Informational Paper #101

Broadband Expansion in Wisconsin

Broadband Expansion in Wisconsin

Prepared by

Margo Poelstra

TABLE OF CONTENTS

Broadband Expansion in Wisconsin

Introduction

The advent of the Internet has transformed the way that businesses, schools, and other services operate. Broadband, defined as high-speed internet access that is always available, is now considered a necessity for accessing the full range of services offered by the Internet and is essential for Wisconsinites to maximize many social, economic, health, and educational opportunities. To address this changing landscape, the state has multiple programs to improve broadband, with the ultimate goal of ensuring statewide access and adoption of affordable broadband services. As shown in Table 1, $279.0 million was available in the 2021-23 biennium for broadband expansion efforts from state general obligation bonding revenues (BR), segregated (SEG) funds, and federal (FED) sources.

Table 1: Total Available 2021-23 Direct Funding for Broadband Expansion

Funding Source	Amount (Millions)
BR	$125.0
SEG	14.1
FED	139.9
Total	$279.0

As a response to the COVID-19 pandemic, federal, state, and local governments have renewed their urgency in establishing access to high quality, reliable, and affordable internet for all, with perhaps more than an additional $1 billion dollars being allocated for broadband expansion efforts in Wisconsin. In addition to efforts to expand broadband infrastructure development, federal, state, local, and telecommunications partners are collaborating to create more accurate and comprehensive maps and a dataset of broadband access nationwide to inform their efforts. Having comprehensive maps is expected to improve broadband access in Wisconsin by identifying populations and geographic locations that need the most improvement.

This paper will provide an overview of broadband expansion efforts by reviewing current data on availability and affordability of broadband service, and describing state programs and related federal funding dedicated to expanding access to broadband in Wisconsin. Chapter 1 begins by providing a context for broadband service in Wisconsin and nationwide by discussing availability and adoption figures. Chapter 2 provides an overview of the Wisconsin Broadband Office, the Wisconsin Broadband Expansion Grant Program, and state-administered federal broadband funds. Finally, Chapter 3 discusses programs supporting broadband affordability. Appendix I shows a map of fixed broadband service availability in Wisconsin as of December, 2022. Appendix II describes the variety of technologies used in broadband infrastructure. Appendix III details factors influencing the quality of broadband service, including speed, latency, jitter, and packet loss.

Computer and Internet Use

A November, 2021, survey conducted by the National Telecommunications Information Administration (NTIA) in cooperation with the U.S. Census Bureau highlights reliance on the Internet for everyday recreation and responsibilities. The study found that approximately 81% of U.S. households and 88% of Wisconsin households use the Internet. Among Wisconsin adults, the most common uses were email (92%), texting (93%), social media (74%), shopping or accessing other consumer services (81%), and online financial services such as banking or paying bills (76%). Further, 29% reported using the Internet to telecommute, 19% used it to search for a job, and 24% used it to take classes or receive job training.

To get a more complete image of use in Wisconsin, Table 2 shows a detailed overview of the type of computer and connection used according to the U.S. Census Bureau's American Community Survey from 2021. Of the

Table 2: Computer and Internet Use in Wisconsin

Total Wisconsin Households	2,449,970
One or more types of computing devices	2,310,196
Desktop or laptop	1,969,807
Smartphone	2,157,117
Tablet or other portable wireless computer	1,524,220
Other	40,382
No computer	139,774
Households with a Computer	2,310,196
With dial-up internet subscription alone	6,887
With a broadband internet subscription	2,177,511
Without an internet subscription	125,798

*Source: U.S. Census Bureau 2021 American Community Survey

approximately 2.4 million surveyed households, 2.3 million (94.3%) have a computer and 2.2 million (88.9%) have a broadband subscription.

Speed and Access to Broadband

The speed of broadband service, measured in megabits per second (Mbps), is the primary indicator of the quality of broadband service. Speed is expressed in download and upload speeds, reflecting the amount of data that can be downloaded from the Internet to a user's device, and the amount that may be uploaded from a user's device. Typically, download speeds exceed upload speeds, as users usually consume more data than they produce. However, certain uses can have data upload rates that are similar to their download rate, such as video conferencing. Demand for such "symmetrical" service has been growing as a result of the COVID-19 pandemic, as video conferencing and telecommuting have become more common for everyday users. The Federal Communications Commission (FCC) prepares a broadband speed guide for households, which provides approximate speed thresholds necessary to support an increasing number of devices and users. Table 3 shows the approximate capacity of different service thresholds to support numerous devices.

FCC defines 25 Mbps download/3 Mbps upload service as the minimum benchmark for internet service to be considered as "advanced telecommunications capability," that is, broadband service. This speed was raised from 4/1 beginning in 2015, and FCC is required to adjust the rate accordingly as new technologies and use

Table 3: Minimum Download Speed for Internet Uses

	Light Use Basic use: email, browsing, basic video, VoIP, streaming music.	Moderate Use Basic use plus one high-demand use: HD video, multiparty video conferencing,	High Use Basic use plus multiple high-demand at the same time online gaming, telecommuting
One user on one device	3 to 8 Mbps	3 to 8 Mbps	12 to 25 Mbps
Two users or devices	3 to 8 Mbps	12 to 25 Mbps	More than 25 Mbps
Three users or devices	12 to 25 Mbps	12 to 25 Mbps	More than 25 Mbps
Four users or devices	12 to 25 Mbps	More than 25 Mbps	More than 25 Mbps

Source: FCC Household Broadband Guide

behaviors change. As seen in Table 3, 25/3 can support two to three users, one of which is using a high-demand service such as video conferencing. If more than one user is using a high-demand service, speeds faster than 25/3 are typically required. In response to changing internet use behaviors, recent federal funding allocations have begun to require that broadband infrastructure built with federal grants provide service of at least 100/20, with strong preference for symmetrical 100/100 speeds.

In its 2021 Broadband Deployment Report, released in January 2021, FCC estimates that as of December 31, 2019, 82.8% of rural Americans and 98.8% of urban Americans had access to speeds of at least 25/3, as compared to 78.2% of rural Wisconsinites and 99.8% of urban Wisconsinites. FCC has not released a 2022 deployment report. However, according to pre-production broadband access map drafts released in November, 2022, in Wisconsin, 98.3% of residences and 98.3% of businesses have access to 25/3 service, while 84% of residences and 61.2% of businesses have access to 100/20 service. Table 4 shows the statistics from the 2021 deployment report, comparing 25/3 fixed terrestrial connection access in Wisconsin to surrounding Midwest states. While these statistics indicate access and suggest that there are providers and infrastructure to provide broadband service to residents, they are not considered a complete indicator of use of broadband in the state.

Table 4: 25/3 Fixed Terrestrial Broadband Access by State as of December 31

	2016	2017	2018	2019
Total				
Illinois	94.7%	94.7%	95.5%	98.0%
Minnesota	92.6	94.8	96.2	97.5
Indiana	86.9	89.9	94.1	96.1
Iowa	90.5	90.7	93.2	96.0
Michigan	90.2	92.0	94.7	95.8
Wisconsin	86.4	91.3	92.9	93.2
National Average	92.3	93.5	94.4	95.6
Rural				
Illinois	63.5	61.1	67.6	88.0
Minnesota	74.9	83.7	88.1	91.4
Indiana	58.5	67.4	80.3	87.4
Iowa	77.4	77.5	84.2	91.2
Michigan	66.4	73.1	82.2	86.3
Wisconsin	56.9	72.1	77.3	78.2
National Average	69.3	73.6	77.7	82.8
Urban				
Illinois	99.8	99.0	98.9	99.3
Minnesota	98.9	98.9	99.1	99.8
Indiana	97.8	98.5	99.4	99.4
Iowa	97.9	98.1	98.3	98.7
Michigan	98.5	98.6	99.0	99.1
Wisconsin	99.1	99.5	99.7	99.8
National Average	97.9	98.3	98.5	98.8

Source: FCC Broadband Deployment Reports

Adoption of Broadband and the Digital Divide

Despite availability of broadband, a household may not choose to subscribe to such service. It is estimated 64.4% of Wisconsinites have an active 25/3 subscription, compared to an estimated 93.2% that have access. The adoption of 25/3 subscriptions and other broadband speeds in Wisconsin and the national averages according to the FCC deployment report are shown in Table 5.

Table 5: Fixed Terrestrial Adoption Rate

	2016	2017	2018	2019
Wisconsin				
10/1	63.9%	62.7%	67.3%	73.3%
25/3	40.4	48.9	56.1	64.4
50/5	31.4	44.5	51.1	59.0
100/10	N/A	20.3	48.2	55.4
250/25	N/A	1.5	1.4	2.7
National Average				
10/1	66.2	69.7	72.7	76.6
25/3	53.3	60.2	64.6	68.9
50/5	44.2	54.8	60.7	64.2
100/10	N/A	29.6	45.7	50.4
250/25	N/A	4.1	5.5	9.0

Source: FCC Broadband Deployment Reports

There are several predictors of adoption including age, race, ethnicity, education, income, and rurality. The disparate access to broadband service across these factors and the divergence in resulting outcomes for individuals lacking access to service is known as the "digital divide." The following statistics from BroadbandNow's 2022 report on Wisconsin internet coverage and availability, FCC's Broadband Deployment Report, and the 2020 U.S. Census Bureau's American Community Survey (ACS) demonstrate how these factors manifest in Wisconsin and impact statewide adoption of broadband.

Income

FCC estimates that as of December 31, 2019, households living in areas lacking access to both fixed terrestrial broadband service of 25/3 and mobile service of 5/1 (4G LTE) had median household incomes approximately 20% lower than those with access to both mobile and fixed service. According to BroadbandNow, 35% of households with incomes of less than $20,000 do not have internet access, compared to 4% of households with incomes of greater than $70,000 without internet access.

Race and Ethnicity

The ACS indicates that 24% of Black Americans, 21% of Native Americans, 16% of Hispanic or Latino Americans, 12% of White Americans, and 8% of Asian Americans do not have a broadband subscription.

Education

96% of individuals with a Bachelor's degree have access to the Internet in Wisconsin compared to 91% of individuals who did not complete high school.

Age

According to ACS data and BroadbandNow, 7% of Wisconsin adults over the age of 65 do not have access, while 30% of the group do not have a broadband subscription of any type. Adults under the age of 65 are three times as likely to have a broadband subscription.

Rurality

FCC estimates that as of December 31, 2019, 82.8% of rural Americans and 98.8% of urban Americans had access to speeds of at least 25/3, as compared to 78.2% of rural Wisconsinites and 99.8% of urban Wisconsinites. Of the 392,500 persons estimated without access, 384,400 are in rural areas and 8,100 are in urban areas.

The digital divide is demonstrated when individuals in marginalized groups are unable to access the same educational, social, and economic

opportunities as those who are not impacted by disparate access. The Wisconsin Broadband Office defines households with physical access to broadband service, but lacking full access due to limiting factors such as cost of service, quality of devices or service, data limits, provider policies, or lack of digital literacy or devices, as "underconnected." While official FCC data is not yet available for periods beyond 2019, it is likely that the COVID-19 pandemic exacerbated these trends as households, businesses, health systems, schools, and governments shifted more work, education, healthcare, and services to online media and more opportunities required reliable internet access.

Wisconsin Broadband Office

The Wisconsin Public Service Commission (PSC) is responsible for managing state broadband expansion efforts. Expansion efforts are the responsibility of the Bureau of Broadband, Digital and Telecommunications Access, within the Division of Digital Access, Consumer and Environmental Affairs. Also known as the Wisconsin Broadband Office, the Office administers programs to advance the availability, affordability, and use of broadband technology. The Office does so through: (a) administration of broadband expansion grants; (b) supporting the Governor's Task Force on Broadband Access and related digital access and equity efforts; (c) comprehensive mapping of broadband availability in conjunction with telecommunications providers and federal agencies; and (d) certifying communities as broadband- and telecommuter-friendly.

As of December 1, 2022, The Wisconsin Broadband Office maintains 7.75 full-time staff funded by agency program revenue (PR) and 5.0 federally funded (FED) project positions. PR-funded positions include: (a) 0.75 bureau director, whose other time is dedicated to non-broadband supervisory duties; (b) 1.0 section chief overseeing the office; (c) 1.0 program and policy analyst administering the state broadband expansion grant program; (d) 1.0 program and policy analyst leading stakeholder engagement; (e) 2.0 broadband data and mapping staff; and (f) 2.0 broadband grant specialists.

In addition to their primary position duties, broadband staff spend time conducting outreach, providing technical assistance, and building local government capacity and partnerships. The Office is also supported by PR-funded division-level staff, including the division administrator, deputy division administrator, and a division policy advisor. PR staff are funded from the Commission's utility regulation appropriation, which receives revenues from general assessments on all regulated utilities to cover costs of their regulation.

FED-funded project positions are primarily assigned to American Rescue Plan Act (ARPA) program administration and include: (a) 1.0 ARPA grants manager; (b) 3.0 ARPA grants specialists; and (c) 1.0 ARPA program and policy analyst. Additionally, 1.0 fiscal staff within the Financial Services Bureau is funded through ARPA to support the Office. As of December 1, 2022, 14.0 additional federal project positions were approved to support recent federal awards and will be funded by a combination of Capital Projects, Broadband, Equity, Access, and Deployment (BEAD), and Digital Equity Act (DEA) funding. These programs and their funding are described in greater detail later in the chapter. The 14.0 positions are expected to be filled by spring of 2023.

Broadband Expansion Programs

Since 2013, PSC has administered broadband expansion grants through various state and federal programs to increase internet access and quality in Wisconsin. Grant requirements vary based on the fund source supporting grants, with state-funded

grants being subject to the requirements established in state law for eligibility and priority, while federal funds are subject to different requirements, particularly related to the type of infrastructure built and its resulting speed. This section describes program requirements and goals, while a subsequent section describes funding amounts.

State Broadband Expansion Grants

State broadband expansion grants have been provided since 2013, and are available to profit and not-for-profit organizations, telecomm-unications utilities, and municipalities partnering with organizations and utilities. For the 2021-22 grant rounds, areas eligible are those that are "underserved," or lacking access to at least two providers of broadband service, with priority given to areas that are "unserved," or lacking access to at least one provider with service of one-fifth the FCC broadband speed benchmark. The particular thresholds for underserved and unserved have varied over time as technology has evolved. For the 2023 state grant round, opened in December of 2022, thresholds are set at two providers of at least 25/3 (underserved), and one provider of at least 5/0.6 (unserved).

Allocation of state grants is subject to a variety of prioritization criteria, which include those that: (a) offer matching funds; (b) involve public-private partnerships; (c) affect areas with no broadband service providers; (d) are scalable; (e) promote economic development; (f) will not delay broadband deployment to neighboring areas; or (g) affect a large geographic area or a large number of underserved individuals or communities.

In general, state broadband grants have not supported the construction of infrastructure that provides speeds of less than 25/3, although earlier grant rounds placed more emphasis on fixed wireless and digital subscriber line (DSL) infrastructure, which may have resulted in slower

service. Beginning in the 2020-21 grant round and continuing to subsequent grant rounds, PSC reported all awarded projects will support service of at least 25/3. The statutes do not impose a speed requirement. However, PSC states that the evolution of broadband infrastructure and the increasing competition for grants has resulted in most projects with capacity to support at least 25/3, and perhaps 100/20 or faster.

Federal Broadband Expansion Grants

The state administers several federal programs and funding sources to expand broadband. This includes one-time funding under the Coronavirus Aid, Relief, and Economic Security (CARES) and American Rescue Plan (ARPA) Acts. These funds were allocated by the Governor from discretionary amounts provided to the state for responding to the impacts of the COVID-19 pandemic. For additional information on the allocations of these federal funds, see the Legislative Fiscal Bureau informational paper entitled "Federal Coronavirus Relief Legislation -- Discretionary Funds (Coronavirus Relief Fund and State Fiscal Re-covery Fund)." Additional funding was provided by the Infrastructure Investment and Jobs Act (IIJA), or Bipartisan Infrastructure Law.

Coronavirus Aid, Relief, and Economic Security (CARES) Act. Projects supported by the one-time allocation of funding received in 2020 under the CARES Act supported projects that were eligible under state program requirements and could quickly be constructed before the December 30, 2020, expiration of funds that was in effect at the time.

American Rescue Plan Act (ARPA). Projects supported by the one-time allocation of funding received under ARPA were areas lacking access to 25/3 intended to provide service of at least 100/100, or 100/20 in certain limited circumstances, and constructed with optical fiber cables. The U.S. Department of Treasury emphasized priority be given to last-mile

connections, nonprofit- or municipally-run networks, projects that have affordability options, and projects that are not planned to receive upgraded service before December 31, 2024.

Broadband, Equity, Access, and Deployment (BEAD) Program. Created under the Infrastructure Investment and Jobs Act, BEAD will provide funding to build broadband infrastructure, prioritizing unserved households and businesses lacking 25/3 Mbps. Wisconsin's allocation of funding will be decided based upon the state's proportion of locations lacking access to adequate broadband service according to FCC maps, which are still in the drafting stage. NTIA, the administrator for BEAD, has indicated BEAD's first allocations to states will be made by June 30, 2023, after FCC's national broadband map drafts released in November 2022 have undergone at least one challenge.

Digital Equity Act (DEA) Programs. The Digital Equity program, also funded under IIJA, is a program created to target broadband adoption efforts towards specific communities. Targeted communities include households with low income or low literacy, the elderly, residents of rural areas, people of color, individuals with disabilities, English-language learners, veterans, and incarcerated individuals. The populations covered under DEA account for 79% of Wisconsin's total population. Funding for DEA will be distributed through three programs over five years: (a) planning grants for states to create digital equity plans that promote broadband availability and access by targeted groups, as well digital literacy and privacy awareness; (b) capacity grants for states to implement digital equity plans; and (c) competitive grants to units of government and nonprofit or community institutions to increase broadband access and availability among targeted populations.

Enabling Middle Mile Broadband Infrastructure Program. "Middle mile" is defined as high-capacity fiber internet lines that carry data between local networks that connect to households and large-scale national networks. This is a competitive grant program funded by IIJA and administered by NTIA. State agencies did not apply directly for any middle-mile funding, but other eligible entities within the state, such as internet service providers (ISPs) have applied.

Grant Funding

Table 6 shows state broadband expansion grant direct funding by year and fund source. The following paragraphs further describe each source and their allocations. It should be noted that although the following paragraphs describe certain planning funds administered by the state, Table 6 intends to reflect direct funding for expansion grants and excludes funds intended for planning purposes.

State Funding

General-Fund-Supported Bonding. 2021 Wisconsin Act 58, the biennial budget act, provided $125 million in state general-fund-supported general obligation bonds to support broadband expansion grants. To ensure compliance with state constitutional requirements related to bonding, recipient telecommunications providers are required to accept a lien on the property built with grant funding until bonds have been repaid.

Universal Service Fund. PSC administers the state universal service fund (USF) to ensure that all state residents receive essential telecommunications services. USF funding supports subsidized access to telecommunications services for those with low incomes or disabilities, as well as aid to public library systems, and broadband expansion grants. Funding for USF programs is derived from PSC assessments on companies providing retail intrastate voice telecommunications services. Funding amounts for USF

Table 6: Total State Broadband Expansion Grant Funding

Year	Program Revenue[a]	Universal Service Fund SEG	Federal E-Rate Program Transfers	Federal Coronavirus Relief Funding	General Fund-Supported Bonding	Total
2013-14	$4,300,000					$4,300,000
2014-15						-
2015-16	(3,347,400)	$6,000,000[b]				2,652,600
2016-17						-
2017-18			$11,000,000			11,000,000
2018-19		2,242,600[c]				2,242,600
2019-20		3,075,700[c]	22,000,000			25,075,700
2020-21		3,392,500[c]	22,000,000	$5,378,500		30,771,000
2021-22		9,632,800[c]		99,932,500	$125,000,000	234,565,300
2022-23		3,450,500[c]		40,000,000		43,450,500
Total	$952,600	$27,794,100	$55,000,000	$145,311,000	$125,000,000	$354,057,700

[a] From the Department of Administration's appropriation for information technology and communications services to nonstate entities. Remaining amounts were transferred to the general fund under 2015 Wisconsin Act 55.
[b] From the unencumbered balance of the USF.
[c] Sweeps of unexpended amounts from other USF program appropriations.

programs other than the broadband expansion grant program are determined by appropriations authorized by the Legislature, and PSC sets assessment rates at levels sufficient to cover these budgeted amounts. Beginning in 2018-19, broadband expansion grant USF funding consists of transfers, or "sweeps," of funds in other USF program appropriations that remain unexpended or unencumbered at the end of the fiscal year or fiscal biennium. If these swept amounts do not total $2 million, PSC is authorized to assess contributing telecommunications providers the difference.

Program Revenue. When the state broadband expansion grant program was created, an initial allocation of $4.3 million PR was transferred from the Department of Administration's information technology and communications services PR appropriation. PR funding supported the first two grant rounds in 2013-14 and 2014-15 totaling $952,600 and remaining PR funding was lapsed to the general fund when USF SEG was provided beginning in 2015-16.

Federal Funding

E-Rate Federal Funds. The federal e-rate program provides funding from the federal universal service fund to reimburse the state for a percentage of funds used to support telecommunications availability in schools and libraries, provided primarily through the state's Technology for Educational Achievement (TEACH) program. As Wisconsin has received federal reimbursement for state USF funding dedicated to e-rate reimbursement-eligible expenditures under TEACH, funding has accumulated in the federal e-rate aid appropriation. These accumulated funds occasionally have been transferred to the broadband expansion grant program, with $11 million in 2017-18 under the 2017-19 biennial budget, and $22 million each year under the 2019-21 biennial budget. As transfers in previous years exhausted available balances, no additional funding was allocated to support broadband expansion grants during the 2021-23 biennium.

Federal Coronavirus Relief Funding. PSC has been responsible for administering several rounds of federal funding received by Wisconsin in response to the coronavirus pandemic. These have consisted of $5.4 million under the CARES Act and $100 million under ARPA. Grants were provided under special one-time grant rounds held

in fall 2020 and summer 2021, respectively.

Federal Infrastructure Investment and Jobs Act. Under the IIJA, Wisconsin will be responsible for administering federal funding for broadband expansion for BEAD and DEA. IIJA provides $42.45 billion for broadband deployment under BEAD, consisting of a minimum of $100 million for each state, with the remainder allocated based on the state's proportion of unserved locations, and 10% set aside for certain high-cost unserved locations. DEA is provided $550 million each year over five years, to be distributed to states based on their proportion of targeted populations.

Allocations under these formulas have not yet been determined, but based on available FCC and Census Bureau data on broadband access, it is estimated Wisconsin's allocation could total up to $1.1 billion for BEAD and $30 million for DEA. Total BEAD allocations are anticipated to be announced by NTIA no later than June 30, 2023. It is expected Wisconsin could receive an allotment of up to 20% of the state's total allocation upon making an initial proposal to NTIA.

Although certain program allocations are yet to be determined, PSC on December 12, 2022, announced the state will receive $5 million to support the BEAD planning process. NTIA has approved PSC to use $1.5 million of BEAD planning funds to offer local planning grants, to be awarded to counties, tribes, and regional economic development organizations. Additionally $100,000 of the planning funds is allocable to a workforce planning grant program, which would direct funds towards preparing certain workforce sectors primarily associated with the building and maintenance of broadband systems supported by BEAD funding. Also, in September of 2022, NTIA awarded Wisconsin $952,200 for the creation of a digital equity plan. NTIA has approved PSC to use $335,000 of this account to conduct outreach for development of the plan.

Capital Projects Fund (CPF). The Capital Projects Fund, administered by the U.S. Department of the Treasury, was created under ARPA to address the digital divide and work towards ensuring that all communities have access to high-quality, modern infrastructure, including broadband. Wisconsin is allocated a total of approximately $189 million from CPF. In October, 2022, Treasury approved Wisconsin's plan and request for $40 million from the fund to support broadband infrastructure projects serving an estimated 8,000 locations and providing service of 100/20 Mbps. The approval of this $40 million plan represents 21% of Wisconsin's total allocation.

Other. In addition to the fund sources listed above, Wisconsin has also received funds from a variety of federal sources and programs since 2014. PSC has identified the following as major broadband funding initiatives: (a) the Connect America Fund (CAF) Phase II; (b) CAF Phase II Auction; (c) CAF Broadband Loop Support (BLS); (d) the Alternative Connect America Cost Model (ACAM); (e) ACAM II; (f) the Rural Digital Opportunity Fund (RDOF); (g) the U.S. Department of Agriculture (USDA) Broadband Reconnect Program; and (h) the Tribal Broadband Connectivity Program (TBCP). The funds received from each of these sources as well as the speed requirements for projects are shown in Table 7. In total, these programs have awarded approximately $1.3 billion in federal funding for broadband in Wisconsin, $980 million of which has been disbursed through 2021. These federal programs should not be considered a comprehensive listing of all federal funding awarded to support broadband expansion in Wisconsin, but do represent the vast majority of funding made available. It should be noted the state does not have a direct role in administering these funds.

Grant Awards and Impacts

Since the first state grant round in 2014,

Table 7: Major Federal Broadband Funding Allocations in Wisconsin

Program	Speed	Allocated	Disbursed through 2021
CAF II*	10/1 Mbps	$646,197,600	$646,197,600
CAF II Auction	25/3 Mbps	4,709,500	131,500
CAF-BLS	Most 25/3 Mbps	135,006,900	135,006,900
ACAM	Most 25/3 Mbps	323,942,400	155,343,400
ACAM II	25/3 Mbps or 1000/500 Mbps	163,137,900	42,913,000
RDOF**	Most 1000/500 Mbps	184,444,900	400
USDA Reconnect	1000/1000 Mbps	13,312,900	0
Tribal Connectivity Program	Varies	35,029,300	Unavailable
Total		$1,370,774,500	$979,592,800

*Disbursed and allocated funds reflect a program extension in 2020, resulting in an additional $73,565,400 in funding.
**Reflects RDOF applications authorized by FCC. FCC deauthorized one award in August, 2022, which is currently under review.

approximately $300,000,000 supporting 434 projects has been awarded from state and federal funding for broadband expansion grants statewide. Of these projects, 240 are ongoing, the last of which is scheduled to be completed by November 20, 2024. According to PSC, grant awards since 2014 have impacted approximately 27,500 businesses and 428,300 residences. In November, 2021, $125,000,000 in general-fund-supported bonding was made available for state grants. In June, 2022, PSC announced 71 recipients who would be receiving awards. The 71 projects will reach around 83,000 homes and 4,600 businesses in 45 counties. In, December, 2022, PSC announced an additional $14.1 in USF SEG funding would be made available for the first 2023 grant round. Table 8 shows grant award totals since the first round of funding and the amount of businesses and residences impacted by projects.

Awarded projects differ by broadband technology type deployed and the resulting speed made available. As grant rounds progressed, PSC staff note that there has been a shift to almost all projects deploying fiber-to-the-premises (FTTP) technology. Fiber currently offers the highest broadband upload and download speeds, and FTTP service provides substantially faster connection speeds than cable internet or DSL. In Appendix II, a description of technology types and a table detailing which technology was deployed in each grant round is provided.

While FCC's current minimum fixed broadband speed benchmark is 25/3 Mbps, some stakeholders or advocates have called for a higher benchmark, as 25/3 was set by the FCC more than five years ago and the reliance on the Internet has increased since. According to the Congressional Research Service (CRS), if FCC were to raise the speed threshold, additional fiber construction across the United States will be necessary. CRS also reported on July 1, 2021, that nationwide download usage has grown 26.6% overall and upload usage has grown 49.0% overall since March 1, 2020, further encouraging the push for increased speed benchmarks that can only be met by fiber.

Governor's Task Force on Broadband Access

The Governor's Task Force on Broadband Access was created on July 14, 2020. The task force was created to advise the Governor and Legislature on broadband actions and policy and develop recommendations for achieving

Table 8: Broadband Expansion Grant Awards

Round	Fiscal Year	Fund Source	Projects	Amount Awarded	Businesses Impacted	Residences Impacted
1	2014	PR	7	$500,000	100	3,340
2	2015	PR	7	452,600	86	3,757
3	2016	SEG	11	1,500,000	129	4,405
4	2017	SEG	17	1,500,000	214	15,595
5	2018	SEG	13	1,500,000	651	6,155
6	2018	SEG/FED	46	7,689,000	2,070	27,859
7	2019	SEG/FED	37	7,053,600	1,145	14,403
8	2020	SEG/FED	72	23,995,000	10,138	115,200
9	2020	FED	12	5,378,500	743	19,515
10	2021	SEG/FED	58	28,443,100	6,160	106,149
11	2022	FED	83	99,932,500	1,490	28,986
12	2022	SEG	71	124,967,400	4,566	82,912
Total			434	$302,911,600	27,492	428,276

statewide, affordable access to broadband for all communities in Wisconsin. In each year since the Task Force was created, the members published a report describing progress, recommendations, and goals. In the 2022 report, the Task Force emphasized a focus on leveraging broadband planning initiatives to benefit the state's overall broadband goals, maintaining and improving equitability goals, and gathering input from stakeholders that could inform the process of allocating and implementing federal funds.

Data and Mapping

A critical component to broadband expansion efforts in Wisconsin and nationwide is reliable data on the availability of broadband service at a given location. However, there is significant deviation in estimates of broadband access when comparing FCC deployment reports and U.S. Census Bureau estimates. FCC's 2019 deployment report estimates approximately 384,400 Wisconsinites in rural areas and 8,100 Wisconsinites in urban areas lack access to broadband service. By comparison, the Census Bureau estimates that as of 2019, approximately 323,000 households in Wisconsin do not have an internet subscription, consisting of 213,000 in urban areas and 110,000 in rural areas. Thus, while it is clear a portion of Wisconsinites lack access to broadband service, different data collection and classification methodologies leave significant gaps in understanding of actual availability of 25/3 service in Wisconsin.

Federal Mapping Efforts. FCC historically collected data on broadband availability from telecommunications providers under FCC Form 477. Under Form 477 requirements, providers must indicate the minimum advertised service speed available to at least one premises in a census block. If one premise in a census block has access to 25/3 service, all inhabitants of that block in the dataset are represented to have access to that service. Thus, Form 477 data is likely to overstate access to broadband service. However, Form 477 data remains useful for identifying census blocks that are entirely underserved, and those most in need of broadband expansion funding. Further, as Form 477 data has been collected in its current form since 2013, the data serves as a useful comparison for measuring increasing access over time.

In 2017, FCC began considering modifications to its data collection to more accurately reflect

premises-level access rather than census block access to broadband. In 2019, FCC issued an order beginning the process of requiring service providers to submit such location-based data to FCC. On March 23, 2020, the federal Broadband Deployment Accuracy and Technological Availability Act ("Broadband DATA Act") was enacted. The Broadband DATA Act generally incorporates FCC's 2019 order and requires FCC to: (a) collect and disseminate granular, location-based broad-band service data; (b) create a process for public review and challenge of broadband service data; (c) conduct audits of service data submitted by telecommunications providers; and (d) provide assistance to tribal governments, states, local units of government, and small providers related to broadband data collection. Subsequently, the 2021 Consolidated Appropriations Act (CAA) provided $98 million to FCC to implement provisions of the Broadband DATA Act.

The FCC released a "pre-production draft" of broadband maps on November 18, 2022. The FCC used geolocation data to show where wire-line and wireless internet are available across the United States with specific location-level information, to rectify maps that previously overstated coverage due to the use of incomplete census block data. FCC opened a challenge period for public feedback to improve map accuracy. In December, 2022, FCC sunset Form 477 reporting in favor of the Broadband Data Collection system to reflect greater premises-level broadband data.

State Mapping Efforts. PSC currently employs 2.0 broadband mapping staff responsible for maintaining the Wisconsin broadband map by aggregating data from ISPs, the U.S. Census Bureau, the FCC, and other sources. Mapping staff also spend time: (a) conducting outreach related to broadband availability; (b) determining eligibility and overlap of broadband expansion grant applications; and (c) developing partnerships and providing technical assistance related to statewide deployment of broadband.

Mapping staff in the Wisconsin Broadband Office collaborate with providers, communities, the federal government, and other stakeholders to develop their own set of maps, separate from those provided by the FCC. The Office maintains an interactive map of broadband access throughout the state, which can be accessed on the PSC website. Map data is collected from a variety of sources, including directly from telecommunications providers and the FCC. The map provides data on the quality and availability of service, including a list of providers at a location and advertised connection speeds and is updated several times annually. In August, 2022, PSC released an interactive mapping tool called the Broadband Grant Footprint, which gives an overview and visual of the progress that has been made and the projects that have been completed, are in progress, or have been abandoned since the first state broadband grant round in 2014. The tool is available on PSC's website.

Telecommuter Forward! and Broadband Forward!

PSC's Wisconsin Broadband Office promotes broadband access by offering Broadband Forward! and Telecommuter Forward! certifications for municipalities. In order to receive these certifications, communities implement policies intended to reduce barriers to telecommuting and construction of broadband infrastructure to achieve social and economic benefits for the community and attract outside investment.

Broadband Forward! was created by 2015 Wisconsin Act 278 and is a voluntary program for local units of government to certify that they have worked towards removing obstacles to broadband infrastructure investment. Broadband Forward! certified municipalities are those that adopt an ordinance meeting the requirements under s.

196.504(5) of the statutes. Generally, a municipality must: (a) implement measures to facilitate and expedite review of permits and applications related to broadband network projects, including appointing a single point of contact for applicants; (b) shorten the review period of proposals; and (c) conduct a transparent review process. As of October, 2022, 79 municipalities have received Broadband Forward! certifications.

Telecommuter Forward! was created by 2017 Wisconsin Act 342 and is another voluntary program for local units of government to certify that they are committed to promoting the availability of telecommuting options for their residents. Telecommuter Forward! Certified municipalities are those that adopt a resolution meeting the requirements under s. 196.5045(3) of the statutes. Generally, the section requires that the municipality demonstrate commitment to facilitating the availability of telecommuting options in a community and appoint a single point of contact that collaborates with broadband providers, the Wisconsin Broadband Office, economic development professionals, and others to support telecommuting. As of October, 2022, 68 municipalities have received Telecommuter Forward! certifications.

As discussed previously, the digital divide can be characterized by two problems: access and affordability. Regardless of the availability of service via sufficiently modern infrastructure, a lack of affordable subscription options may limit the use of the Internet by certain populations. Federal programs currently are the primary means of providing financial assistance to households for broadband services. These programs are described in greater detail below. Additional PSC efforts are described in a separate section.

Emergency Broadband Benefit

In response to increased need for broadband access during the COVID-19 pandemic, the federal Consolidated Appropriations Act of 2021 created the Emergency Broadband Benefit Program (EBB). EBB was created as a temporary pandemic relief program to provide low-income households, or those experiencing economic distress during the pandemic, a discount of up to $50 per month for broadband service ($75 for qualifying tribal lands), and a one-time computing device discount of up to $100. IIJA converted the EBB to a permanent benefit known as the Affordable Connectivity Program (ACP) effective January 1, 2022. Through the end of the program, approximately 161,000 Wisconsin households were enrolled in EBB.

Affordable Connectivity Program

Under the ACP, eligible participants receive a discount of up to $30 per month for broadband service, as well as a one-time computing device discount of up to $100. Households on qualifying tribal lands are eligible for a discount of up to $75 per month for broadband service. The discount is paid directly to the broadband service provider, and any remaining cost is billed to the recipient.

Eligibility. ACP is available to any household below 200% of the federal poverty line ($55,500 for a household of four in 2022), or with at least one member that satisfies any one of the following: (a) participates in BadgerCare, FoodShare, the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), the National School Lunch Program, or the federal Supplemental Security Income (SSI) program: (b) qualifies for the federal Lifeline program, which provides phone and internet assistance to low-income households through the federal universal service fund; (c) participates in certain federal tribal assistance programs; (d) received a Pell grant; or (e) meets the eligibility criteria for a participating ISP's existing low-income subscription program. If a household is eligible for more than one program, ACP may be combined in most cases with support from the Lifeline program, as described below.

Funding. ACP is supported by federal funds, and is provided an allocation of $14.2 billion, which is available until expended. As of December 1, 2022, approximately 288,600 households in Wisconsin participated in ACP. Wisconsin households had received approximately $56 million in ACP funds, according to Federal Funds Information for States.

Other Federal and State Activities

The federal Lifeline program is funded from the federal universal service fund and provides discounts for telephone or broadband internet service for households at or below 135% of the federal poverty line (equal to $37,500 for a household of four in 2022) or qualifying for certain assistance programs, including BadgerCare, FoodShare, SSI, federal public housing assistance, or certain tribal assistance programs. Lifeline provides a discount of $9.25 per month directly to the provider for broadband service of at least 25/3. A state Lifeline program provides additional discounts of up to $9.25 per participant funded from the state universal service fund. In most cases, households may qualify for both ACP and Lifeline and apply their discounts to the same internet subscription.

The Wisconsin State Broadband Office engages in various activities to reduce the digital divide, including: (a) coordinating Wisconsin's Digital Equity and Inclusion Stakeholder group; (b) hosting the Internet Discount Finder Tool; (c) maintaining an Internet and Phone Helpline, and (d) facilitating enrollment in the federal Affordable Connectivity Program (ACP).
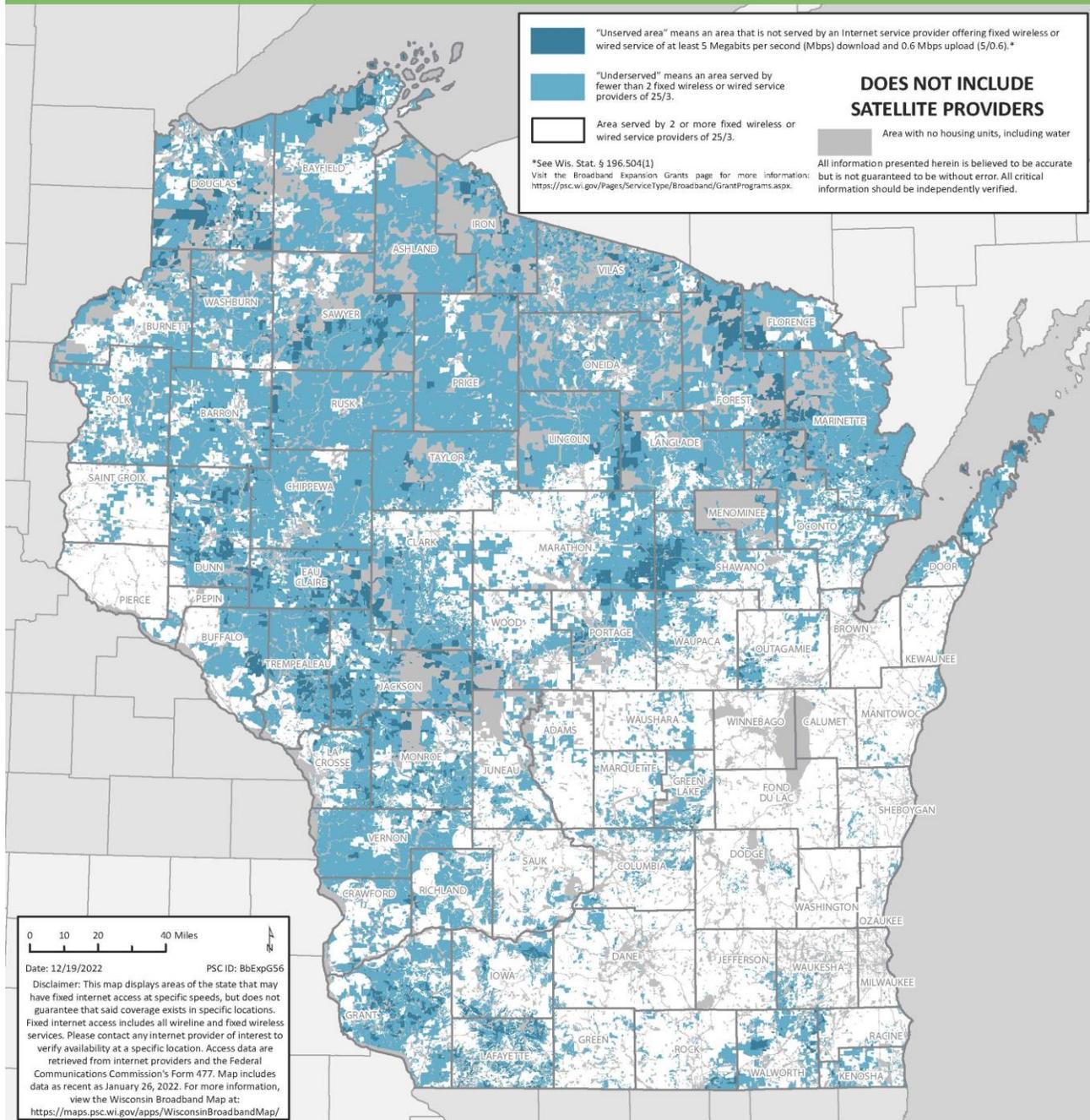
Internet Service Technology Types

The following descriptions provide general structural differences between commonly deployed internet service technologies.

• *Landline switched-access.* This internet service is provided using traditional copper telephone infrastructure. Conventionally known as "dial-up," this service provides low-speed data connection through analog transmission and does not allow for simultaneous use of internet and telephone.

• *Digital Subscriber Line (DSL).* This internet service is provided using traditional copper telephone infrastructure. DSL transmits data in digital form, using a broader range of frequencies in copper infrastructure than traditional analog telephone service, allowing simultaneous use of internet and telephone.

• *Cable internet.* This internet service is provided using hybrid fiber-coaxial data lines deployed by cable television companies. Cable internet requires a provider to replace existing copper network infrastructure or install an additional wired network.

• *Fiber-to-the-Home/Premises (FTTP).* This internet service is provided using optical fiber cable connected directly to an existing optical fiber network. Similar to cable internet, FTTP requires replacement of existing copper lines or installation of an additional network. FTPP provides substantially faster connection speeds than DSL or cable internet.

• *Fixed wireless.* This internet service is provided by radio transmission to a fixed antenna. Fixed wireless technology varies, but generally provides connections only over unobstructed line-of-sight connections. Additionally, fixed wireless uses radio frequencies either with or without a license. Use of radio frequencies without a license requires lower power levels, which limit broadcast distance. Frequencies available to be licensed are scarce and thus expensive. Evolving wireless technology provides increasing connection speeds and quality, allowing for longer-distance wireless connections and somewhat obstructed connections.

• *Mobile wireless.* This internet service is provided by radio transmission to mobile devices. Mobile wireless is provided through licensed radio frequencies and uses 3G (up to 6 Mbps), 4G (up to 300 Mbps), and 5G (up to 1000 Mbps) technology. Due to cost, mobile wireless is primarily provided in high-density urban areas, or along high-traffic highway corridors. Further, mobile wireless access is typically limited by monthly data limits, which are often lower than typical usage on wired broadband connections.

• *Satellite.* This internet service is provided wirelessly by satellite connection to a fixed antenna. Satellite internet technology is constrained considerably by adverse weather and network congestion. Further, due to the distance traveled by data, connections suffer from high latency, limiting effectiveness of certain uses like two-way voice or video communication. Similar to mobile wireless service, satellite internet service may be subject to monthly data limits.

Table 9 shows Wisconsin broadband expansion projects since the first grant round and which technology types were adopted. The table shows a shift to projects mostly employing FTTP, as this technology can support higher broadband speeds.

Table 9: Broadband Projects by Technology Type

Grant Round	Fiscal Year	Cable Internet Service	Digital Subscribe Line (DSL)	Fiber/ Co-Axial Route	Fiber/Fiber to the Premises (FTTP)	Fixed Wireless Internet Service	Wi-Fi Internet Service	Total
1	2014	0	1	2	1	3	0	7
2	2015	0	0	2	2	3	0	7
3	2016	0	2	0	8	1	0	11
4	2017	0	5	0	8	4	0	17
5	2018	0	1	1	6	5	0	13
6	2018	1	6	0	23	16	0	46
7	2019	1	4	0	22	10	1	37
8	2020	0	0	0	4	8	0	12
9	2020	10	2	0	52	7	0	72
10	2021	1	0	2	49	6	0	58
11	2022	0	0	0	83	0	0	83
12	2022	0	0	0	70	1	0	71
Total		13	21	7	328	64	1	434

Factors Influencing Broadband Service Quality

The following provides more detailed information on broadband speed and additional factors influencing the quality of broadband service.

Broadband Speed

• *Speed.* The speed of broadband service, measured in megabits per second (Mbps), is the primary indicator of the quality of broadband service. Speed is expressed in download and upload speeds, reflecting the amount of data that can be downloaded from the internet to a user's device, and the amount that may be uploaded from a user's device.

• *25/3 Service.* 25 Mbps download/3 Mbps upload was defined by FCC in 2015 as the minimum benchmark for internet service to be considered as "advanced telecommunications capability," i.e. broadband service. 25/3 can support two to three users, one of which is using a high-demand service such as video conferencing. If more than one user is using a high-demand service, speeds faster than 25/3 are typically required.

• *100/20 Service.* In response to changing internet use behaviors, some recent federal funding allocations have begun to require that broadband infrastructure built with federal grants provide service of at least 100/20 (1000 Mbps of download speed and 20 Mbps of upload speed).

In July, 2022, the Chair of FCC proposed officially increasing the required minimum speed to 100/20 from 25/3.

Additional Factors Influencing Service

• *Latency.* Latency is measured in milliseconds and reflects the amount of time it takes for a piece of data to travel from one point on a network to another. High latency has a larger impact on interactive internet services, where a delay in responses may reduce the effectiveness of services by causing pauses in conversation on a video call, or delays in an interactive online game. Latency is determined primarily by the technology used to transmit the data, but is also affected by the route and distance that data travels. While latency typically remains low for fixed terrestrial broadband service, internet service provided via mobile, fixed wireless, or satellite technologies may have latency sufficiently high to affect service quality.

• *Jitter.* Jitter is related to latency and reflects the variation in latency during transmission of data, where lower jitter represents a more consistent connection.

• *Packet Loss.* Packet loss, expressed as a percentage, reflects the success rate in transferring data. High packet loss can result in interrupted, "choppy" voice or video calls and can slow down transmission of data.