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National Broadband Navigator

- The National Broadband Navigator boosts connectivity in underserved areas with the BEAD Navigator, a groundbreaking tool made possible through generous support from the Rockefeller Foundation





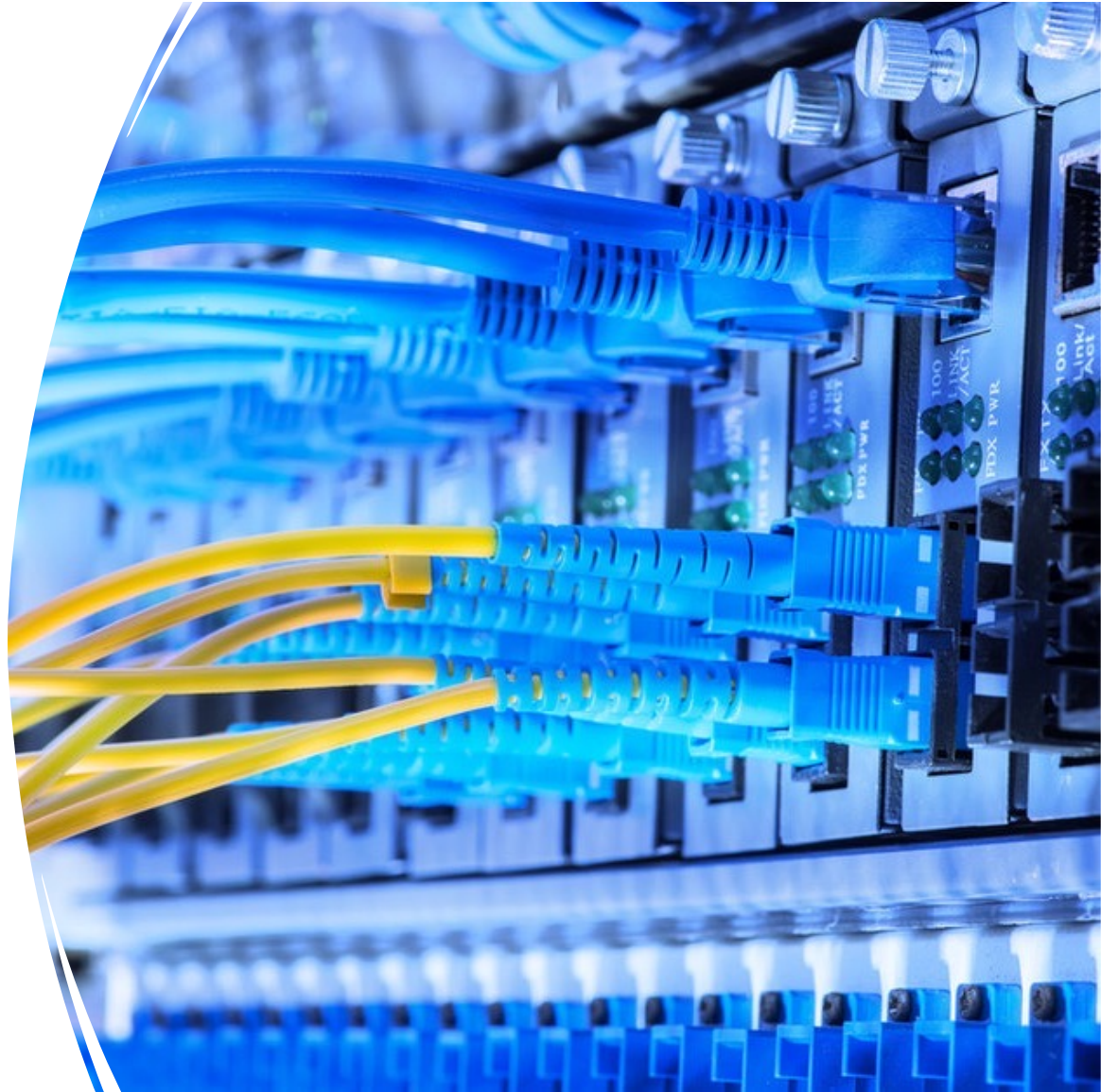
Technology Overview

Tom Beresnyak • Penn State Extension

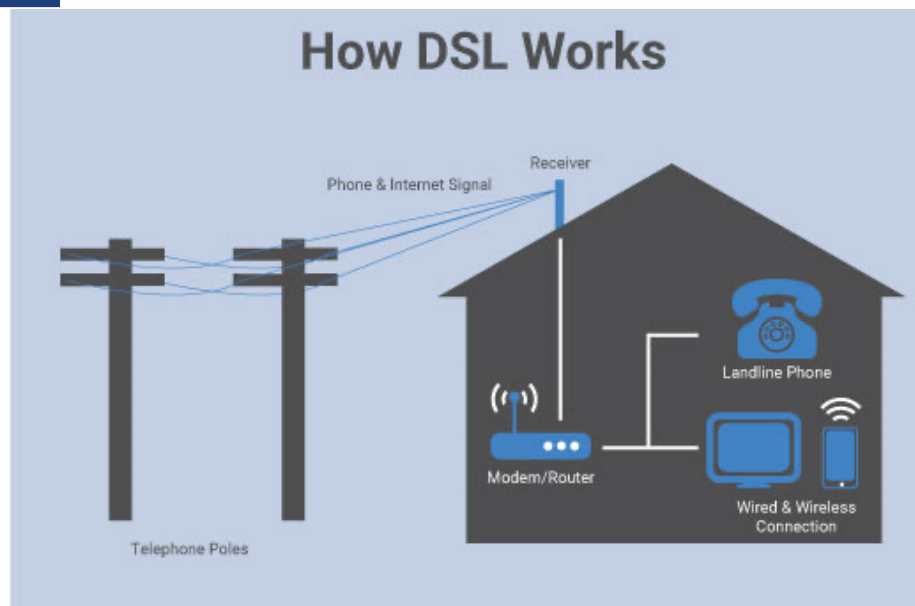
DELIVERING EDUCATION YOU CAN TRUST

Overview of Existing Broadband Technologies

- DSL
- Cable
- Fiber-optic
- Wireless
- Satellite



Digital subscriber line (DSL)



<https://www.upwardbroadband.com/fixed-wireless-internet-vs-dsl-the-pros-and-cons/>

DSL is a wireline transmission technology that transmits data faster over traditional copper telephone lines

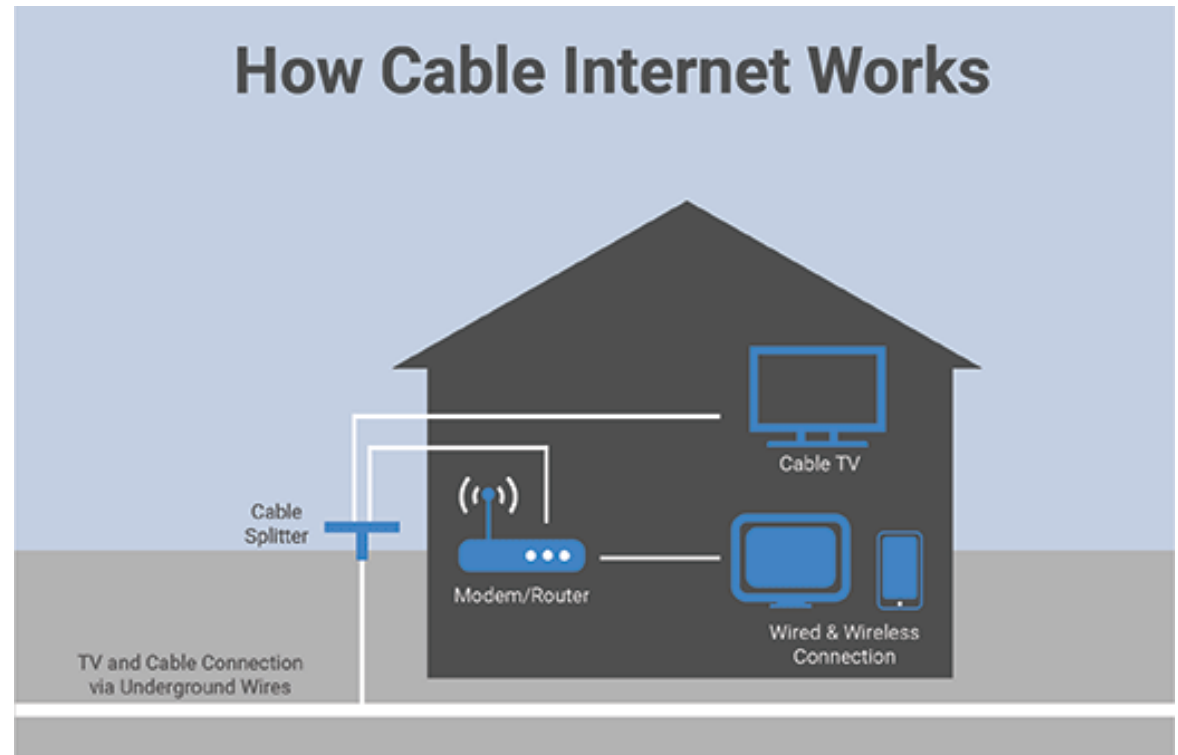
- Asymmetrical Digital Subscriber Line (ADSL) – used primarily by residential customers. ADSL typically provides faster speed in the downstream direction than the upstream direction
- Symmetrical Digital Subscriber Line (SDSL) – used typically by businesses for services such as video conferencing. Downstream and upstream traffic speeds are equal

<https://www.fcc.gov/consumers/guides/getting-broadband-qa>

Cable Internet

- Cable modem service provides broadband using the same coaxial cables that deliver pictures and sound to your TV set
- Transmission speeds vary depending on the type of cable modem, cable network and traffic load
- Speeds are comparable to or exceed typical residential DSL

<https://www.fcc.gov/consumers/guides/getting-broadband-qa>

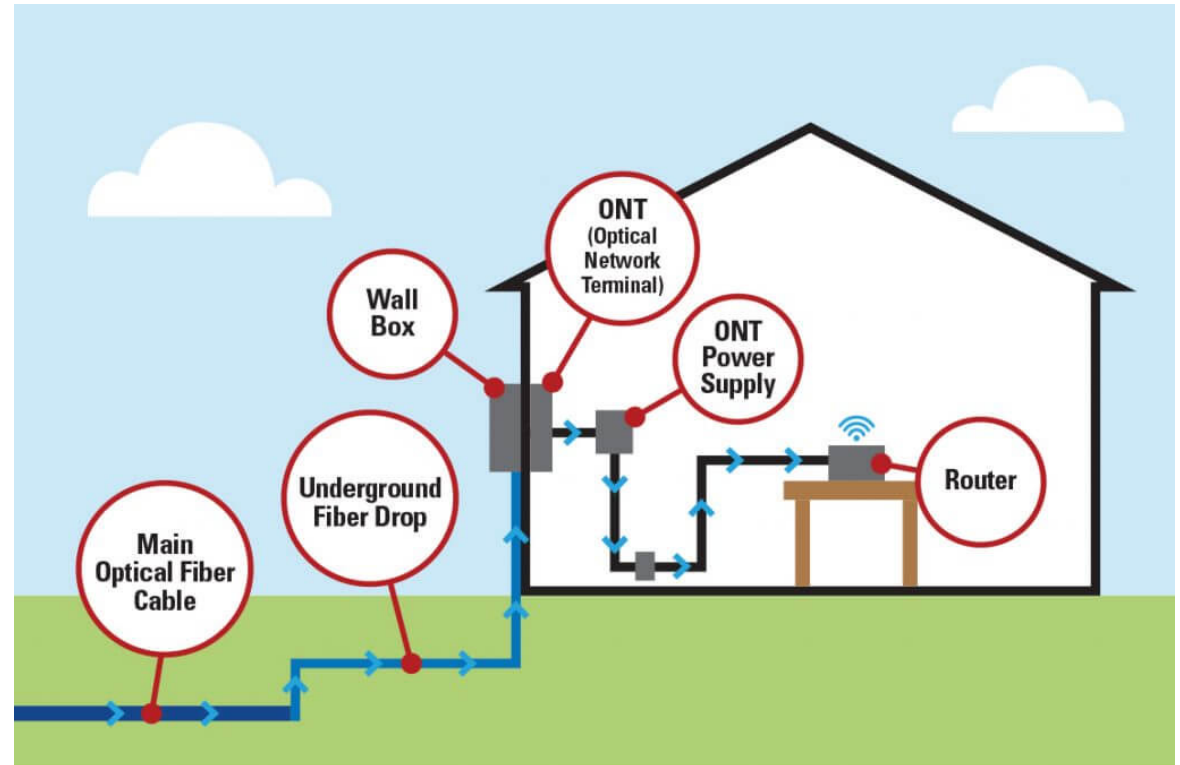


<https://www.upwardbroadband.com/fixed-wireless-internet-vs-cable-internet/>

Fiber — Optic Internet

- Fiber optic technology converts to light electrical signals carrying data and sends the light through transparent glass fibers about the diameter of a human hair
- Fiber transmits data at speeds far exceeding current DSL or cable modem speeds
- The actual speed you experience will vary depending upon factors: such as how close to your computer the service provider brings the fiber and how the service provider configures the service

<https://www.fcc.gov/consumers/guides/getting-broadband-qa>

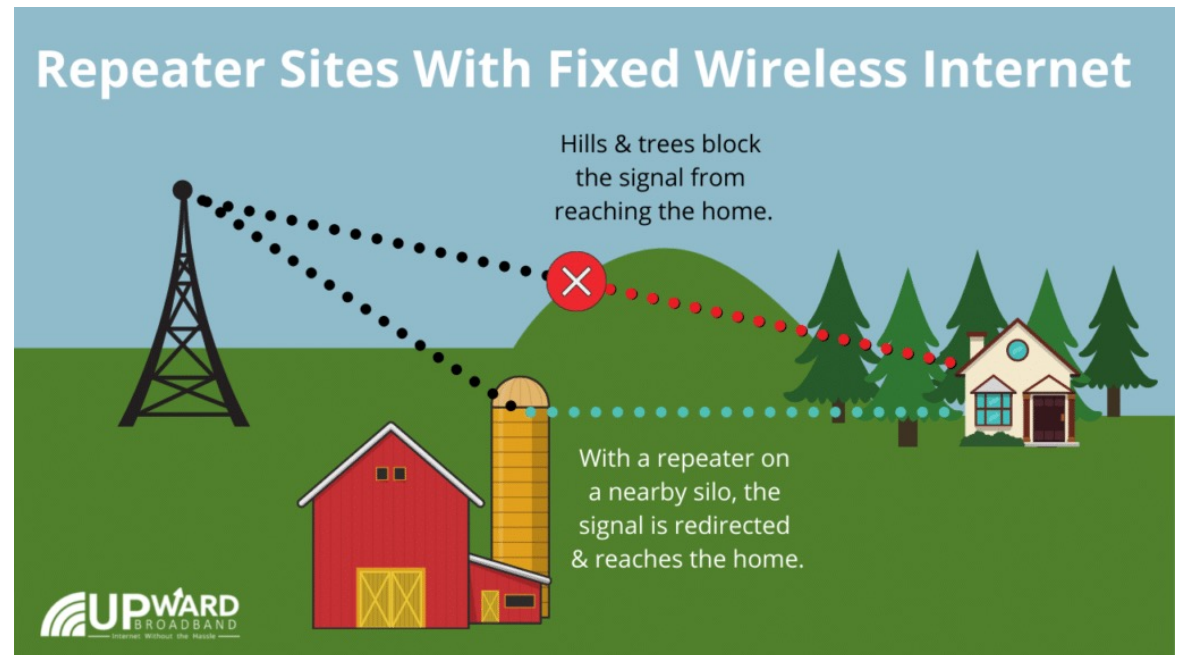


<https://stratfordtelephone.com/resources/fiber-optics/>

Wireless Internet Technologies

- Fixed wireless technologies using longer-range directional equipment can provide broadband service in remote or sparsely populated areas
- Mobile wireless broadband services are also widely available from mobile broadband service providers. Mobile wireless broadband service is typically slower than either wired or fixed wireless alternatives

<https://www.fcc.gov/consumers/guides/getting-broadband-qa>

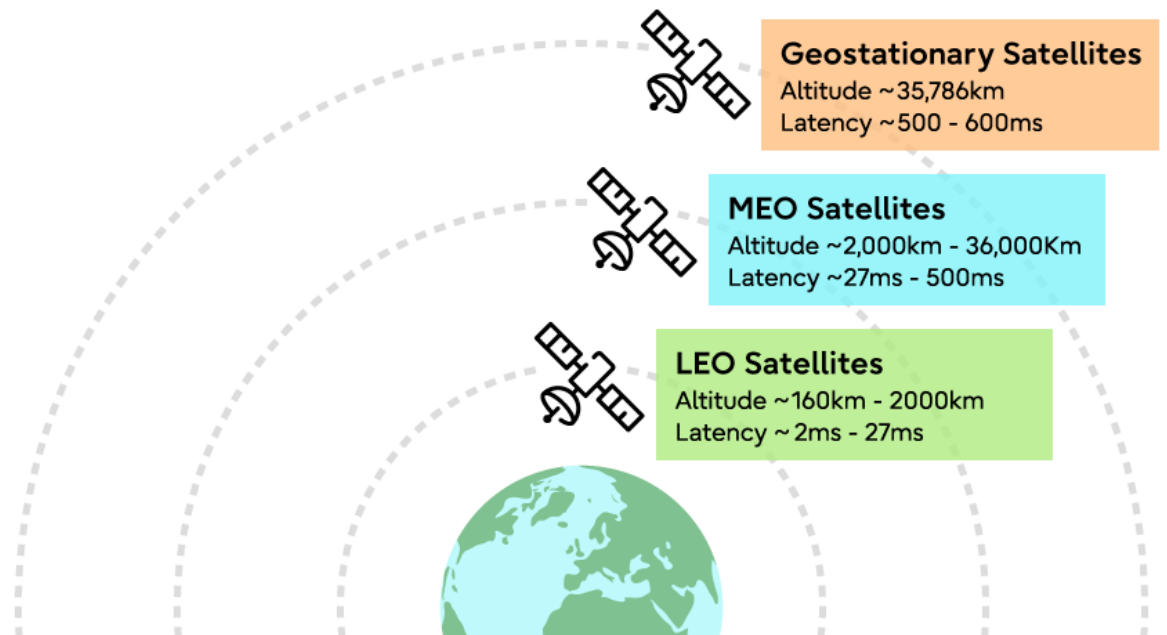


<https://www.upwardbroadband.com/what-are-repeater-sites-for-fixed-wireless-internet/>

Satellite Internet

- Satellite broadband is useful for serving remote or sparsely populated areas. Speeds may be slower than DSL and cable modem, but the download speed is still much faster than dial-up
- For satellite broadband service, a user must have:
 - Two or three-foot dish or base station
 - Satellite Internet modem
 - Clear line of sight to satellite

<https://www.fcc.gov/consumers/guides/getting-broadband-qa>



<https://www.fujitsu.com/global/vision/insights/22-leo-satellite-broadband/>



Network Issues

Latency

- Latency is the time it takes a data packet to travel from point-to-point on the network. Each step your traffic takes through the network will add to its latency. Latency higher than 150 milliseconds (ms) will cause unnatural delays in an audio conversation

Jitter

- Inconsistent arrival of packets between two endpoints. Jitter of more than 20 ms will cause delays in packet arrival, which will result in delays in audio/video

Packet Loss

- Packet loss happens when a packet does not arrive, arrives out of order, or arrives too late. Lost packets don't go into a "packet lost and found," though – they're just discarded. Packet loss over a network will cause choppy, poor-quality audio and video





Local Broadband Project Funding Options

Tom Beresnyak

DELIVERING EDUCATION YOU CAN TRUST

Why High-Speed Internet Matters



Government Services

High-Speed Internet helps government agencies improve quality, lower costs and increase transparency by improving internal operations and making it easier for residents to interact with them online.

Telework

High-Speed Internet allows teleworkers opportunities to more readily live and work in locations of their own choosing, without having to be within commuting distance of a corporate center or another base location.

Education

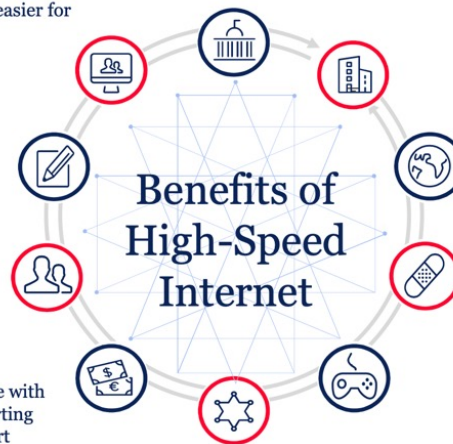
High-Speed Internet networks enhance educational experiences by providing students and teachers with access to an array of resources and the opportunity for distance learning.

Accessibility

High-Speed Internet is an important tool to address the needs of people with disabilities. Through various broadband-based applications and supporting technologies, people with disabilities have access to a new array of smart devices improving quality of life.

Economic Development

High-Speed Internet enables local communities, regions and nations to develop, attract, retain and expand job-creating businesses and institutions.



Urban Revitalization

Fully wired communities can provide residents with opportunities to take career and skill development classes, allow for more effective public safety and contribute to greater economic growth.

Environmental Sustainability

High-Speed Internet enables buildings to communicate with utilities and the energy market. Smart buildings and smart grids, hold great promise for greater efficiencies in energy consumption.

Healthcare

High-Speed Internet makes remote access to clinical services possible and cost-effective. It also allows physicians to monitor their patients through innovative home health devices.

Entertainment

High-Speed Internet is essential to enjoy 21st-century entertainment. Streaming video, online gaming and connecting with friends and relatives via social media are only possible because of broadband.

Public Safety

Wireless broadband, is becoming indispensable to the interoperability of police, fire, health and other government entities in both day-to-day and crisis situations.



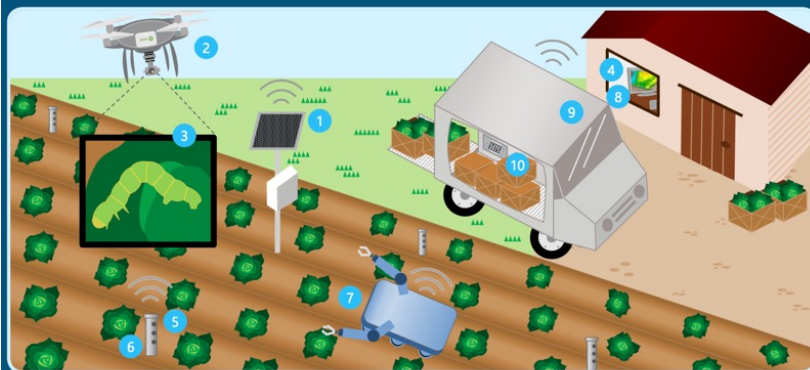


“When we are able to deploy broadband ubiquitously, think of all the things we will be able to design, harvest, and develop ... Broadband in rural America will be as transformative in the 21st century as rural electrification was in the last century.”

- U.S. Secretary of Agriculture
Sonny Perdue

<https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf>

CONNECTED TECHNOLOGIES IN SPECIALTY CROPS



PLANNING

1 Weather Modeling: On-site stations can forecast and detect local problems, saving users \$19,500 per year in spray costs and preventing \$264,000 per year in crop loss.

PRODUCTION

2 Machine Learning: Software and field imagery can identify overgrown or foreign plants and inform fungicide application, reducing labor costs by 20% to 25%.

3 Pest Prevention and Monitoring: Connected drones and software can prevent or identify pest problems, reducing spray loss on the ground by 68% to 93%.

4 Input Use and Management: Decision support software can enable data-driven decision making to maximize yield while reducing inputs, like fungicide use by 50%.

5 Smart Irrigation: Soil-based plant sensors can help control irrigation systems to improve water efficiency by 20% to 25%, increase yields by 17.5%, and cause 10-20% less tip burn, increasing profitability by \$500-\$4,000 per acre.

6 Frost Detection: Wireless sensors can help identify frost patterns and alert producers, improving forecasts by 50% and increasing relative crop value by an average of 18%.

7 Robotic Harvesting: Autonomous pickers using vacuums or pincers for harvesting and picking can reduce overall harvest costs to 35% to 45% of total production costs.

MARKET COORDINATION

8 Food Waste Management: Online platforms can help sell perishable food that might otherwise go to waste, increasing market access and creating \$10,651 in additional revenue per producer.

9 Direct-to-Consumer Sales: Digital platforms can shorten the supply chain and increase producer revenue by 50% per unit of apples, 649% per unit of salad mix, and 183% per unit of blueberries.

10 Storage Monitoring: Remote sensor systems can manage containers and send alerts, to avoid temperatures and pressures causing perishable good prices to drop 10% per hour.

<https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf>



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SOCIETAL BENEFITS OF PRECISION AGRICULTURE

SECURITY



7.5% fewer people at risk of
hunger in developing countries²⁰

HEALTH



2 seconds to trace food products' journey, using blockchain-enabled records²¹

SUSTAINABILITY



40% less fuel burned, due to VRT technologies²²



20–50% + lower water usage^{22,23}



up to 80% reduction in chemical application²⁴

<https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf>



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OVER \$125 BILLION IN FEDERAL BROADBAND SPENDING

Over the past four years, the federal government has dedicated over \$125 billion in funding for broadband connectivity. Most of this funding was allocated to build broadband connectivity to homes and businesses. Major broadband funding of at least \$1 billion has been divided among four federal agencies: the National Telecommunications and Information Administration (NTIA) within the U.S. Department of Commerce; the U.S. Department of Agriculture (USDA); the U.S. Department of Treasury (Treasury); and the Federal Communications Commission (FCC).

Table 1: Federal Programs with at least \$1 billion in Funding for Broadband

| TOTAL FUNDING SINCE 2019 | AGENCY | PROGRAM NAME | STATUS |
|---|----------|---|---|
| BROADBAND FUNDING FOR DEPLOYMENT: \$82.2 BILLION | | | |
| \$42.45 BILLION | NTIA | Broadband Equity, Access, and Deployment (BEAD) | NTIA announced funding allocations for each state, but funds have not yet been made available for projects. NTIA reserved \$849 million to administer the program—about 7 times more than the NTIA total staff budget request for Fiscal Year 2024—that is effectively a block grant program administered by state offices. |
| \$21.6 BILLION | FCC | High Cost Program | Total amount disbursed to companies from 2019-present to subsidize broadband networks, including build out, in high cost rural areas. This funding includes Rural Digital Opportunity Fund, Connect America Fund Phase II, A-CAM, legacy rate-of-return, and other programs. |
| \$10 BILLION | Treasury | Capital Projects Fund ^a | Treasury has approved funding applications for most states with five states and territories remaining to be approved. |
| \$5.15 BILLION | RUS | ReConnect | Funding has been awarded to broadband connectivity projects that are in phases of planning, construction, and completion. |
| \$3 BILLION | NTIA | Tribal Broadband Connectivity Fund | \$1.8 billion has been awarded from the first funding round and another application period has been opened. |

<https://www.commerce.senate.gov/services/files/0B6D8C56-7DFD-440F-8BCC-F448579964A3>

What is BEAD?

INTERNET FOR ALL

Broadband Equity, Access, and Deployment Program

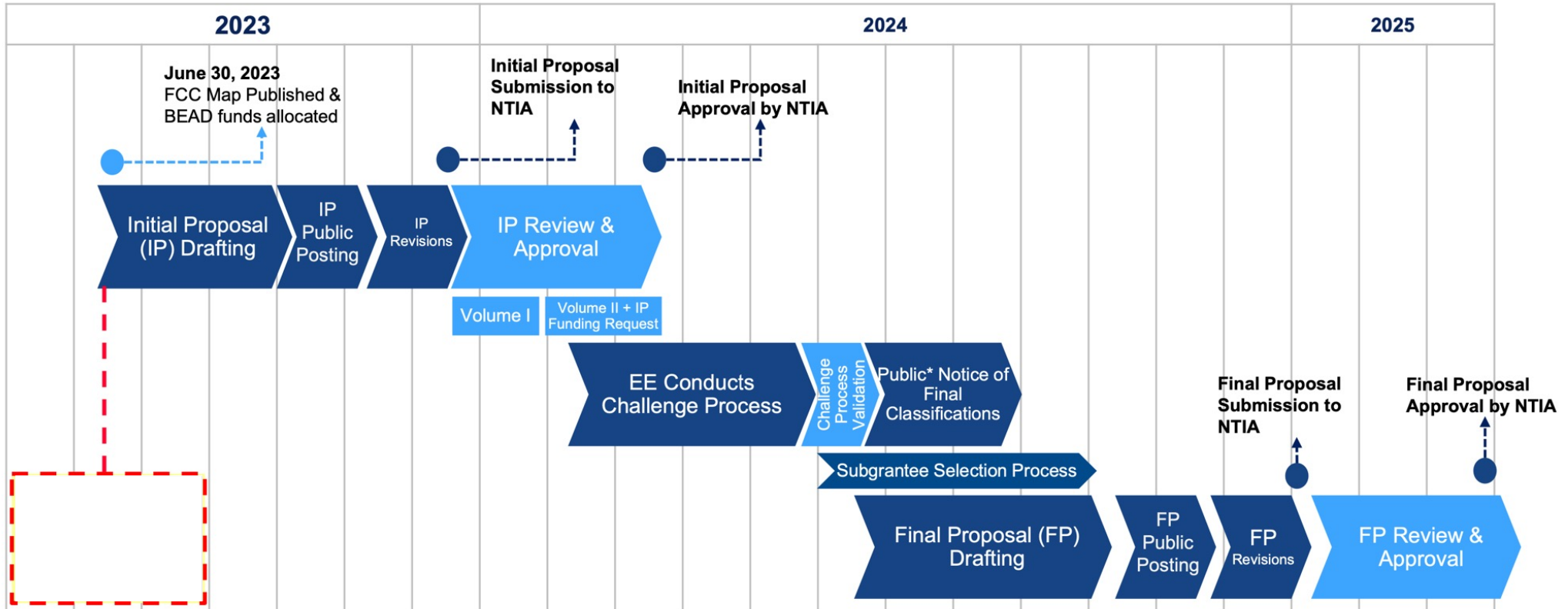


U.S. Department of Commerce
National Telecommunications and Information Administration

Timeline of the Initial Proposal for BEAD



Eligible Entities have submitted their LOIs and Initial Plans, and Initial Planning Funds have been issued. Eligible Entities are currently developing Five-Year Action Plans and preparing for the Initial Proposal submission. A sample timeline is outlined below.



*Per the BEAD NOFO, an Eligible Entity must provide public notice of the final classification of each unserved location, underserved location, or Eligible Community Anchor Institution within the jurisdiction of the Eligible Entity after resolving each challenge and at least 60 days before allocating grant funds for network deployment.



August 2024

Recent BEAD Clarification on Technology

States must use “reliable broadband” technologies first. “Reliable broadband” is Internet service that meets high-speed thresholds, can adapt to changing societal needs, and provide service for decades.

- Fiber builds are priority broadband projects for BEAD. If a provider bids to serve a home or business with an end-to-end fiber connection, and their proposal is not too expensive, then they will be prioritized in receiving funds to deploy that network.
- The next priority is other “reliable broadband” technologies, like coaxial cable or licensed fixed wireless. These technologies are prioritized above alternative technologies. They may be selected for any locations that would be too expensive to serve with fiber.

For a small percentage of locations, in the hardest-to reach-parts of the country, a “reliable broadband” provider will not be available, or it will be too costly to deploy. In these limited circumstances, states can choose to fund projects using an alternative technology. Alternative technologies include unlicensed fixed wireless and low-earth orbit (LEO) satellite broadband service that meet the BEAD speed and latency requirements.

August 2024

Recent BEAD Clarification on Technology

Reliable Broadband Service

The technologies that qualify as **Reliable Broadband Service** and are eligible for BEAD funding include:

- ✓ Fiber to the Home (FTTH) (**Priority Broadband Service**);
- ✓ Hybrid Fiber-Coaxial (HFC);
- ✓ Licensed Fixed Wireless (LFW); and
- ✓ Digital Subscriber Line (DSL)

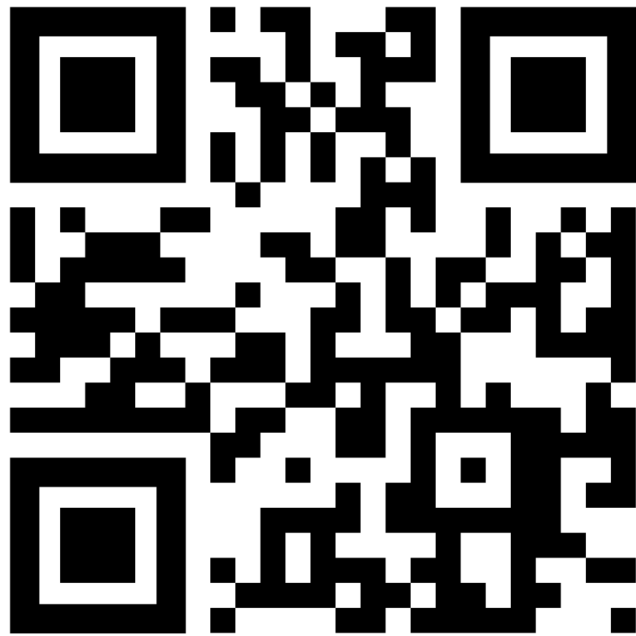
Other Broadband Technologies

The technologies **not defined as Reliable Broadband Service** include:

- ✓ **Alternative Technologies**, e.g., Unlicensed Fixed Wireless (ULFW) and Low Earth Orbit (LEO) Satellite, meeting the BEAD Program's speed and latency technical requirements (**eligible for BEAD funding**); and
- ✗ **Other technologies** not meeting the BEAD Program's technical requirements, e.g., Geostationary Orbit (GEO) Satellite (**ineligible for BEAD funding**)

Technologies marked with a ✓ are eligible for BEAD funding under the requirements outlined in the BEAD NOFO, whereas those with an ✗ are not eligible for BEAD funding.

Link to Broadband USA Interactive Guide



https://broadbandusa.ntia.doc.gov/sites/default/files/2023-07/FY23_BroadbandUSA_Federal_Funding_Interactive_Guide_071323.pdf

States

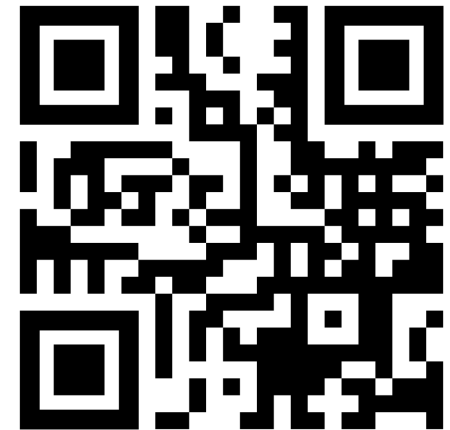
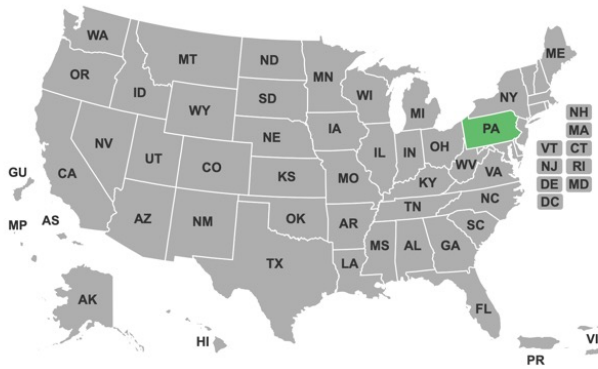
State Broadband Leaders Network (SBLN)

The National Telecommunications and Information Administration's (NTIA) BroadbandUSA program convenes and facilitates the State Broadband Leaders Network (SBLN), a community of practitioners who work on state broadband initiatives. SBLN participants share priorities and best practices and discuss emerging telecommunications policy issues. The network also provides a forum to strengthen policy and program connections among states, local jurisdictions and federal agencies.

For more information on the SBLN, consult the [SBLN Fact Sheet](#)

State Broadband Programs

Select 'state' to review State Broadband Programs



<https://broadbandusa.ntia.doc.gov/resources/states>

NTIA BroadbandUSA State Info Example

Pennsylvania

State broadband website(s):

- [Pennsylvania Broadband Development Authority](#)

State broadband contact(s):

- Nicole Ugarte
NTIA Federal Program Officer
nugarte@ntia.gov
- Brandon Carson
Executive Director
Pennsylvania Broadband Development Authority
bwcarson@pa.gov
- Erin Wachter
Deputy Secretary of Policy and Planning
Office of Governor Tom Wolfe
serin@pa.gov
(717) 346-9523
- Kalie Snyder
Executive Assistant
Pennsylvania Department of Community & Economic Development
kalsnyder@pa.gov
(717) 425-7599

State broadband coordinators:

PA Department of Community & Economic Development

Broadband programs:

The Pennsylvania Broadband Investment Incentive Program: Created in March 2018, the Pennsylvania Broadband Investment Incentive Program offers up to \$35 million in financial incentives to private providers bidding on service areas within Pennsylvania.

Funding for broadband:

Unserved High-Speed Broadband Funding Program: The Unserved High-Speed Broadband Funding Program authorizes the Commonwealth Financing Authority to award grants that shall not exceed \$1 million or 75 percent of the total project costs, whichever is less. This award may be granted to nongovernmental entities that have expertise with high-speed broadband service infrastructure in unserved areas of the state.

Pennsylvania Economic Development Financing Authority Tax Exempt Bond Program: The Tax Exempt Bond Program provides tax exempt bonds which can be utilized for broadband deployment.

Pennsylvania Economic Development Financing Authority Taxable Bond Program: The Taxable Bond Program provides taxable bonds which can be utilized for broadband deployment.

Pennsylvania Industrial Development Authority: The Pennsylvania Industrial Development Authority provides low-interest loans and lines of credit for eligible businesses, which can be utilized for broadband deployment.

Pennsylvania First Program: The Pennsylvania First Program provides grants, loans, and loan guarantees for eligible entities, which can be utilized for broadband deployment.

5G Fund for Rural America

Overview of the FCC's new 5G Fund FNPRM Sept 21, 2023

With the recent release of the FCC's Further Notice of Proposed Rulemaking (FNPRM) the FCC now seeks to bolster the record to inform the rulemaking process. Core concepts in the FNPRM surround:

- Budget – is \$9 Billion enough or too much?
- How to retarget mobility funding in rural areas – such as the use of more precise Broadband Data Collection (BDC) data to support the understanding of the presence of 5G service
- The geographic units of coverage and area eligibility
- Geography and funding aggregation
- The use of reverse auctions for funding distribution and funding price metrics
- Compliance and testing



<https://www.costquest.com/resources/articles/update-on-the-5g-fund-for-rural-america-whats-new/>

Precision Agriculture Connectivity Task Force

- The FCC says that it intends to re-charter the Precision Agriculture Connectivity Task Force, with the goal of meeting the production and sustainability challenges faced by agricultural and food systems (Aug 2023)
- 5G Fund for Rural America: The Commission established the 5G Fund to take up to \$9 billion in Universal Service Fund support available to carriers to deploy advanced 5G mobile wireless services
- **The Fund also sets aside at least \$1 billion specifically for deployments facilitating precision agriculture needs**

<https://www.telecompetitor.com/fcc-task-force-will-take-a-fresh-look-at-precision-ag-connectivity/>



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National Broadband — Navigator Tool

Live Demonstration
by Harry Crissy, Penn State
Extension



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Thank you!



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