogoway, Mike, "Data center company buys Hillsboro acreage for new server farm," The Oregonian, August 4, 2016.

in property taxes for operating in Hillsboro's enterprise zone.¹⁴⁴ Not surprisingly, the other server farms in Hillsboro operate within the borders of that enterprise zone.

Given nearly equal electricity rates, similar quality digital infrastructure, and similar electrical reliability, the only major difference between Oregon and Washington, with regard to data centers, is different tax policies.

¹⁴⁴ Rogoway, Mike, "Data centers' small-town tax breaks bring Silicon Valley to rural America," The Oregonian October 11, 2015.