

Rural Broadband Task Force

Friday, May 3, 2019
1:30 p.m. to 4:00 CDT

Varner Hall, Lower Level, Board Room
3835 Holdrege Street, Lincoln, Nebraska

Video Locations:

University of Nebraska at Omaha, Eppley Administration Building, Room 110A, 6001 Dodge Street, Omaha, NE 68182
Homestead Bank, 619 Grand Street, St. Paul, NE 68873
1005 Woodcrest, Norfolk, NE 68701

Web streaming for up to 100 viewers will be available. Information for connecting via Zoom is included on the following page. Links to agendas, minutes, and meeting materials are available at ruralbroadband.nebraska.gov

Agenda

1:30	Opening Business — <i>Ed Toner, Office of the Chief Information Officer</i> Roll Call Notice of Posting of Agenda Notice of Nebraska Open Meetings Act Posting Approval of the March 29, 2019 minutes*
1:35	Utilizing the NUSF to Leverage Federal Universal Service Fund Support Panelists: <ul style="list-style-type: none">• Cullen Robbins, Nebraska Public Service Commission• SuAnn Witt, Nebraska Department of Education• Christa Porter, Nebraska Library Commission
2:10	Addressing the Homework Gap Panelists <ul style="list-style-type: none">• Tom Rolfes, Nebraska Information Technology Commission• Holly Woldt, Nebraska Library Commission• Jessica Chamberlain, Norfolk Public Library• Burke Brown, District OR-1 Palmyra/Bennet Public Schools <i>*Formation of a subcommittee to develop recommendations for addressing the homework gap and leveraging federal universal service funds.</i>
3:00	Subcommittee Reports <ul style="list-style-type: none">• <i>Broadband Technologies Subcommittee Report*</i>• NUSF Subcommittee Report
3:45	Developing Rural Broadband Task Force Report <ul style="list-style-type: none">• <i>Approval of Draft Report Outline*</i>• <i>Formation of a subcommittee to review the draft report*</i>
4:00	Adjourn

The task force will attempt to adhere to the sequence of the published agenda, but reserves the right to adjust the order and timing of items and may elect to take action on any of the items listed.

The meeting announcement was posted on the Nebraska Public Meeting and Rural Broadband Task Force websites on Dec. 3, 2018. The agenda was posted on the Rural Broadband Task Force website on April 25, 2019.

[Nebraska Open Meetings Act](#)

Zoom Information

Please click the link below to join the webinar:

<https://zoom.us/j/102085502>

Or Telephone:

Dial(for higher quality, dial a number based on your current location):

US: +1 669 900 6833 or +1 646 558 8656

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RURAL BROADBAND TASK FORCE

Friday, March 29, 2019, 9:30 a.m. to 12:00 noon C
August N. Christenson Research and Education Building
Eastern Nebraska Research and Extension Center
1071 County Road G, Ithaca, NE 68033

MINUTES

MEMBERS PRESENT:

Ed Toner, Chair, Nebraska Information Technology Commission
Mary Ridder, Chair, Nebraska Public Service Commission
Senator Curt Friesen, District 34, Chair, Transportation and Telecommunications Committee, Nebraska Legislature
Senator Bruce Bostelman, District 23, Nebraska Legislature
Ben Kuspa for Dave Rippe, Nebraska Department of Economic Development
Zachary Hunnicutt, Farmer, Hunnicutt Farms
Tom Shoemaker, President, Pinpoint Communications
Daniel Spray, Owner, Precision Technology
Timothy Lindahl, CEO/General Manager, Wheat Belt Public Power District
Andrew Buker, Executive Director of Infrastructure Services, University of Nebraska Ron Cone, Director of Network Information Services, ESU 10

Members Absent: Steve Wellman, Isaiah Graham, and Anna Turman

OPENING BUSINESS, ROLL CALL NOTICE OF POSTING OF AGENDA NOTICE OF NEBRASKA OPEN MEETINGS ACT POSTING

Ed Toner, Office of the Chief Information Officer

Mr. Toner called the meeting to order at 9:30 a.m. Roll call was taken. There were nine voting and two ex officio non-voting members present. A quorum existed to conduct official business. The meeting announcement was posted on the Nebraska Public Meeting and Rural Broadband Task Force websites on December 3, 2018. The agenda was posted on the Rural Broadband Task Force website on March 22, 2019. The Nebraska Open Meetings Act was located next to the recording secretary at the front of the room.

APPROVAL OF THE FEBRUARY 25, 2019 MINUTES*

Ed Toner, Office of the Chief Information Officer

Mary Ridder moved to approve the February 25, 2019 minutes as presented. Mr. Spray seconded. Roll call vote: Toner-Yes, Ridder-Yes, Kuspa-Yes, Hunnicutt-Yes, Shoemaker-Yes, Spray-Yes, Lindahl-Yes, Buker-Yes, and Cone-Yes. Results: Yes-9, No-0, Abstained-0. Motion carried.

AGRICULTURAL TECHNOLOGY AND BROADBAND: DIRECT MARKETING BEEF

Hannah Raudsepp, Honestbeef.com

Ms. Raudsepp provided a brief history of her family business. After graduating from Creighton University, she moved to Boston where she met her husband. It was during this time, she realized the huge disconnect between agricultural producers and those who eat their products and started direct marketing beef. She and her husband moved back to Nebraska to help with the family business. Broadband was critical in making it possible for Ms. Raudsepp and her husband to move back to the Sandhills. Ms. Raudsepp and her husband have also hosted discussions local community members and friends from Boston via video on social issues. This has enriched their small community. Task Force members were given an opportunity to ask questions.

REPORTS FROM TASK FORCE SUBCOMMITTEES

Broadband Data Subcommittee. Subcommittee members include Senator Bruce Bostelman, Dan Spray, Anna Turman, and Andrew Buker. Mr. Spray reviewed the subcommittee report findings with the task force. The subcommittee was asked to answer the following questions:

- **What data do we currently have?** Nebraska's [broadband map](#) currently utilizes Form 477 data released by the FCC. Providers of fixed broadband report the type of technology and maximum advertised speeds by census block to the FCC. Mobile wireless providers provide polygons of their service area and the minimum speeds that are publicly available. There are also several sources of speed test data which could potentially supplement data submitted by providers.
- **What data do we need?** The Broadband Data Subcommittee agreed that data on where fixed broadband is currently being provided, at what speeds, and with what technology at a level which is more granular than census block reporting is needed annually.
- **How can we get the data we need but don't have?** The Broadband Data Subcommittee identified the following strategies which may be utilized to develop an address level data and mapping program for fixed broadband providers:
 - Collecting address level data from providers annually
 - Leveraging the NextGen 911 address point database
 - Leveraging federal or national data collection efforts if possible
 - Supplementing address level data from providers with additional sources of data

USTelecom announced a broadband mapping pilot with Missouri and Virginia on March 21, 2019. This mapping initiative could potentially address many of the issues the subcommittee has identified. The pilot is expected to be completed in 4-6 months. The Subcommittee would like to review its recommendations after results of the pilot are available.

Mr. Hunnicutt moved to approve the initial findings of the Rural Broadband Task Force's Broadband Data Subcommittee Report and to direct the Broadband Data Subcommittee to present final recommendation to the task force later this fall. Mr. Shoemaker seconded. Roll call vote: Hunnicutt-Yes, Shoemaker-Yes, Spray-Yes, Lindahl-Yes, Buker-Yes, Cone-Yes, Toner-Yes, Ridder-Yes, and Kuspa-Yes. Results: Yes-9, No-0, Abstained-0. Motion carried.

Public-Private Partnerships Subcommittee. Subcommittee members include Tom Shoemaker and Tim Lindahl. Mr. Shoemaker reported that the subcommittee identified public-private partnership models and made several recommendations. Recommendations included:

- **Encouraging local and regional broadband planning.** Each community, county or region is different and will likely require a unique solution. Bringing stakeholders together to develop a local, county or regional plan can lay the groundwork for public-private partnerships.
- **Exploring the creation of a statewide broadband association.** The association could include telecommunications providers, public power districts, schools, hospitals, municipalities, counties, and other stakeholders interested in advancing broadband in Nebraska. The association could convene regional and statewide discussions and develop and distribute resources such as model or sample agreements.
- **Removing barriers to public-private partnerships.** A couple of possible barriers have been identified by stakeholders. Neb. Revised Statutes Section 86-577 places restrictions on leasing of dark fiber by public entities. Public power providers have stated that this could be a barrier. Legislation clarifying communications as an approved use for private easements set up for telephone and electric use would also eliminate uncertainty and litigation over this issue.

- **Identify funding for public-private partnerships.** Possible funding sources for public-private partnerships include LB 840 funds, USDA broadband grants and loans, Community Reinvestment Act, and New Market Tax Credits. Additional sources of funding such as a state broadband grant program would facilitate the development of public-private partnerships. Approximately 25 states have created broadband grant funds.

Mr. Spray moved to approve the findings and recommendations of the Public-Private Partnerships Subcommittee for inclusion in the task force's final report and to direct the subcommittee to continue to work to identify barriers and recommendations to address these barriers. Mr. Buker seconded. Roll call vote: Hunnicutt-Yes, Shoemaker-Yes, Spray-Yes, Lindahl-Yes, Buker-Yes, Cone-Yes, Toner-Yes, Ridder-Yes, and Kuspa-Yes. Results: Yes-9, No-0, Abstained-0. Motion carried.

Due to time constraints, the reports of the Broadband Technologies and NUSF Subcommittees were postponed until the next meeting by group consensus.

TOPICS FOR MAY MEETING

Ed Toner, Office of the Chief Information Officer

Mr. Toner stated that the Rural Broadband Task Force is making good progress, but that there is one final charge to the task force. That charge is to “recommend state policies to effectively utilize state universal service fund dollars to leverage federal universal service fund support and other federal funding.” That will be on the agenda for the next meeting on May 3. Mr. Toner asked members to let Ms. Byers know if they have recommendations for speakers for a panel on this issue. Andrew Buker also suggested including the homework gap on the agenda for the next meeting.

The meeting proceeded with the following informational presentations on agricultural technology and broadband:

- **ENREC and Microsoft Corporation/IANR Precision Ag Project Update, Doug Zalesky.** The Eastern Nebraska Research and Extension Center (ENREC) has 9,600 acres. Half of the acres are used for crops. The other half is used for pasture or hay. ENREC’s vision is to have wireless connectivity to all acres. ENREC would like to do more precision livestock production, but there is limited wireless coverage to implement some of the technologies. ENREC has been working with Microsoft’s Airband initiative. Unfortunately, due to the proximity to Omaha and Lincoln, the spectrum necessary for a TV white space test is not available. Microsoft is currently looking at other possible technologies.
- **Precision Agriculture, Joe Luck.** The future of crop management will be predictive, highly automated, and action-focused. In one study, the use of precision agriculture technologies saved 50 pounds of nitrogen per acre. In the future, higher speed data transmission; cloud storage and computing tools; and test beds for automated, data-driven solutions will be needed.
- **Plant Phenotyping Research, Hector Santiago.** The University of Nebraska has a Spidercam to collect phenotype data on crops. The system is the only one in the U.S. The spider camera can carry 30 kilograms of imaging equipment, including spectrometer, thermal infrared, Lidar, and Visible RGB, and Near Infrared cameras. Researchers physically move the data to the Holland Supercomputer center.
- **UAV Research, Wayne Woldt.** It has been legal to fly unmanned aircraft since 2016. In January the University of Nebraska received approval for spray testing. Sensors can be carried for early detection of moisture stress, irrigation management. The drone collects 22 GB per 160 acres. Data is transmitted via the “sneaker method.”

A working lunch was provided to continue discussions with the presenters and to entertain questions from the task force members.

ADJOURNMENT

With no further business, Mr. Toner, adjourned the meeting. The meeting was adjourned at 12:44 p.m.

The meeting was followed by a demonstration of Unmanned Aerial Vehicles (UAVs).

The minutes were taken by Lori Lopez Urdiales and reviewed by Anne Byers, Office of the CIO/NITC.

Rural Broadband Technologies

Report to Rural Broadband Task Force
May 29, 2019

Overview

On November 7, 2018 the Rural Broadband Task Force formed the Broadband Technologies Subcommittee to review “the feasibility of alternative technologies and providers in accelerating access to faster and more reliable broadband service for rural residents.” Subcommittee members include Zachary Hunnicutt, Ron Cone, and Dan Spray. In addition to alternative technologies, subcommittee members also included a review of technologies currently being used to deploy broadband to provide a frame of reference.

Some of the emerging technologies may be particularly well-suited for rural areas. Low Earth Satellites could potentially provide a gigabit per second service. AirGig and fixed wireless technologies using mid-band spectrums could potentially provide 100 Mbps service in rural areas. Although TV white space has been touted as a solution for rural areas, the subcommittee’s review found that TV white space typically delivers speeds of only 3-24 Mbps. Perhaps with further development and changes to current FCC regulations, this technology will provide better speeds.

The subcommittee also noted that a number of emerging and currently technologies may provide speeds of one gigabit per second or more. It is likely that most of these technologies--particularly 5G--will be deployed first in urban areas, potentially exacerbating the speed gap between rural and urban areas.

Here is the list of technologies reviewed by the Rural Broadband Subcommittee:

- Wireline Technologies—Digital Subscriber Line (DSL)
- Wireline Technologies—Fiber
- Power Line Technologies—AirGig
- Fixed Wireless—TV White Space
- Fixed Wireless—Millimeter Wave
- Fixed or Mobile Wireless—Educational Broadband Service (EBS)
- Fixed or Mobile Wireless—Citizens Broadband Radio Service (CBRS)
- Mobile Wireless—5GSatellite—Low Earth Orbit

Rural Broadband Technologies

Wireline Technologies—Digital Subscriber Line (DSL)

Description	This family of technologies (including ADSL2+, VDSL, VDSL2) provides internet access by transmitting digital data over a local telephone network.
Bandwidth Capabilities	1.5 Mbps up to 50-100 Mbps using the newest xDSL protocols. Speeds are distance dependent and are often provided as asymmetric bandwidth. Current VDSL@ standards provide 100 Mbps @ 500 meters maximum distance. Typical ADSL speeds are 24/3 Mbps depending on distance.
Effective Distance	5.5 km (18,000 feet) without a repeater
Scalability/Future Proof	Except at short distances, DSL probably won't provide the speeds--especially upload speeds--needed by consumers in the future.
Typical Construction Costs Per Subscriber	\$655-\$1100
Barriers	Distance limitations of using existing cable infrastructure to meet increasing bandwidth needs
Pros	Uses the existing telephone network; can be bundled/unbundled with traditional voice service
Cons	Very distance sensitive, higher quality cable allows longer distance Asymmetric
Overall Feasibility	Currently widely used, but may not be the best technology for future needs.
Sources and Links	Broadband 101 Video with Jason Axthelm, Nebraska Broadband Today Conference 2017 Whatis.com Broadband Recommendations: Meeker County, Minnesota County by Design Nine (August 2018)

Rural Broadband Technologies

Wireline Technologies—Fiber

Description	Fiber technology converts electrical signals to optical laser signals carrying data
Bandwidth Capabilities	Up to 10 Gbps or more. An upper limit has not been found.
Effective Distance	Up to 25 miles (Passive Optical Network/PON Fiber) and up to 50 miles (Active Ethernet)
Scalability/Future Proof	Scalable and future proof
Typical Construction Costs Per Subscriber	\$3,250-\$3,500
Barriers	Expensive to deploy due to build costs
Pros	Up to 10 Gbps or more. Fiber has a life expectancy of 30-40 years or more.
Cons	Expensive to deploy
Overall Feasibility	May be too expensive to deploy in rural areas without additional support
Sources and Links	Broadband 101 Video with Jason Axthelm, Nebraska Broadband Today Conference 2017

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Wireline Technologies—Cable Modem

Description	Cable providers deliver broadband using the same coaxial cable used to deliver cable TV service using DOCSIS (Data over Cable Service Interface Specification). This is a shared bandwidth service.
Bandwidth Capabilities	Up to 10 Gbps down/1 Gbps up using DOCSIS 3.1
Effective Distance	Up to 100 miles
Scalability/Future Proof	The asymmetric nature of cable modem service is a limitation for some consumers and will likely be more of an issue in the future.
Typical Construction Costs Per Subscriber	\$2,500 to \$3,500
Barriers	Cable modem technology is usually only deployed within towns.
Pros	Good download speeds and generally one of the more affordable options for consumers in towns
Cons	Asymmetric and shared bandwidth service
Overall Feasibility	Since cable service is typically only available within city limits, cable modem service isn't a feasible technology for reaching rural areas outside of town.
Sources and Links	Broadband 101 Video with Jason Axthelm, Nebraska Broadband Today Conference 2017

Rural Broadband Technologies

Power Line Technologies—AirGig

Description	AirGig is being tested by AT&T with a reported availability date of 2021. AirGig uses antenna modules called eggs which are clamped on power lines to send data signals which cling to the wire. A demonstration in September 2018 showed data capacity of 90 gigabits per second (Gbps). To link to a home, AT&T will likely use more conventional wireless equipment like 5G mobile networks. AT&T began testing the technology with Georgia Power in 2017. In January 2019, AT&T said it is discussing testing and building commercial-grade AirGig equipment with suppliers.
Bandwidth Capabilities	Possibly 100 Mbps
Scalability/Future Proof	Unknown
Barriers	Public power providers could not provide telecommunications services directly, but could partner with telecommunications providers.
Pros	Power line infrastructure is in place which may reduce implementation costs.
Cons	Power line infrastructure is vulnerable to damage due to severe weather events such as ice storms or tornadoes.
Overall Feasibility	Potentially promising
Sources and Links	<p>Stephen Shankland. AT&T AirGig could mean 100-megabit rural broadband in 2021. (Sept. 10, 2018) C Net</p> <p>Joan Engebretson. AT&T plans to test 5G with AirGig, Seeks AirGig Manufacturers (Jan. 30, 2019). Telecompetitor</p>

Rural Broadband Technologies

Wireless Spectrum Overview

Bands	Spectrum Range	Coverage v. Capacity
Low-Bands TV White Space 554-698 MHz	Below 1 GHz	Offer greater coverage due to longer range and building penetration, but less capacity.
Mid-Bands Millimeter Wave 2.4 Ghz, 5 GHz Educational Broadcast Service (EBS) 2495-2690 GHz Citizens Band Radio Service (CBRS) 3550-3700 MHz Wireless Fiber 3700-4200 MHz	2 GHz to 6 GHz	Offer a combination of coverage and capacity.
High-Bands Millimeter Wave 30-300 GHz	Above 24 GHz	Offer enormous capacity, but limited propagation. Good for short distances and line of sight.

The FCC currently has spectrum sharing proceedings open on TV White Space, Citizens Band Radio Service, “Wireless Fiber,” Educational Broadband Service (EBS), and Extending Unlicensed and Wi-Fi Across 6 GHz.

Source: SHLB webinar on Key Concepts in Spectrum Policy, Feb. 2019.

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Fixed Wireless—TV White Space

Description	Point to multipoint wireless Internet delivery via UHF frequencies in the 554-698 MHz range. “White Space” refers to the unoccupied channels previously used to deliver television broadcasts.
Bandwidth Capabilities	3-24 Mbps
Effective Distance	~3-6 miles Line-of-Sight (LOS) delivery. Less than that distance with Non-Line-of-Sight (NLOS) delivery.
Scalability/Future Proof	Developing technology, current FCC regulations limit the effectiveness of this technology specifically in truly rural areas.
Typical Construction Costs Per Subscriber	~\$1,000-\$1,500 in rural areas. Current sectors are only able to support ~20 clients, but range does not allow for sparsely populated areas to reach that density therefore raising the per subscriber cost. Estimated Costs: Base station \$5,000-\$15,000 plus customer premise equipment \$300-\$700 per site
Typical Operational Costs Per Subscriber	~\$20-\$40/mo depending on delivered speeds
Barriers	Current FCC regulations and costs per subscriber in low density areas
Possible Incentives	This technology could work well in rural communities and customer sites just outside of city limits, incentivizing the technology buildout in those areas would be useful.
Pros	Capable of delivering NLOS broadband
Cons	Short distance ranges and bandwidth limits for NLOS delivery, until equipment improves
Overall Feasibility	Definitely a technology to watch, but not ready for truly rural areas

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Fixed Wireless—Millimeter Wave

Description	Point-to-Multipoint 2.4Ghz, 5Ghz, 24Ghz and 60Ghz Wireless
Bandwidth Capabilities	Varied from 5 Mbps to 2.5 Gbps based on frequency and distance
Effective Distance	Varied from .6 miles to 15 miles
Scalability/Future Proof	Quite scalable and actively developed, well supported by the FCC rulings.
Typical Construction Costs Per Subscriber	~\$200-\$1,500 depending on frequency and distance
Typical Operational Costs Per Subscriber	~\$30-\$90 per month depending on bandwidth provided to the client
Barriers	These frequencies are limited to line of site and power per the FCC.
Possible Incentives	Higher density builds need to be used to adequately provide services to rural areas. Incentives for building towers and providing power to the structures could increase the profit model and make it more feasible.
Pros	Solid technology that's been around and is well supported by the FCC. Able to deliver high rate of speed at respectable distances.
Cons	Technology still needs FCC approval for higher powers in rural areas. Technology is limited to LOS delivery, this gets difficult in both urban and rural areas.
Overall Feasibility	This is a mainstream solution that needs to be well supported due to low cost of delivery

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Fixed or Mobile Wireless—Educational Broadband Service (EBS)

<p>Description</p>	<p>Educational Broadband Service (EBS), formerly known as the Instructional Television Fixed Service (ITFS), 2.5GHz (2495-2690 MHz) spectrum, is a high-speed, high-capacity wireless broadband service, including two-way Internet service via cellularized communication systems.</p> <p>Generally, only accredited educational institutions and nonprofit educational organizations can hold EBS licenses, limited to a 35-mile radius Geographic Service Area, although licensees can lease their excess capacity to commercial providers (e.g. Sprint).</p> <p>Because this spectrum was reserved for educational purposes and a number of educational institutions have licenses, digital equity advocates have proposed using this spectrum to address the homework gap.</p>
<p>Bandwidth Capabilities</p>	<p>Mature EBS networks operated over 4G/LTE are observing customer bandwidth experiences of up to 25 Mbps down, 5 Mbps up.</p>
<p>Effective Distance</p>	<p>Effective distance is determined by the power of the device radio and the height of the cellular antenna array. Mounted antennas on subscriber homes support ranges of up to 9 miles, with shorter distances for mobile cellular antennas and lower tower arrays.</p>
<p>Scalability/Future Proof</p>	<p>Speeds currently being delivered would not meet future needs. As the FCC opens up this spectrum to new licenses and development, greater speeds may be achievable.</p>
<p>Typical Construction Costs Per Subscriber</p>	<p>Varies. Large scale EBS network operators must implement a cellular array per tower or community high point, Evolved Packet Core, tower study and tower lease costs, and customer premise antennas and/or device SIM cards.</p>
<p>Typical Operational Costs Per Subscriber</p>	<p>Current EBS networks operated by non-profit educational institutions are recovering costs of \$15-\$25 per subscriber per month.</p>
<p>Barriers</p>	<p>The FCC has not granted any new ITFS/EBS licenses since 1995. However, the FCC is expected to adopt new rules as early as June 2019 to open up the spectrum to new licenses.</p>
<p>Possible Incentives</p>	<p>Public/private partnerships for infrastructure deployment could make this 2.5GHz spectrum cost-effective for addressing the rural homework gap.</p>

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Pros	EBS operated over a mature 4G/LTE wireless network is a tried and true technology that can be easily managed.
Cons	Uncertainty over the FCC's current proceeding
Overall Feasibility	The feasibility of EBS for providers serving rural areas or for educational entities to address the homework gap depends upon the outcome of the FCC's current proceeding.

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Fixed or Mobile Wireless—Citizens Broadband Radio Service (CBRS)

Description	Citizens Broadband Radio Service (CBRS), 3.5GHz (3550-3700 MHz), has been dubbed the “Innovation Band” by developers. The FCC made this additional spectrum available in 2015 as a result of the National Broadband Plan. Early development is aimed at LTE mobile wireless, fixed wireless, and Wi-Fi-like IOT implementations for venues and/or buildings. CBRS could also be used to replace last-mile fiber access, deliver fixed wireless services and point to multipoint service.
Bandwidth Capabilities	Potentially 1 Gbps indoors and 5-10 times higher outdoors with line-of-sight access. Midco, a cable provider in the northern plains states, reports offering speeds of 100/20 Mbps at distance of 8.8 miles using CBRS on an experimental license.
Effective Distance	Midco, a cable provider in the northern plains states, reports offering speeds of 100/20 Mbps at distance of 8.8 mile using CBRS on an experimental license. Charter Communications has also tested fixed wireless in the 3.5 GHz in rural communities, determining it can provide at least 25/3 Mbps at “significant distances.”
Scalability/Future Proof	Too early to tell.
Barriers	Development costs, and maturation of the spectrum usage and devices.
Possible Incentives	Newest spectrum made available by the FCC.
Pros	The CBRS band sits directly below and adjacent to the current NN Rural Broadband band of 3.65-3.70 GHz, making it easy for rural operators to adopt the new spectrum. The CBRS Band should significantly lower the costs of entry for non-traditional wireless carriers, and the propagation characteristics of the 3.5 GHz spectrum rivals current WiFi networks.
Cons	To use CBRS spectrum, one must request and be assigned a band by a Spectrum Allocation Server (SAS). The SAS calculates RF density and

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	channel availability using terrain, radio propagation and current usage data before approving the request and allocating the spectrum.
Overall Feasibility	Too early to tell, but potentially promising.
Sources and Links	<p>Testimony of Justin Forde to the Committee on Commerce, Science, and Transportation, Innovation, and the Internet, March 12, 2019</p> <p>Mike Dano. Charter Hints at 25 Mbps fixed wireless speeds using 3.5 GHz in rural areas. (January 31, 2019). Fierce Wireless.</p> <p>Bob Brown. FAQ: What in the wireless world is CBRS? (March 14, 2014) Network World.</p>

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Mobile Wireless—4G/LTE

Description	4G LTE is the fourth generation of the mobile cellular network. It is the technology used by nearly all data-using mobile devices currently in service.
Bandwidth Capabilities	Theoretically up to 1 Gbps Practically up to 45 Mbps
Effective Distance	Several miles, up to 30-45 miles in flat terrain.
Scalability/Future Proof	Very scalable, currently available to ~90% of Americans. Still more room for growth in terms of speed and coverage area.
Barriers	Infrastructure development is expensive. Data caps and throttling reduce feasibility for use as primary broadband connection.
Pros	Widely used. All current mobile data technology revolves around 4G. Speeds are relatively fast, and nowhere near the potential upper limit.
Cons	Infrastructure development is expensive. If an area doesn't already have 4G, it likely means it is too expensive to cash flow. Terrain and vegetation can impact performance.
Overall Feasibility	4G is and will continue to be part of solving rural broadband issues.

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Mobile Wireless—5G

Description	5G is the latest generation of wireless mobile communication.
Bandwidth Capabilities	Peak download speeds of 20 Gbps (theoretical) Expected user experience of ~1Gbps Increased antenna ports will increase the capacity of mobile networks by a factor of 22 or greater
Effective Distance	Very short. Small cells (miniature base stations) are required roughly every 250 meters. One estimate put it at one city block per cell.
Scalability/Future Proof	The millimeter wave technology that defines 5G and makes the increased speeds possible is impossible to spread over greater areas. It could be possible to build cells onto existing infrastructure, but this would require significant coordination with utility companies and potentially create safety hazards.
Typical Construction Costs Per Subscriber	Unable to estimate. One estimate guessed that telecoms will spend \$275 billion to roll out the technology over 7 years.
Typical Operational Costs Per Subscriber	Also unclear. AT&T has introduced a “5G” plan in some cities that only works at hotspots. Subscribers pay \$70/mo for 15 gigabytes of data.
Barriers	High costs of deployment. Will not work with current mobile devices.
Pros	Very fast speeds. Universal support for development from major carriers and device manufacturers. Mobile network capacity will be vastly improved.
Cons	Distance limitations mean that covering large rural areas will be highly difficult. Current mobile devices will not work.
Overall Feasibility	While the technology could be used to handle traffic in home and office situations (and possibly farm yard networks), it seems nearly completely unfeasible to deliver broadband to rural Nebraska.
Sources and Links	Amy Nordrum, Kristen Clark and IEEE Spectrum Staff. (Jan. 27, 2017) Everything You Need to Know About 5G (Jan. 27, 2017) IEEE Ferry Griepink, Alexandre Ménard, Halldor Sigurdsson, and Nemanja Vucevic. The Road to 5G: The inevitable growth of infrastructure cost. (February 2018). McKinsey.

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[Aaron Pressman. AT&T Unveils Super-Fast Mobile 5G Service. Here's How Much It Costs. \(Dec. 18, 2018\). Fortune.
http://fortune.com/2018/12/18/att-5g-price-mobile-hotspot/](http://fortune.com/2018/12/18/att-5g-price-mobile-hotspot/)

Satellite—Traditional Satellite

Description	HughesNet and Viasat have improved satellite service with Viasat advertising that it can provide up to 100 Mbps in select areas. The FCC's broadband map (with data as of June 2017) shows that service up 25 Mbps down and 3 Mbps up is available.
Bandwidth Capabilities	Advertised speeds up to 25 Mbps down and 3 Mbps up. 15 Mbps down 1 Mbps speeds are common.
Effective Distance	Available virtually anywhere in the U.S.
Scalability/Future Proof	Low Earth Orbit Satellites will likely replace current satellite service
Typical Operational Costs Per Subscriber	\$69.99 per month for 20 GB/month at 25 Mbps down/3 Mbps up
Barriers	None
Pros	Available anywhere in Nebraska with a view of southern sky
Cons	Latency, data caps, and low upload speeds
Overall Feasibility	Latency and low upload speeds limit the use of some applications.

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Satellite—Low Earth Orbit

Description	Several companies are planning to launch low earth satellites to provide internet service. Full deployment of satellite arrays may be completed by mid-2020s. Latency may be as low as 25-35 milliseconds.
Bandwidth Capabilities	Gigabit per second
Effective Distance	Would be available anywhere
Scalability/Future Proof	Potentially Scalable and Future Proof
Typical Construction Costs Per Subscriber	Unknown
Typical Operational Costs Per Subscriber	Unknown
Barriers	High cost of deploying satellite arrays
Possible Incentives	Undetermined
Pros	Would be available anywhere
Cons	Likely won't be available until mid-2020s
Overall Feasibility	Potentially promising

NUSF Subcommittee

Draft Report

March 22, 2019

NUSF Subcommittee

On October 15, 2018, the Rural Broadband Task Force formed the NUSF Subcommittee to examine “the role of the Nebraska Telecommunications Universal Service Fund in bringing comparable and affordable broadband services to rural residents and any effect of the fund in deterring or delaying capital formation, broadband competition, and broadband deployment.” Subcommittee members include PSC Commissioner Mary Ridder, Tom Shoemaker, and Dan Spray.

NUSF Overview

Price cap carriers, rate of return carriers, and mobile wireless carriers receive support from the Nebraska Universal Service Fund. The Nebraska Public Service Commission has established separate distribution mechanisms for each of these carrier types.

Price Cap Carriers. Price cap carriers include the three largest carriers in the state: CenturyLink, Windstream, and Frontier (also known as Citizens Telecommunications of Nebraska). Through NUSF-99, the Nebraska Public Service Commission has taken steps to modernize the NUSF by transitioning the fund from only supporting landline telephone service to also supporting broadband.

Perhaps more importantly, most of the funds that price cap carriers receive are treated, in part, like a grant program. Specifically, a portion of the funds allocated to price cap carriers can only be accessed if the carriers apply for funding for broadband projects. These funds are allocated specifically to each of the carriers and remains allocated to them until they are approved for a project. Currently, 80% of the funds they receive must be applied for. The other 20% may be utilized for the companies’ ongoing costs, which must be used for “provision, maintenance, and upgrading of facilities.” In 2016, the allocation was split 50/50 for grant and funds for on-going costs. The PSC has adopted an 80/20 split of annual NUSF support for price cap carriers, where 80% is allocated for broadband projects, and 20% is allocated for ongoing expenses. This 80/20 split continues into the current year (2019). A carrier’s unused balance can be carried over. The following table shows how support has been allocated to Price Cap Carriers since the “grant” methodology was started in 2016:

**Table 1 NUSF Support Allocation for Price Cap Carriers
2016-2019**

Year	Total Support Allocated	Company	Amount Requested	Balance
2016	\$ 1,527,374	Frontier/Citizens	\$ 1,116,000	\$ 411,374
	\$ 2,473,501	Windstream	\$ 2,473,501	\$ -
	\$ 5,467,471	Centurylink	\$ 5,253,016	\$ 214,455
2017	\$ 2,199,943	Frontier/Citizens	\$ -	\$ 2,199,943
	\$ 4,394,372	Windstream	\$ 2,034,539	\$ 2,359,833
	\$ 7,951,126	Centurylink	\$ 6,217,675	\$ 1,733,451
2018	\$ 1,822,449	Frontier/Citizens	\$ -	\$ 1,822,449
	\$ 3,640,329	Windstream	\$ -	\$ 3,640,329
	\$ 6,586,769	Centurylink	\$ 5,150,766	\$ 1,436,003
2019	\$ 1,822,448	Frontier/Citizens	N/A	N/A
	\$ 3,640,329	Windstream	N/A	N/A
	\$ 6,586,769	Centurylink	N/A	N/A
Total	\$ 48,112,880		\$ 22,245,497	\$ 13,817,837

Rate of Return Carriers. In 2018, the Commission completed an effort to reform how support is distributed to rate of return carriers. Through its NUSF-108 proceeding, the Commission sought to incentivize broadband buildout, increase accountability, account for federal support received by carriers, and efficiently target support to areas of need. The Commission decided to use a cost model, the State Broadband Cost Model (SBCM), to base determinations of support for rate of return carriers. This cost model is essentially the same as the model used for the Connect America Fund (CAF) Phase II process, and both model fiber to the home buildout. The Commission used the SBCM to determine allocations of support for both ongoing costs and broadband deployment for each rate of return carrier. Each carrier’s allocation depended on how much of its territory was already capable of 25/3 service, and how much needed to still be built out. For example, if a carrier was completely built out with fiber to the home in their entire service territory, they would not need deployment support, and would only receive ongoing support. Conversely, if a carrier had no areas capable of 25/3 support, they would receive most of their support in deployment funds. In order to avail themselves of the deployment support allocated to companies, carriers must notify the Commission of where they intend to complete projects, and then seek reimbursement for the costs of the project. Projects can only be completed in blocks that are not 25/3 capable and are not supported through the Alternative Connect America Cost Model (A-CAM). Through this methodology, the Commission can track where broadband has been deployed, where it needs to be deployed, and where projects are occurring to deploy it.

The Commission initially proposed that areas where A-CAM support was designated would not receive support through the mechanism outlined. There is a progression order (P.O. #4) currently open to further examine that issue.

Initial allocations of support for 2019 are shown in the following table:

Table 2 NUSF Initial Support Allocations for Rate of Return Carriers 2019

Company Name	Final Ongoing Support	Final Broadband Deployment Support	Total Support
ABB - Huntel	\$ -	\$ 190,511	\$ 190,511
Arapahoe	\$ 223,504	\$ 937,616	\$ 1,161,120
Benkelman	\$ 209,853	\$ 175,865	\$ 385,717
Cambridge	\$ 187,622	\$ 90,648	\$ 278,271
Clarks	\$ 234,328	\$ -	\$ 234,328
Consolidated Telco	\$ 5,408	\$ 110,042	\$ 115,450
Consolidated Tele	\$ 445,779	\$ 77,369	\$ 523,148
Consolidated Telecom	\$ 41,456	\$ 234,150	\$ 275,606
Cozad	\$ 51,352	\$ 322,117	\$ 373,469
Curtis	\$ 39,701	\$ 122,463	\$ 162,164
Dalton	\$ -	\$ 648,674	\$ 648,674
Diller	\$ 260,101	\$ 214,278	\$ 474,380
Elsie	\$ -	\$ 6,424	\$ 6,424
Glenwood NS	\$ 258,546	\$ -	\$ 258,546
Glenwood TMC	\$ 963,241	\$ -	\$ 963,241
Great Plains	\$ 299,046	\$ 1,204,462	\$ 1,503,509
Hamilton	\$ 59,814	\$ 878,022	\$ 937,835
Hartington	\$ 181,270	\$ -	\$ 181,270
Hartman	\$ 193,440	\$ 147,989	\$ 341,429
Hemingford	\$ 382,644	\$ -	\$ 382,644
Henderson	\$ 137,479	\$ -	\$ 137,479
Hershey	\$ 72,026	\$ 179,561	\$ 251,587
Hooper	\$ 7,205	\$ 4,745	\$ 11,949
K&M	\$ 90,163	\$ 11,871	\$ 102,033
Nebraska Central	\$ 295,718	\$ 309,592	\$ 605,311
Northeast Nebraska	\$ 1,765,612	\$ -	\$ 1,765,612
Pierce	\$ 19,782	\$ 26,983	\$ 46,765
Plainview	\$ 186,428	\$ -	\$ 186,428
Sodtown	\$ -	\$ -	\$ -
Southeast Nebraska	\$ 385,048	\$ -	\$ 385,048
Stanton	\$ 183,544	\$ -	\$ 183,544
Three River	\$ 713,711	\$ -	\$ 713,711
Wauneta	\$ 167,440	\$ 145,416	\$ 312,856
Total	\$ 8,061,261	\$ 6,038,797	\$ 14,100,058

Mobile Wireless Carriers. The NUSF-92 program includes funding to support tower builds for mobile wireless carriers. Each year, the Commission opens a docket to request applications from carriers to build towers. The applications are evaluated to make sure that projects are in rural areas, are in areas where coverage is needed, and consequently are not built in close proximity to existing towers, and as long as the project is considered rural, provides service to as many potential users as possible. Individual tower applications are ranked to determine the locations where support would best be utilized.

The support amounts made available to wireless carriers for 2016, 2017, and 2018 are shown below. Determinations of support for individual carriers for the 2018 grant cycle have not yet been made.

**Table 3 NUSF Support Allocations for Mobile Wireless Carriers
2016-2019**

Year	Total Support	Company	Support Allocated
2016	\$ 4,000,000.00	US Cellular	\$ 2,486,525.00
		Viaero	\$ 915,945.00
		Pinpoint	\$ 597,530.00
2017	\$ 4,000,000.00	US Cellular	\$ 2,152,250.00
		Viaero	\$ 1,808,611.00
2018	\$ 3,200,000.00	US Cellular	TBD
		Viaero	

Conversations with Invited Stakeholders

The NUSF Subcommittee held two sessions to gather information and solicit input from invited stakeholders. The first session held on Nov. 19, 2018 focused on the role of the NUSF. The second session held on Jan. 18, 2018 gathered information and input on the feasibility of a reverse auction or other methods as an alternative support mechanism for broadband deployment.

Session 1: The Role of the NUSF

On Nov. 19, 2018 the NUSF Subcommittee met with invited stakeholders and resources to discuss the following questions:

- What is the role of the NUSF in bringing comparable and affordable broadband services to rural residences?
 - How are telecommunications providers using NUSF to deploy broadband?
 - Are the current NUSF programs meeting the need for broadband in rural areas?
 - How could the NUSF be better targeted to support broadband deployment in unserved areas?
 - The NUSF requires recipients of funding to be eligible telecommunications carriers (ETCs). ETCs currently include wireless providers, CLECs, and ILECs. Is there anything that prevents other carriers from becoming an ETC?
 - Are sufficient mechanisms in place to hold carriers accountable? Are there ways that this could be improved?
- Has the fund deterred or delayed capital formation, broadband competition, and broadband deployment? If so, in what way?

The following stakeholders and resources attended the meeting on Nov. 19, 2018:

- Cullen Robbins, Nebraska Public Service Commission
- Shana Knutson, Nebraska Public Service Commission
- Mike Hybl, Nebraska Public Service Commission
- Doc Wininger, Pinpoint
- Andy Pollock, Remboldt Ludtke
- Nick Paden, Remboldt Ludtke
- Dave Webb, NPPD
- Ansley Mick, Nebraska Farm Bureau
- Matt Larson, Vistabeam
- Paul M. Schudel, Woods & Aitken LLP
- John Barrett, Great Plains Communications
- Ann Prockish, CenturyLink
- Deonne Bruning, U.S. Cellular
- David Rosenbaum, University of Nebraska

How are telecommunications providers using NUSF to deploy broadband?

Price cap carriers, rate of return carriers, and mobile wireless carriers reported using the NUSF to deploy broadband:

- **Price Cap Carriers.** Ann Prockish, CenturyLink, stated CenturyLink is working hard to fund projects. A big project in the Valentine area was just approved. Other projects are in the works.
- **Rate of Return Carriers.** Three representatives of rate of return carriers described how the NUSF benefits rate of return carriers. Andy Pollock, Remboldt Ludtke, said that rural carriers depend on high cost NUSF support to service ongoing loan obligations. NUSF broadband grants would reimburse carriers for eligible expenses. Doc Wininger, Pinpoint, said that NUSF acts as a supplement. NUSF provides 25% of project costs for their RUS loan. Paul Schudel, Woods & Aitken, commented that NUSF has been in the forefront in providing support for high cost areas based on the assumption that the support also goes to broadband infrastructure.
- **Mobile Wireless Carriers.** Deonne Bruning, US Cellular, said U.S. Cellular has used NUSF funds for towers since 2010. A current NUSF application is pending for 8 towers in 8 different counties

Are the current NUSF programs meeting the need for broadband in rural areas?

While most representatives of telecommunications providers expressed appreciation for the NUSF, they also recognized that the NUSF alone at the current fund size was not adequate to meet the need for broadband in rural areas. Doc Wininger, Pinpoint, answered the above question by saying, "A NUSF of \$29 million is only a fraction of the amount needed to deploy broadband, given its original \$80 million total. The answer is 'no,' but moving in the right direction with stabilization of the fund."

Deonne Bruning, US Cellular, and Paul Schudel, Woods and Aitken, also commented on the need for increased funding. Deonne Bruning said that broadband fund is now at \$3.2 million, previously \$5 million. The amount of funding doesn't meet the need.

Paul Schudel, Woods & Aitken, commented that as the size of the NUSF has decreased from \$50 million in 2013 to NUSF was \$29.3 million in 2018, disbursements have become less predictable, contributing to a lack of capital investments. He recommended converting disbursements to a 10-year predictable disbursement.

Participants discussed the need for more accurate data on broadband availability. Ann Prockish from CenturyLink referenced the difficulty of identifying areas in which broadband is not available. NUSF Funding is not available for areas that are already served. One non-profit she is working with wants service but is in a census block which shows availability

The Nebraska Public Service Commission currently uses Form 477 data to determine broadband availability. Data reported via USAC's High Cost Universal Broadband (HUBB) portal may be another potential source of data. ACAM carriers and possibly price cap carriers are required to use HUBB reporting for CAF II awards. HUBB requires reporting locations served.

Participants agreed that Nebraska Universal Service Fund is supporting broadband deployment. However, the NUSF is at too low a level to bring about significant improvements in broadband. The Commission's steps to modernize the contribution method and stabilize the fund is a positive. Depletion of the fund has made it harder to deploy broadband.

Mike Hybl, PSC, said, “The broader question is has the fund been good or bad for Nebraska? The answer is ‘yes.’ The CenturyLink Valentine project is a good example.” Ann Prockish agreed. “The project had an 800 year payback without NSUF,” she said.

How could the NUSF be better targeted to support broadband deployment in unserved areas?

Participants discussed the need for better data on broadband availability in order to better target NUSF support for broadband deployment in unserved areas. Doc Wining, Pinpoint, said that in the 80s, PSC staff actually tested quality of service. There may be something the Commission could do along those lines.

Ansley Mick, Nebraska Farm Bureau, said that Nebraska Farm Bureau has been collecting mobile speed test data, but that the Nebraska Farm Bureau hasn’t had the response from members that we had hoped. Kansas had a great response and will file a response with the Mobility Fund.

Matt Larson, Vistabeam, recommended looking at what other states are doing. Wyoming has a \$10 million broadband grant program. Colorado also has a broadband grant program. Wyoming has a GIS database showing areas that do not have service. Russ Elliott from Wyoming has spent quite a bit of time meeting with people in unserved/underserved areas.

One participant, Deonne Bruning, US Cellular, identified a potential change in the threshold for funding for wireless broadband support. She said that the density test for wireless support is 4.5 households per square mile. At 5 or 6 households per square mile, a wireless company will not build out towers. At a density threshold of 5.5 or 6 households, a wireless company may build out more towers with appropriate support. Increasing the threshold may allow the fund to get more bang for the buck. She cited a project near Wisner and Pilger that was not fundable due to the current threshold. Cullen Robbins asked Ms. Bruning to provide evidence documenting the need to change the threshold.

Dan Spray, Connecting Point, commented that fixed base wireless is a real solution for 25/3 service. We need to look at more efficient use of the funds and different delivery methods.

The NUSF currently supports carriers designated as ETCs. Should the NUSF support non-ETC carriers?

In order to be eligible for the high-cost program (or any USF program), a carrier must be designated by the PSC as an eligible telecommunications carrier (ETC). ETC is a designation created by federal statute as a condition for receiving federal high-cost funds, which is also used by the PSC for state support. ETCs have special obligations to their customers and to the PSC. They must commit to offering specific “supported services”, must only charge a specific rate, serve everyone in a designated area, and meet financial and other reporting requirements.

Participants were in agreement that ETC status should be a requirement for support from the NUSF.

Are sufficient mechanisms in place to hold carriers accountable? Are there ways that this could be improved?

Participants agreed that accountability for providers was necessary and felt that the Nebraska Public Service Commission was taking steps to ensure accountability. Deonne Bruning, US Cellular, said that wireless providers have a large degree of accountability, with funds disbursed through a quasi-grant process. She commented that the process to get reimbursement was difficult at first, but is now better.

Ann Prockish, CenturyLink, agreed that accountability is required, but the process for reimbursing price cap carriers must be streamlined in Nebraska. She later provided sample documentation that was used to request reimbursement from Minnesota's universal service program.

Matt Larson, Vistabeam, commented that there is a federal reporting requirement for the CAF II funding that requires sampling of a certain number of customers that speed tests are being met.

Has the fund deterred or delayed capital formation, broadband competition, and broadband deployment? If so, in what way?

Several participants commented that the sustainability and predictability of the NUSF have made it harder for providers to invest. Participants did not identify any other way in which the fund has deterred or delayed capital formation, broadband competition, and broadband deployment.

Session 2: Exploring the Feasibility of a Reverse Auction or Other Methods as an Alternative Support Method for Broadband Deployment

The following stakeholders and resources attended the meeting on Nov. 19, 2018:

Dave Webb, NPPD
 Cullen Robbins, Nebraska Public Service Commission
 John Barrett, Great Plains Communications
 Nick Paden, Remboldt Ludtke
 Ann Prockish, CenturyLink
 Shana Knutson, Nebraska Public Service Commission
 Andy Pollack, Remboldt Ludtke
 Ansley Mick, Nebraska Farm Bureau
 Timothy Lindahl, Wheat Belt Public Power District
 Doc Wininger, Pinpoint Communications
 Matt Larsen, Vlstabeam
 Deonne Bruning, U.S. Cellular

Connect America Fund (CAF) II Reverse Auction Overview. The FCC announced the winning bidders for the CAF II reverse auction on August 28, 2018. Cullen Robbins shared a fact sheet with the following information:

- In areas of Nebraska where the incumbent price cap carriers declined model-based support, the FCC decided to award support through a competitive bidding process.
- Bidding by providers was done on a **census block group** basis (or a collection of census blocks).
- Minimum speed requirements were 10/1 Mbps (Down/Up), but were weighted based on performance and latency (i.e. – 100/20 service held a significant advantage over 10/1).
- In Nebraska, 4 carriers (all fixed wireless) were awarded support:

Table 4 Winning CAF II Reverse Auction Bidders for Nebraska

Bidder	Support (Annually)	Locations
AMG Tech. Inv. Group LLC	\$ 4,084,838.99	8,768
Inventive Wireless of Nebraska, LLC	\$ 67.80	2
LTD Broadband LLC	\$ 2,708.25	74
NE Colorado Cellular, Inc. (Viaero)	\$ 24,098.90	56
Total	\$ 4,111,713.94	8,900

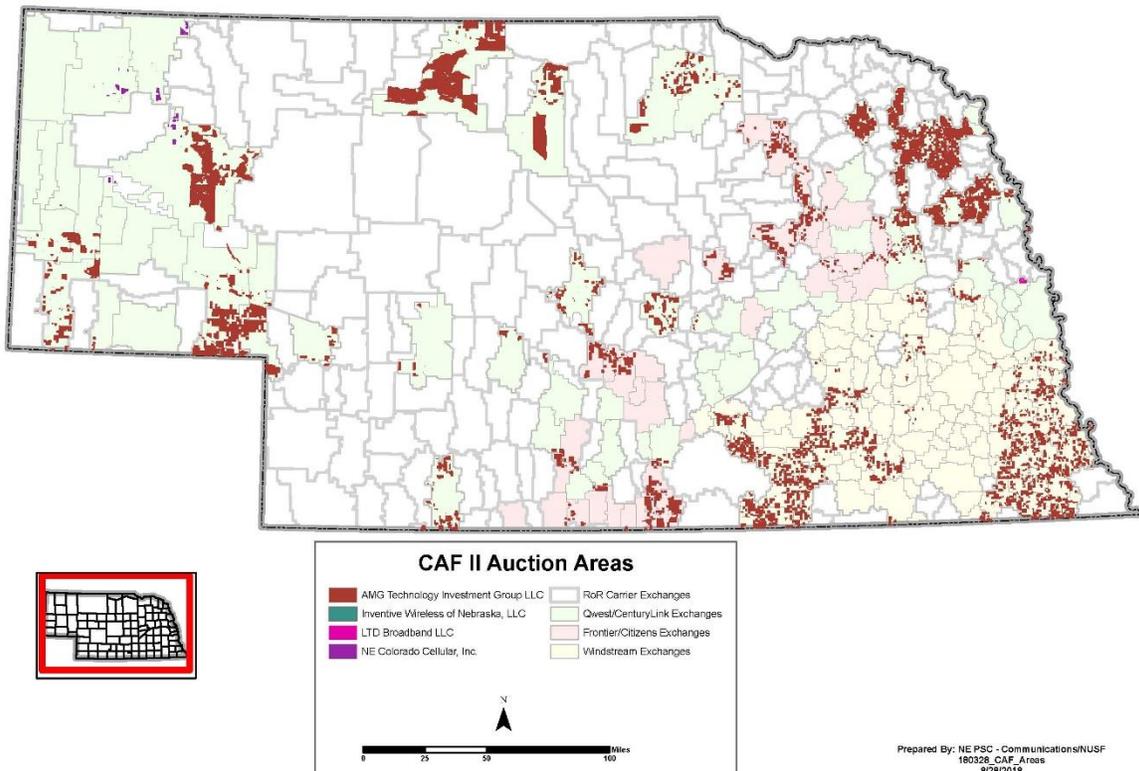
- AMG Tech. Inv. Group (Nextlink) won their block groups with a 100/20 Mbps min., others won with 25/3 bids.
- Satellite providers either didn't bid or didn't win any block groups in Nebraska.

Mechanism:

- Started with the modeled cost to build as the reserve, then went through rounds where entities could bid on support amounts that were lower than the reserve.

- A bid was a commitment to serve locations within that block group with service that they are bidding for, at the support level indicated in that round
- Rounds were continued until support levels were below the overall budgeted amount, then continued for those areas that still had competitive bidding.
- Bidders had weights applied based on speed and latency offerings.

The following map shows the census block groups in Nebraska awarded.



An interactive map of the awarded areas is available at <https://www.fcc.gov/reports-research/maps/caf2-auction903-results/>.

The awarded bids came in at 70% of the reserve/model cost for the block groups. There was no preference on technology types, although technologies which offer lower speeds and higher latency would not be weighted as heavily. Support is awarded over 10 years. By year 3, 40% of locations must be served, with an additional 20% served over the following 3 years so that by year 6 all locations are served.

There are non-compliance provisions in the CAF order to ensure that providers comply with the terms of their awards. Matt Larsen explained that providers will have an opportunity to correct deficiencies.

Applicants were required to submit letters of credit as part of the eligibility requirements to participate. CAF II auction winners need to obtain Eligible Telecommunications Carrier (ETC) status from states.

Approximately 16,000 locations were available for auction in Nebraska, with 8,900 locations awarded. Approximately 7,100 locations in Nebraska were not awarded. The FCC is planning an additional auction.

Additional information on the CAF II reverse auction is available at <https://www.fcc.gov/auction/903>.

The following pros and cons of a reverse auction were identified:

Pros:

- 70% reduction in price from the reserve/model price
- Multiple technologies were supported. Winning bidders in Nebraska will be using fixed wireless. Most winning bidders in the U.S. are planning to use fixed wireless, although satellite and wireline technologies will be deployed in some locations in other states. Matt Larsen commented that fixed wireless is often the most cost-effective technology and that speeds have improved.
- Provided higher speeds. Most awarded locations in Nebraska will get 100 Mbps down/20 Mbps up.
- Created competitive processes and positive movement in the right direction of faster speeds and lower costs

Cons:

- Implementing a reverse auction takes time. It has taken the FCC 7 years to implement a reverse auction. The FCC has been working on a reverse auction since 2011 and made awards in late 2018. Nebraska may be able to learn from the FCC process, but it would still take a considerable amount of time to determine eligible census blocks and put a process in place.
- Support was insufficient to get many large Price Cap Carriers to participate. In addition, Ann Prockish said that CenturyLink determined that the requirements were too burdensome. For example, providers are required to conduct ongoing speed tests.
- At this time, we only know the winning bidders for the CAF II reverse auction. We have not yet seen the results of any implementations.
- There are also concerns about emergency services. 911 access is more reliable over wireline technologies.
- There are also regulatory issues concerning the incumbent carriers and carrier of last resort obligations. Requiring applicants to be ETCs may partially resolve these issues.

General Discussion:

Mary Ridder said the PSC could selectively identify some rural areas to target, and then add additional areas later. Dan Spray commented that going forward, there will have to be a marrying of technologies to serve everyone. No one technology can do it all. We cannot wait another 7 years.

When asked about the PSC's ability to regulate broadband providers, Shana Knutson said that it gets murky when the PSC is asked to regulate those entities not traditionally regulated by the PSC.

Andy Pollock asked, “If the State would authorize a reverse auction, what would happen if the Feds implement another CAF II reverse auction?”

Other Alternatives:

Matt Larsen suggested the use of vouchers. Customer-centered vouchers in unserved areas would allow customers to turn in a voucher to the provider to get assistance from the PSC. Qualification levels could be set. A voucher program would be verifiable, action-based, and catering to multiple providers.

Tom Shoemaker asked, “How do you value a voucher when different providers have much different build costs?” (E.g. \$5K vs. \$10K for a specific address).

Other Funding

Block Grant Funding. Tim Lindahl suggested asking the FCC to administer CAF support as a block grant. He asked if we have any data on how Nebraska fared with respect to other rural states. Shana Knutson said New York was successful in getting CAF funding because they had \$500 million of their own money and Verizon chose not to accept CAFII money in New York. Pennsylvania and Colorado tried to get CAF money from the FCC, but were denied by the FCC.

USDA ReConnect Program. Doc Winger commented that the USDA \$600 million ReConnect Program will award grants and loans to companies or partnerships in areas with service of less than 10/1. That requirement disqualifies many areas in Nebraska. Tom Shoemaker commented that the USDA qualifier doesn’t consider quality, speed performance, and reliability.

Public-Private Partnerships. Doc Winger commented that there should be some allowance for communities to come to the PSC as public/private partnerships to seek funding for residences that are less than 25/3. Dan Spray said that Colorado has done some work with capital bond investments to incentivize infrastructure buildouts. Anne Byers mentioned that there may be other sources of funding including LB 840 funding, the use of special improvement districts, and philanthropic funds. Matt Larsen said that LB 840 money has helped with infrastructure buildouts in communities.

Revolving Loan Funds. Matt Larsen said that the State of North Dakota has a revolving loan fund for broadband and infrastructure buildouts. A revolving loan fund would be helpful for upgrades.

Nebraska Internet Enhancement Fund (NIEF). Matt Larsen said that the Nebraska Internet Enhancement Fund has helped with initial build costs, but can’t be used for upgrades.

Additional Information

On March 12, 2019, the Nebraska Public Service Commission opened a proceeding to adopt Reverse Auction and Registry rules and regulations in Title 291, Chapter 15, in accordance with Legislative Bill 994. Comments are due Thursday, April 18, 2019, and a hearing has been set for May 7, 2019 at 1:30 p.m.

Members of the NUSF Subcommittee collected information additional information on:

- Connect America Fund disbursements to Nebraska and neighboring states
- Broadband coverage by Incumbent Local Exchange Carrier (ILEC)
- Census blocks eligible but unawarded through the CAF II reverse auction

The following tables and maps show the additional information collected to date.

**Table 5 Connect America Fund Disbursements 2015-2017
Nebraska and Neighboring States**

State	CAF Disbursements 2015-2017
Colorado	\$147,508,157.52
Iowa	\$321,836,186.56
Kansas	\$151,236,282.28
Missouri	\$526,005,373.72
Nebraska	\$148,795,181.88
South Dakota	\$72,232,494.00
Wyoming	\$6,888,587.88

Table 6 Connect America Fund Disbursements for Nebraska 2015-2017

Fund	Company Name	Deployment Year	Locations Obligation through Deployment Year	Locations Deployed through Deployment Year	Support Disbursed through Deployment Year
CAF-BLS	DTC HOLDING COMPANY	2017		144	\$491,676.00
ACAM	WEST IOWA TELEPHONE COMPANY	2017		627	\$897,071.40
ACAM	USCONNECT HOLDINGS, INC.	2017		42	\$900,212.40
CAF II	WINDSTREAM HOLDINGS, INC.	2017	8624	9534	\$39,611,122.00
CAF II	WINDSTREAM HOLDINGS, INC.	2016		7142	\$26,019,682.00
ACAM	K & M TEL CO, INC	2017		57	\$507,832.80
CAF II	FRONTIER COMMUNICATIONS CORPORATION	2015		603	\$2,559,741.00
CAF II	FRONTIER COMMUNICATIONS CORPORATION	2017	1352	1402	\$5,295,501.00
ACAM	GPC, INC.	2017		830	\$17,671,797.36
ACAM	AMERICAN BROADBAND COMMUNICATIONS ET AL.	2017		417	\$2,796,656.76
ACAM	WEST IOWA TELEPHONE COMPANY	2016		58	\$0.00
ACAM	PIERCE TELECOMMUNICATIONS, INC.	2017		12	\$1,014,793.44
CAF II	WINDSTREAM HOLDINGS, INC.	2015		3912	\$12,428,242.00
CAF II	CENTURYLINK, INC.	2015		974	\$2,940,600.00
CAF II	CENTURYLINK, INC.	2016		2544	\$9,829,020.00
CAF II	CENTURYLINK, INC.	2017	4360	5189	\$16,717,440.00
ACAM	CONSOLIDATED COMPANIES, INC.	2017		309	\$3,631,214.64
ACAM	NCTC HOLDINGS, INC.	2017		163	\$4,548,493.08
CAF-BLS	COZAD TEL CO	2017		2050	\$934,086.00
CAF-BLS	DTC HOLDING COMPANY	2016		55	\$0.00
Nebraska Total					\$148,795,181.88

Table 7 Broadband Coverage by ILEC Including Fixed Wireless Coverage By Rural Households Not Covered

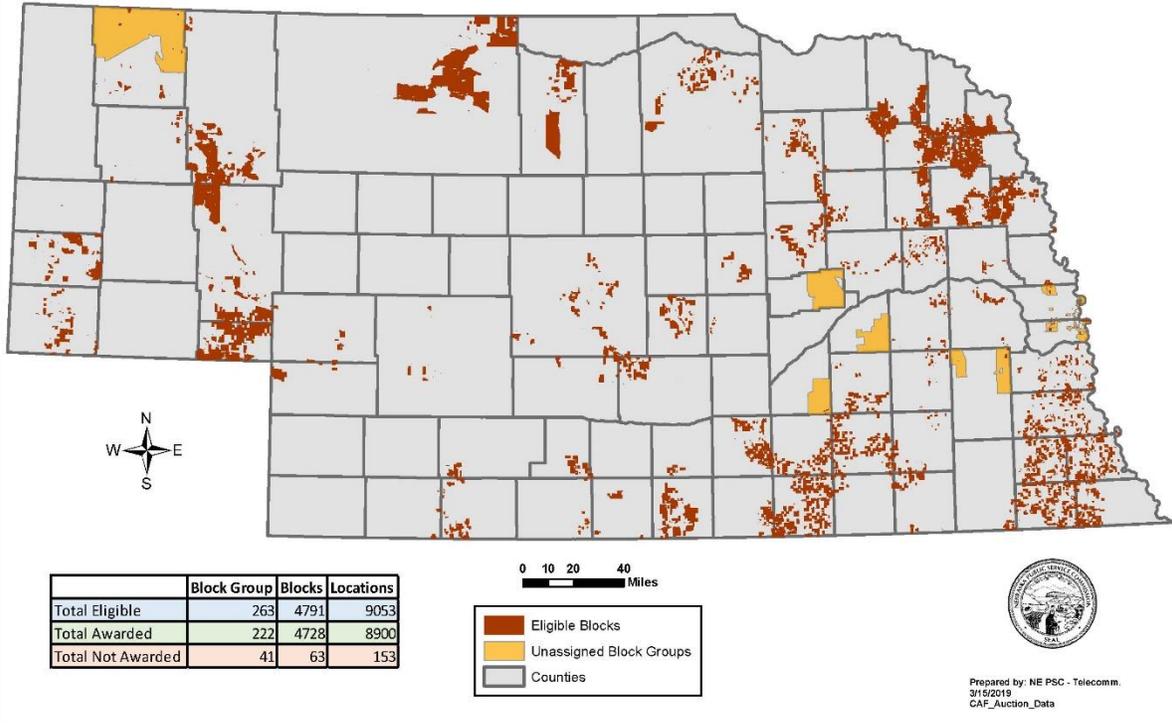
Carrier	Fixed Wireless Included				
	Rural Area Covered by 25/3 (miles ²)	Rural Households not covered by 25/3	Rural Households covered by 25/3	% Rural Area - 25/3	% Rural Households 25/3
Windstream	1,531	21,619	6,589	15%	23%
Centurylink - UTC of the West and Qwest/Centurylink	10,144	14,404	31,970	43%	69%
Great Plains Comm.	2,767	9,647	1,771	16%	16%
Frontier (Citizens)	1,611	5,454	3,817	30%	41%
ABB	732	3,194	918	32%	22%
Nebraska Central Tel. Co.	1,157	2,065	1,366	28%	40%
Consolidated Telephone Company	3,217	860	533	39%	38%
Consolidated Teleco, Inc.	228	678	75	14%	10%
Consolidated Telecom, Inc.	327	437	167	36%	28%
Hamilton Tel. Co.	293	794	597	46%	43%
Pierce Tel. Co., Inc.	47	725	139	13%	16%
ATC Comm. (Arapahoe)	441	598	299	33%	33%
Glenwood Tel. Mem. Corp.	709	439	776	65%	64%
Glenwood Network Services	549	85	398	56%	82%
Hooper Tel. Co. (WesTel Systems)	68	398	155	32%	28%
Dalton Telephone Co.	555	375	223	30%	37%
K&M Telephone Co.	223	350	46	21%	12%
Hershey Cooperative Tel. Co.	28	343	119	8%	26%
BW Telecom	927	212	432	57%	67%
Diller Tel. Co. (Diode Comm.)	153	199	268	51%	57%
Curtis Telephone Company	103	187	30	19%	14%
Elsie Comm., Inc.	4	124	2	1%	2%
Cambridge Tel. Co.	462	100	573	64%	85%
Northeast Nebraska Tel. Co.	3,061	92	3,298	94%	97%
Cozad Telephone Company	234	37	457	92%	93%
Three River Tel. Co.	1,692	8	581	97%	99%
Southeast Nebraska Tel. Co.	407	7	696	97%	99%
Clarks Telecomm. Co.	293	6	539	99%	99%
Hemingford Cooperative Tel. Co. (Mobius)	1,052	5	356	96%	99%
Stanton Telecom, Inc.	198	5	345	98%	99%
Plainview Telephone	222	3	303	99%	99%
Henderson Cooperative Tel. Co.	120	3	247	99%	99%
Hartington Telecomm. Co., Inc.	202	1	439	99%	100%
Sodtown Tel. Co.	79	0	94	100%	100%
Total	19,392	63,454	58,618	21%	48%

Table 8 Broadband Coverage by ILEC Excluding Fixed Wireless Coverage by Rural Households Not Covered

Data derived from June 2017 FCC Form 477 Data	No Fixed Wireless Included						
Carrier	Total Rural Area of CBs in Exchanges (miles ²)	Total Rural Households in exchanges	Rural Area Covered by 25/3 (miles ²)	Rural Households not covered by 25/3	Rural Households covered by 25/3	% Rural Area - 25/3	% Rural Households - 25/3
Windstream	10,062	28,208	932	22,594	5,614	9%	20%
Centurylink - UTC of the West and Qwest/Centurylink	23,755	46,374	4,343	21,929	24,445	18%	53%
Great Plains Comm.	17,187	11,418	1,495	10,801	617	9%	5%
Frontier (Citizens)	5,337	9,271	413	7,305	1,966	8%	21%
ABB	2,256	4,112	732	3,194	918	32%	22%
Nebraska Central Tel. Co.	4,091	3,431	239	3,311	120	6%	3%
Consolidated Telephone Company	8,201	1,393	2,977	871	522	36%	37%
Consolidated Teleco, Inc.	1,638	753	211	688	65	13%	9%
Consolidated Telecom, Inc.	918	604	157	537	67	17%	11%
Hamilton Tel. Co.	642	1,391	33	1,328	63	5%	5%
Pierce Tel. Co., Inc.	355	864	47	725	139	13%	16%
ATC Comm. (Arapahoe)	1,351	897	31	851	46	2%	5%
Glenwood Tel. Mem. Corp.	1,083	1,215	708	442	773	65%	64%
Glenwood Network Services	980	483	379	307	176	39%	36%
Hooper Tel. Co. (WesTel Systems)	211	553	68	398	155	32%	28%
Dalton Telephone Co.	1,835	598	0	598	0	0%	0%
K&M Telephone Co.	1,053	396	223	350	46	21%	12%
Hershey Cooperative Tel. Co.	346	462	28	343	119	8%	26%
BW Telecom	1,614	644	750	274	370	46%	57%
Diller Tel. Co. (Diode Comm.)	300	467	153	199	268	51%	57%
Curtis Telephone Company	551	217	98	188	29	18%	13%
Elsie Comm., Inc.	257	126	4	124	2	1%	2%
Cambridge Tel. Co.	717	673	309	451	222	43%	33%

Carrier	Total Rural Area of CBs in Exchanges (miles ²)	Total Rural Households in exchanges	Rural Area Covered by 25/3 (miles ²)	Rural Households not covered by 25/3	Rural Households covered by 25/3	% Rural Area - 25/3	% Rural Households - 25/3
Northeast Nebraska Tel. Co.	3,250	3,390	3,061	92	3,298	94%	97%
Cozad Telephone Company	254	494	7	483	11	3%	2%
Three River Tel. Co.	1,749	589	1,692	8	581	97%	99%
Southeast Nebraska Tel. Co.	419	703	407	7	696	97%	99%
Clarks Telecomm. Co.	296	545	283	19	526	96%	97%
Hemingford Cooperative Tel. Co. (Mobius)	1,092	361	1,052	5	356	96%	99%
Stanton Telecom, Inc.	202	350	197	6	344	97%	98%
Plainview Telephone	225	306	222	3	303	99%	99%
Henderson Cooperative Tel. Co.	121	250	117	6	244	96%	98%
Hartington Telecomm. Co., Inc.	204	440	202	1	439	99%	100%
Sodtown Tel. Co.	79	94	0	94	0	0%	0%
Total	92,629	122,072	21,565		43,540	23%	36%

CAF II Auction - Unassigned Block Groups



Draft Rural Broadband Task Force Report Outline

April 23, 2019

Cover

Inside Cover

Forward

Table of Contents

Members –Do we want to include photos of each member?

Executive Summary

Importance of Broadband

- Businesses
- Residents
- Students
- Agriculture (Need to cover acres as well as households)

LB994 Charge to the Task Force

Vision of Task Force: *Broadband and telecommunications service in rural areas of the state should be comparable in download and upload speed and price to urban areas.*

Definition of Rural, Unserved and Underserved

Current Status of Broadband Deployment-- How Nebraska rural areas compare to neighboring states and the rest of the nation in average download and upload speeds and in subscription rates to higher speed tiers, when available

- Availability Data and Maps
- Average Download and Upload Speeds
- Subscription Rates
- Affordability Data
 - UNK Price Study Data
 - Broadband Now Affordability Report <https://www.telecompetitor.com/broadband-affordability-report-nearly-half-of-u-s-population-lacks-access-to-a-low-price-offering>

Broadband Data Collection and Mapping

- Findings
- Recommendations

Feasibility of alternative technologies and providers in accelerating access to faster and more reliable broadband service for rural residents;

- Findings
- Recommendations

Role of the Nebraska Telecommunications Universal Service Fund in bringing comparable and affordable broadband services to rural residents and any effect of the fund in deterring or delaying capital formation, broadband competition, and broadband deployment

- Findings
- Recommendations

Alternatives for deployment of broadband services to areas that remain unserved or underserved, such as reverse auction programs described in section 4 of this act, public-private partnerships, funding for competitive deployment, and other measures, and make recommendations to the Public Service Commission to encourage deployment in such areas

- Reverse Auction
 - Findings
 - Recommendations
- Other Alternatives (if any other alternatives are recommended by subcommittees)
- Public Private Partnerships
 - Findings
 - Recommendations

Recommendations on state policies to effectively utilize state universal service fund dollars to leverage federal universal service fund support and other federal funding

- Findings
- Recommendations

Recommendations to the Governor and Legislature as to the most effective and efficient ways that federal broadband rural infrastructure funds received after the operative date of this section should be expended if such funds become available; (To be discussed at the early fall 2019 meeting)

Other issues that may be pertinent to the purpose of the task force.

- Homework Gap (If creation of a subcommittee is approved by the task force on May 3)
 - Findings
 - Recommendations

Appendix

- Links to Reports of Subcommittees
- List of Speakers at Rural Broadband Task Force and Subcommittee Meetings

Developing Rural Broadband Task Force Report

Tentative Work Plan

April 3, 2019

May 3, 2019

Rural Broadband Task Force reviews and approves draft outline of the report.

- *Are there other topics which should be included?*

Rural Broadband Task Force identifies additional work to be done to complete the plan.

- Public Private Partnership Subcommittee will further develops initial recommendations.
- NUSF Subcommittee will develop recommendations.
- Broadband Data Subcommittee will review initial recommendations after more information is known about mapping initiatives underway.
- Leveraging USF/Homework Gap Subcommittee (if formed) will develop recommendations.
- Recommendations to the Governor and Legislature as to the most effective and efficient ways that federal broadband rural infrastructure funds received after the operative date of this section should be expended if such funds become available will be discussed by task force at the early fall meeting.
- *Are there additional items that need to be addressed and completed?*
- *Would the task force like to form a subcommittee to review the draft report?*

August/September—Date To Be Determined

Public Comment

The Task Force will review and approve findings and recommendations from the subcommittees.

October—Date to Be Determined (This could be a short meeting via video)

The task force will approve the final report.

The task force will discuss next steps and a tentative meeting schedule for 2020.

- Are there issues that the task force would like to address and/or monitor in 2020?
- When would the task force like to begin meeting to develop the 2022 plan?