

ACEC Private Industry Brief

Data Centers & Telecommunications

Special Issue 2022

Introduction & Market Scope

In this *Private Industry Brief Special Issue* we take a deeper look into digital infrastructure which includes data centers and telecommunications markets. *The World Economic Forum* reports that the digital economy will account for 26% of GDP by 2040, while it accounts for 15% today. It also expects technology to reshape healthcare, mobility and energy production in the next 10 years.

According to FMI's *Second Quarter 2022 Engineering & Construction Report*, a surge of investment is expected in office and communication markets. The annual design and construction spending for the office market is expected to grow to \$95 billion by 2026, up 6% year-over-year from \$81 billion in 2023. Data centers are a subset of office and commercial real estate asset classes. Drivers in this market include acceptance of remote work, emerging technologies, and crypto-miners (think Bitcoin). The Infrastructure Investment Jobs Act (IIJA) also allocates \$65 billion in federal funding to broadband infrastructure, the second largest market to receive funding after transportation (*see allocation on page 3*). This includes wireless infrastructure to provide reliable high-speed internet and other telecommunications services, including cables, fiber optics, wiring and other permanent (internal to the structure) infrastructure. Many firms count data center developers and owners as well as telecommunications companies, as major clients.

Top Clients

Key data center investors: Apple, Key News, Amazon Web Services (AWS), CyrusOne, DigitalRealty, Equinix, Facebook (Meta), GDS Holdings, Google, NTT Communications, ST Telemedia Global Data Centres, and Vantage Data Centers.
Source: *Global Data Center Construction Markets & Forecast Report 2022*

Cable companies (ordered by size): Comcast, Charter, Cox, Altice, Mediacom, CableOne and Breezeline.
Source: *Leichtman Research Group, Inc. - Q1 2022*

Phone companies (ordered by size): AT&T, Verizon, Lumen, Frontier, Windstream, TDS, and Consolidated.
Source: *Leichtman Research Group, Inc. - Q1 2022*

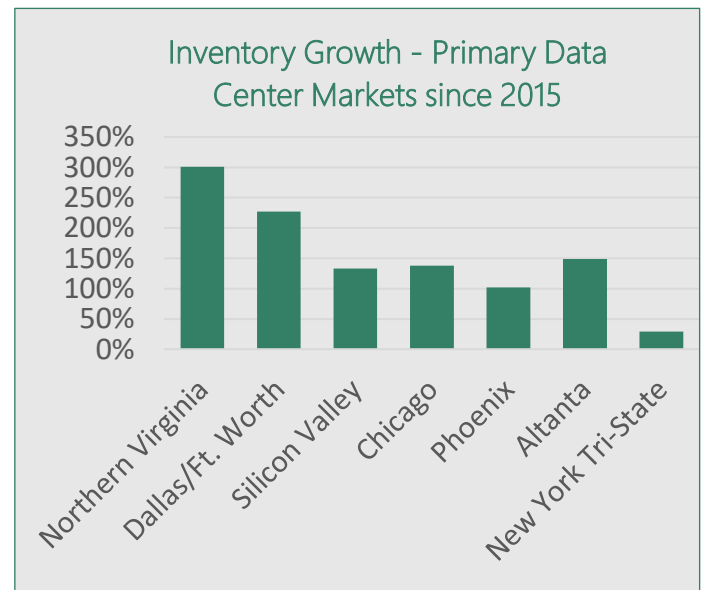
See lists of top A/E/C firms in these markets on page 4.

5 Current Market Trends

► **1. Construction Returns After COVID-19 Delays:**
Gartner, Inc. estimates that 60% of planned new construction for facilities was put on pause in 2020 and 2021 due to COVID-19. With lockdowns in the past, capital expenditures in data centers worldwide are forecasted to grow 10% by 2026 according to a *2022 Data Center IT Capex Report* by Dell'Oro Group (an industry focused research group). According to FMI, total construction put in place for the communication market is expected to grow 8% annually, year-over-year to \$31 billion by 2026, up from the projected \$25 billion in 2023.

Growth in the data center market can also be measured by absorption and inventory. According to CBRE, there was a 50% absorption increase from 2020 to 2021, driving total inventory to grow by 17% year-over-year to 3,358 MW with 728 MW of capacity under construction. Market supply in primary markets grew 9% from the first half of 2021 to the second half. As you can see in the chart below, Northern Virginia remains the largest market with 300% inventory growth from 2015 to 2021. Other primary markets include Dallas/Ft. Worth, Silicon Valley, Chicago, Phoenix, Atlanta, and New York Tri-State, according to CBRE.

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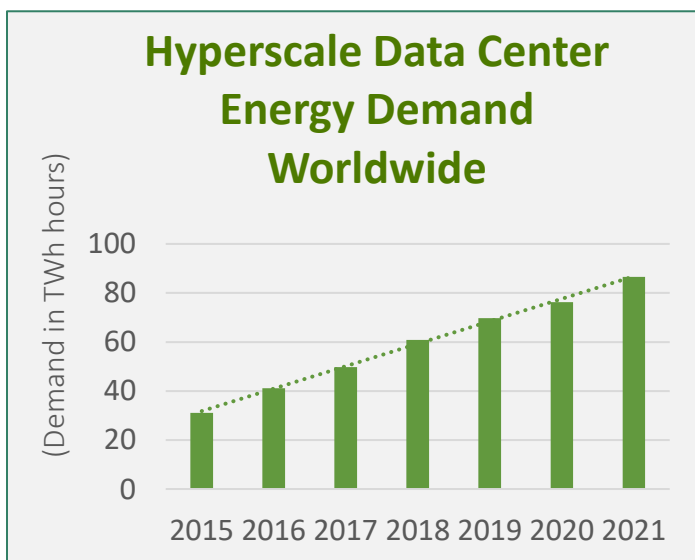
Source: CBRE

5 Current Market Trends *continued*

▶ 2. Emerging Technologies Go Hyperscale:

Advanced technologies including artificial intelligence (AI), internet of things (IoT), 5G and the cloud are all driving energy usage and require more investment. Additional technologies include autonomous vehicles, virtual reality and blockchain. High data consumption rates by consumers are being driven by increases in remote work, social media, and streaming content from providers including Amazon Prime Video, Disney, and Netflix.

There are typically three types of data centers: traditional, cloud and hyperscale. Energy demand by hyperscale centers worldwide hit 87 terawatt hours (TWh), up from 31 TWh from 2015 to 2021 according to Statista's *Energy Demand in Data Centers Worldwide from 2015 to 2021* (see chart below). Hyperscale centers exceed 5,000 servers, 10,000 square feet and provide faster network connections and higher bandwidth for large volumes of data. Hyperscale centers are business-critical facilities designed to efficiently support robust, scalable applications associated with big-data producing companies, including Google, Amazon, Facebook, IBM, and Microsoft.



Source: Statista

▶ 3. Fiber is an Economic Development Tool:

Service can come from incumbent telecommunication companies, cable companies, municipalities, or electric cooperatives. Communities that invest in municipal broadband networks are hoping to also receive the economic benefits that come along with it. Fiber access creates jobs and provides reliable and affordable internet access. According to Deloitte's *Quantifying the Economic Impact of Closing the Digital Divide*, a 10 percentage-point increase of broadband penetration in 2016 would have resulted in more than 806,000 additional jobs in 2019, an average annual increase of 269,000 jobs. Fiber can make a community attractive to new businesses, allow residents to work from home, access healthcare easily and strengthen local housing markets.

▶ 4. Data Centers Reach for Sustainability Goals:

As big-tech companies race toward net-zero goals they consider the carbon footprint of their data centers. The Office of Energy Efficiency & Renewable Energy, an office within The United States Department of Energy reported that data centers consume 10 to 50 times more energy per floor space than a typical commercial office building. Collectively this accounts for 2% of total U.S. electricity use. Data centers are also among the top 10 water-consuming industrial/commercial industries in the U.S., according to Datacenter Dynamics's *Data Center Water Usage Remains Hidden*.

Thus, companies look to alternative designs and power sources to achieve their sustainability goals. For example, the new Facebook Mesa Data Center in Arizona claims to use 60% less water than a typical data center due to a fresh air-cooling technique, as reported by Building Design + Construction. Facebook also offered to address the local communities water consumption concerns with three water restoration projects that claim to restore 200 million gallons of water per year in the Colorado River and Salt River basins and offered to work with local utilities to add solar energy to the grid. Colocation of solar projects and data centers are increasing in areas including Georgia and Texas, where access to acreage is easier than in more densely developed areas. For example, 1 MW of solar requires four acres of land and a data center needs a minimum of 32-50 MW of power.

▶ 5. Supply Chain Disruptions Effect the Market:

Several supply chains intersect for the construction and delivery of data centers including permitting, labor, IT infrastructure, electrical and HVAC. According to the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA), the supply chain for broadband electronics faces competitive constraints with other high-demand goods, specifically cars and bucket trucks. The shortage in semiconductor chips became a particular concern regarding broadband electronics such as modems, central office electronics and satellite ground equipment.

As data center owners experience supply chain delays and inflationary pressures, they turn to a portable method for deploying data center capacity that can be delivered at a fraction of the time and reduced cost. Modularity may be an interim solution until the supply chain stabilizes. A modular data center is a prefabricated unit that can be installed rapidly anywhere, in a remote office or for temporary tasks. According to *the Data Center Construction Market – Global Outlook & Forecast 2022-2027*, 50% of prefabricated modular data center deployments will be complete by 2027 and that will attract more investment in the data center construction market.

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IJA Allocates \$65 Billion to Broadband Market:

IJA allocated \$65 billion over 5 years specifically to broadband (see allocation below). The broadband grants provision of the IJA seeks to provide digital equity for unserved and underserved locations, and community-anchor institutions (CAI's). A CAI could be a school, library, health care facility, public safety entity, colleges, or public housing or community support organization that facilitates broadband service to vulnerable populations. Priority projects will be identified by Broadband DATA Maps, published by the Federal Communications Division (FCC). See map on page 4 for counties with unreliable internet, defined as 25 megabits or less per second download speed. The National Telecommunications and Information Administration (NTIA) established two broadband-focused offices including the [Office of Internet Connectivity and Growth](#) (OICG) and the [Office of Minority Broadband Initiatives](#) (OMBI) which will administer \$48.2 billion of total funding through the following programs:

- **Broadband Equity, Access & Deployment Program (BEAD):** \$42.45 billion for state-administered grants to expand high-speed internet by funding planning, infrastructure deployment and adoption programs.
- **Digital Equity Act Programs:** \$2.75 billion divided into three federal grant programs, \$60 million for a state planning program, \$1.44 billion for a state capacity program and \$1.25 billion for a competitive program to support digital inclusion projects.
- **Enabling Middle Mile Infrastructure:** \$1 billion to connect major and local networks to ensure reliable high-speed internet service for remote communities.
- **Tribal Connectivity:** \$2 billion for the Tribal Broadband Connectivity Program.

Eligible entities for grant funding include public-private partnerships, private companies, public or private utilities, public utility districts and local governments.

Business Development Insight

Know what firms participate in this market

Each year Building Design+Construction (BD+C) offers the *Giants 400 Rankings*, ranking the nation's largest architecture, engineering, and construction firms across 25 building sectors and specialty categories. Engineering News-Record (ENR) releases a similar list of the top 20 design firms by sector.

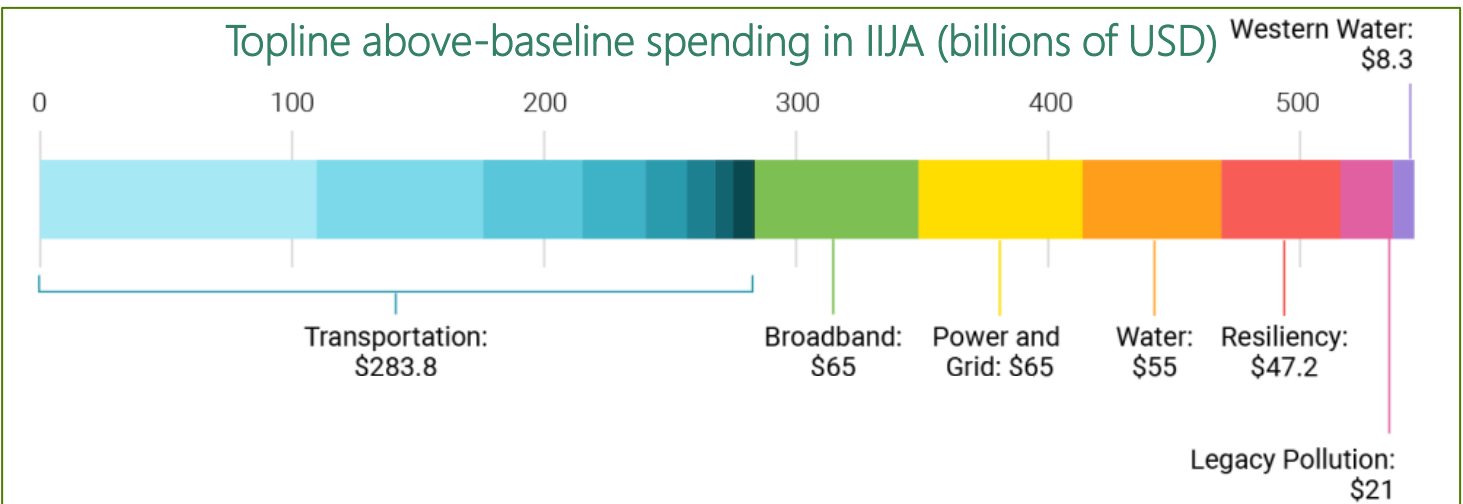
Tracking A/E/C firms provides insight into which firms are already invested in the telecommunications and data center markets. The first table shows the top engineering firms by revenue in the telecommunications market according to the ENR *Top 500 Design Firms List*. The tables on page four show the top architecture, construction and engineering firms in the data center market, according to the BD+C's *2021 Giants 400 Report*.

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Top Engineering Firms in Telecommunications Market

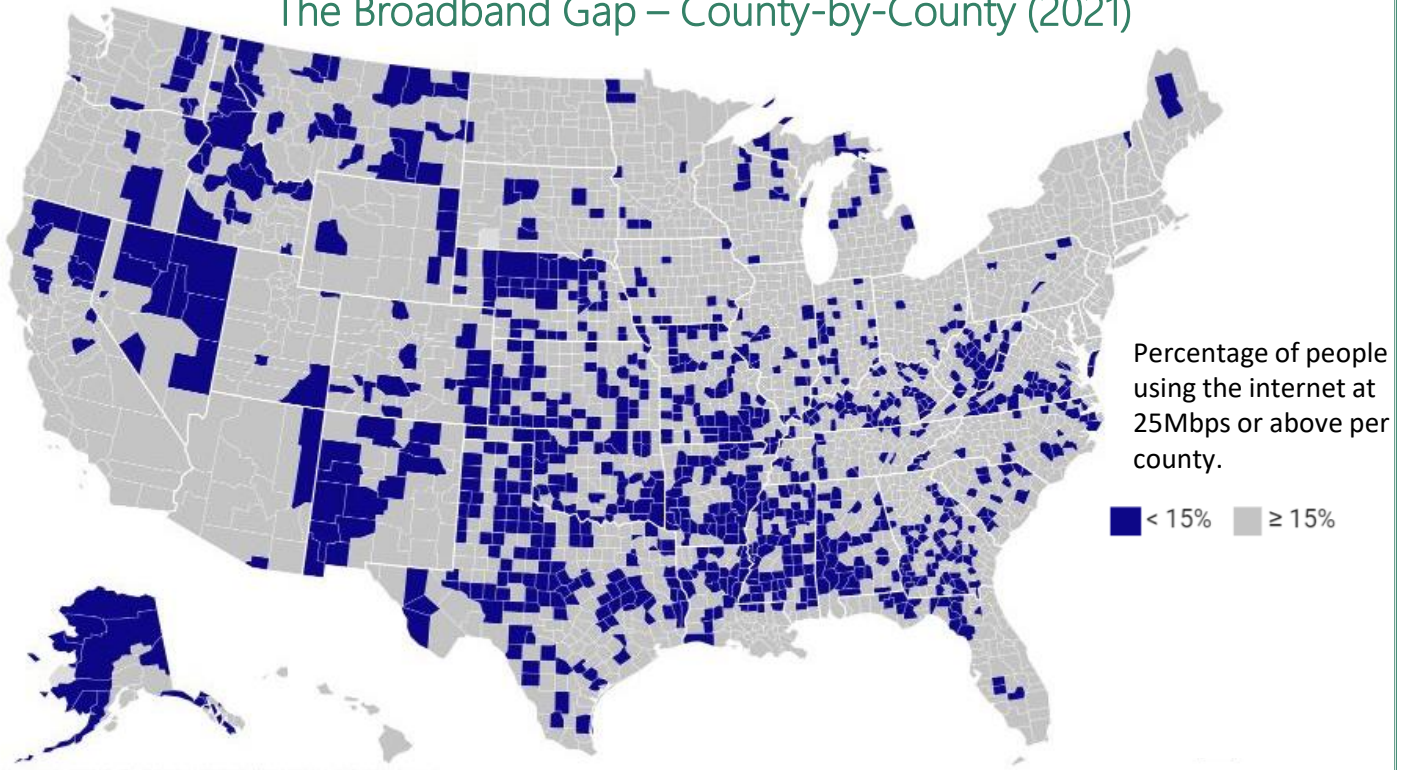
Rank	Engineering Firm
1.	Jacobs
2.	Burns & McDonnell
3.	Tower Engineering Professionals
4.	EXP
5.	Congruex
6.	Black & Veatch
7.	Corgan
8.	Kimley-Horn
9.	Network Connex
10.	HDR

Source: Engineering News-Record 2022



Source: Brookings Institute – Metropolitan Policy Program

The Broadband Gap – County-by-County (2021)



Source: Benton Institute for Broadband & Society

Top A/E/C Firms in the Data Center Market

Rank	Architecture	Engineering	Construction
1.	Corgan	Jacobs	Holder Construction
2.	Gensler	Burns & McDonnell	Whiting-Turner Contracting Co., The
3.	Sheehan Nagle Hartray Architects	ESD	DPR Construction
4.	Page	WSP USA	Turner Construction
5.	HED	Alfa Tech Consulting Engineers	HITT Contracting
6.	HKS	Black & Veatch Corp.	Fluor Corp.
7.	Wendel	HPE Data Center Technologies Services	Fortis Construction
8.	DGA Planning Architecture Interiors	Vanderweil Engineers	Mortenson
9.	Macgregor Associates Architects	AECOM	STO Building Group
10.	Stantec	Syska Hennessey Group	JE Dunn

Source: Building Design + Construction Giants List 2021

Private Industry Briefs

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ACEC's Private Industry Briefs include annual updates of four key markets, including a newly added market K-12 & Higher Education. Further coverage can be found in *Engineering Inc.*'s regular column 'The Private Side.'

