
Senate Commerce, Science, and Transportation’s Field Hearing
“Transforming Rural America: A New Era of Innovation”
Thursday, September 5, 2019
1:30 p.m. - HUB Building at Southeast Technical Institute.

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Oral Testimony

Good afternoon. I am José-Marie Griffiths, President of Dakota State University in Madison, South Dakota.

Thank you, Senator Thune, and members of the Committee for the opportunity to testify today on this important topic. In this field hearing, I invite you to come with me as I take you on a field trip of sorts, illustrations of the power and importance of broadband connectivity.

A classroom full of students, eager to learn how to program secure software for mobile devices, greet their professor as he rolls into the room. The professor is a quadriplegic who uses an electric wheelchair, and at this moment he is stranded in his home by a South Dakota snowstorm his wheelchair can’t get through. However, a Plains snowstorm will not stop him from teaching his class. The professor confidently makes his way to the front of the Dakota State University campus classroom via a tall robot, nicknamed “Cosmo” after the professor’s favorite *Seinfeld* character. Miles away in his home office, the professor uses his computer to move the iPad, positioned on the top of the robotic stand, to see and warmly greet the students. He begins teaching and the students intently listen, take notes, and periodically ask questions. The professor sees their raised hands through his computer screen at home, and immediately responds. He moves the robot in closer to the student to clearly hear and understand the question, then moves back to the front of the class so everyone can see and hear his answer. An hour later, 30 students walk out of the room knowing how to program certain security features into their software, a skill desperately needed by businesses and organizations across the country. The professor heads out of the classroom with the students via his robot. The students carry on animated conversations with him as they all make their way down the hall. The professor then heads to his office for individual meetings with students during his scheduled office hours¹.

¹ SiouxFalls.Business. (2019, February 5). Robotic assistant allows DSU professor to appear virtually on campus. Retrieved from <https://siouxfalls.business/robotic-assistant-allows-dsu-professor-to-appear-virtually-on-campus/>

A respiratory therapy student studies the numbers coming up on the computer monitor, quickly reviewing and analyzing the data to choose a treatment protocol. The instructor is sending multiple scenarios in succession for the student to address. In one hour, the student is confronted with more different cases than she would likely see in a week or more working full-time in a hospital. The student’s confidence grows as she makes and corrects her mistakes with the instructor’s assistance. By the end of the hour she is well-prepared to assist any patient experiencing the specific life-threatening condition that is the topic of this class session.

A shrimp-farm engineer sits down in front of his computer and brings up the morning report giving him the status of the thousands of shrimp in the farm’s water tanks. His business is located in a large building in the middle of a South Dakota prairie. He makes some adjustments to temperature and water flow for some of the tanks, then turns his attention to the morning updates from his supply chain. He notes that U.S. supply is running low on one of the types of shrimp his company farms. He sends a message to his staff to switch over 5 of their tanks to increase production of those shrimp, knowing the price on them is rapidly rising with the shortage in other parts of the industry.

A high school senior walks into her AP biology class. The teacher hands her a virtual reality headset for the day’s lesson. The entire senior class in this very small rural high school has only 7 students. It is one of the 50% of U.S. schools (or more than 70% of South Dakota Schools) located in a rural community. However, so far this school year these 7 students have visited the Great Hall at Ellis Island, walked on the moon, experienced trench warfare during World War I, and studied Van Gogh’s “Sunflower” paintings in a museum in Amsterdam – all from the comfort of their classroom. The student with the headset begins exploring a 3-D virtual reality model of the heart through her headset, turning, expanding, and shrinking the beating object as she explores its various parts and sees how they function. When she is done, the teacher hands her the standardized test for the unit. The student scores 100%, and then has a conversation with the teacher about the student’s newly sparked interest in becoming a cardiac surgeon².

A mother frantically calls 911, her choking toddler turning blue in her arms. The operator, with one computer keystroke, sends to the mom’s phone a text with a series of photos showing how to do the Heimlich maneuver on a child. With another few keystrokes the dispatcher sends the woman’s location to the closest first responder’s GPS system. The mother brings up the pictures on her phone, follows the

² Stanford Children’s Hospital. (2019, March). The Stanford Virtual Heart - Stanford Children's Health. Retrieved from <https://www.stanfordchildrens.org/en/innovation/virtual-reality/stanford-virtual-heart>

directions, and one of big brother’s Lego pieces flies out of little sister’s mouth. The toddler coughs and begins to breathe again, as mom hugs her tight, happy tears streaming down her face³.

These situations might seem to be very different. But they all share one key dependency: they require robust secure reliable broadband connectivity.

Without broadband, the classroom would be empty, the smart, eager students left without knowledge and skills our communities need to be safe, competitive, and thrive in this century.

The respiratory therapy student would be following someone around the hospital, seeing a few cases a day, mostly watching rather than doing – no one should let an untrained student make life-threatening decisions on a real patient.

The shrimp farm would totally disappear from our prairie, taking with it the \$30 million impact it is expected to have on the local South Dakota economy.⁴

The company would be forced to relocate to one of the U.S. coasts to access industry supply chains and markets. The high school senior would have to sit through a class far below her AP-level passion for science, constrained by her less-interested classmates who require their teacher to deliver a basic-level biology class.

And if the 911 system the mother called was one of the 911 systems hacked and taken off line - which includes over 50 in the last couple of years – that frantic mother would have been left alone and without the help she needed to save her child’s life. For example, not long ago the 911 system for the entire state of Washington crashed and was offline for 6 hours, leaving over 4,000 911 calls unanswered with no response.⁵ Presently, only 11 states and the District of Columbia have cyber protection programs in place for their 911 systems.⁶ The main reason for this? 911 systems report that they cannot find tech professionals who have the broad technological expertise necessary to regularly install new software patches, identify what parts of the systems are vulnerable and plug the holes, or quickly restore systems

³ Government Technology Magazine. 911 Dispatchers Use New Technologies to Quickly Locate Cellphone Callers. Retrieved from <https://www.govtech.com/dc/articles/911-Dispatchers-Use-New-Technologies-to-Quickly-Locate-Cellphone-Callers.html>

⁴ Askren, M. G., & Askren, M. G. (2019, January 4). Tru Shrimp to build in Madison; \$30 million impact expected. Retrieved from http://www.dailyleaderextra.com/news/top_stories/article_6309dd88-106e-11e9-aa23-ff243e4ded54.html

⁵ Bernnton, H., & Fields, A. (2018, December 28). 911 outage in Washington and other states triggers federal, state investigations of CenturyLink. Retrieved from <https://www.seattletimes.com/seattle-news/911-outage-in-washington-and-other-states-triggers-federal-investigation-of-centurylink/>

⁶ Schuppe, J. (2018, April 3). Hackers have taken down dozens of 911 centers. Why is it so hard to stop them? Retrieved from <https://www.nbcnews.com/news/us-news/hackers-have-taken-down-dozens-911-centers-why-it-so-n862206>

when they crash. And the vast majority of 911 systems have no backup system available if the main system is hacked.

Reliable, fast, secure, adequate capacity broadband connectivity enables individuals and organizations ANYWHERE to participate in this amazing Age of Innovation.

However, those of us who have been engaged over the years in the development of our present “Technology Age” have long been concerned about what has been called “the digital divide.” This is the phrase to describe the state of the “haves” and “have nots” when it comes to access to technology. Today, it especially refers to those who have – or do not have - access to secure reliable broadband connectivity. In the United State today, more than 60 million people cannot effectively access the indispensable parts of American life that have migrated online, like education, health care, business and financial opportunities, and employment.⁷

Twenty and even ten years ago the digital divide primarily split on finances – those who had money had access; those who did not were cut off. While poverty still has an impact on access to connectivity, the real digital divide in the U.S. is now between urban and rural areas.

Rural America that is experiencing the benefits of broadband connectivity – like Dakota State University and our host community, Madison and Lake County, here in South Dakota – are making sure we have 4 components:

- 1) Reliable, fast, secure, adequate capacity broadband Internet service,
- 2) Reliable, fast, secure, adequate capacity cell phone service,
- 3) Technology services at costs we can sustainably afford, and
- 4) A highly skilled tech workforce.

Unfortunately, rural communities generally do not have one or more of these components, and instead of innovation and hopeful futures, they are more and more being left behind attempting to access 21st century electronic resources with 20th century technology.

A very important point here: this lack of connectivity does not just impact those living in rural areas, it impacts the economic success of the entire United States. According to a 2016 study done by Deloitte for

⁷ Tung, L. (2019, April 16). Microsoft: FCC massively overstating how many Americans have broadband access. Retrieved from <https://www.zdnet.com/article/microsoft-fcc-massively-overstating-how-many-americans-have-broadband-access/>

Facebook, every day that **one person is not connected** to the internet, **America in 2016 lost \$2.16 of potential economic activity**, which means that **the rural/urban digital divide in 2016 cost our country over \$78 million a day in economic activity, or over \$28 Billion in a year.**^{8 9} In 2019 dollars, that amount is \$2.30 a day. This means **if we could solve the rural/urban digital divide today, tomorrow we have the potential to add \$83 million a day to the U.S. economy, or \$30 Billion a year.**

The background behind this stunning statistic is this: according to the U.S. Census Bureau, about 60 million people, or one in five Americans, live in rural America.¹⁰ According to a recent Pew Charitable Trust study, almost 60% of those rural Americans, or 6 out of every 10 people living in a rural area (36 million people), report that access to high-speed Internet is a major or significant problem in their communities. In contrast, less than 20% of urban Americans report this as an issue.¹¹ According to the FCC, close to 40% percent of rural Americans—roughly 23 million people—lack any access to broadband services, land-based or mobile.¹²

It doesn't help that the new rural/urban digital divide is piggy-backed on top of the poor/rich divide that has existed. Specifically, according to a Wharton Business School study, in 2018 the rural poverty rate is over 15%, contrasting with less than 13% in urban areas.¹³

And in rural areas, it doesn't make any difference how much money you have – 1 out of 5 people making less than \$30,000 a year say they can't get access to effective Internet service, but close to 1 out of 4 people making \$75,000 a year or more ALSO say they can't get broadband access. It's even worse for rural non-whites; 1 in 3 say they have no way to connect to the Internet with any bandwidth that will support more than straight text.

Those American living on Tribal lands are even more cut off. 41 percent of Americans living on Tribal lands (1.6 million people) lack access to 25 Mbps/3 Mbps broadband and 68 percent living in rural areas

⁸ Deloitte. (October, 2016). The economic impact of disruptions to Internet connectivity A report for Facebook. Retrieved from <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Technology-Media-Telecommunications/economic-impact-disruptions-to-internet-connectivity-deloitte.pdf>

⁹ Chike Aguh. (2018, February 13). How the 'digital divide' is holding the U.S. economy back. Retrieved from <https://venturebeat.com/2018/02/10/how-the-digital-divide-is-holding-the-u-s-economy-back/>

¹⁰ Nasser, H. E. (2019, May 23). What is Rural America? Retrieved from <https://www.census.gov/library/stories/2017/08/rural-america.html>

¹¹ For 24% of rural Americans, high-speed internet is a major problem. Retrieved from <https://www.pewresearch.org/fact-tank/2018/09/10/about-a-quarter-of-rural-americans-say-access-to-high-speed-internet-is-a-major-problem/>

¹² (2018, February 5). 2018 Broadband Deployment Report. Retrieved from <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report>

¹³ Wharton Business Research. Rural America is Losing Young People - Consequences and Solutions. Retrieved from https://publicpolicy.wharton.upenn.edu/live/news/2393-rural-america-is-losing-young-people-#_edn1

of Tribal lands (1.3 million people) have no access.

While the United States is generally the world leader in technology access, when it comes to broadband social penetration, the U.S. rate of subscribers per 100 inhabitants ranks Americans broadband penetration behind Japan, Finland, and Estonia.¹⁴

It is not at all an exaggeration to say that unless this country can move rapidly to ensure that our rural communities have broadband access, a large portion of Americans will no longer be able to participate in the life of this country. The United States cannot afford to just “write off” the 60 million people who live in rural parts of the country, to cut them off from participation in the culture, society, politics, and economic activity of the 21st century, not only that of their own country but the entire world as well. This is an unacceptable situation in a country founded on “We, the people...”

But already the impacts of not having connectivity is decimating our rural communities. For example:

In education:

- According to a comparative analysis of Bureau of Labor Statistics and data from the Deloitte multinational professional services network students are **10 percent more likely to earn a high school diploma and college** when connected to the internet at home and **will earn over \$2 million more** over their lifetimes.¹⁵
- In a study published by the Carsey School of Public Policy at the University of New Hampshire, researchers discovered 47.2% of rural districts have NO secondary students enrolled in Advanced Placement (AP) courses. This 47% rural AP class void compares to urban districts where less than 3% have no students in AP course, and in suburban areas only 5% have no students in AP courses.¹⁶
- In education we have the added issue of bandwidth and simultaneous users. Not only do schools require reasonable Internet speeds, they must also have enough bandwidth to accommodate large numbers of students online simultaneously.
- Approximately 41% of schools do NOT yet meet the FCC’s short-term bandwidth goal of 100 Mbps per 1,000 students and staff and thus are cut off from a vast number of educational

¹⁴ OECD. OECD broadband statistics update. Retrieved from <https://www.oecd.org/internet/broadband/broadband-statistics-update.htm>

¹⁵ U.S. Census Bureau. (2019, May 23). Rural and Lower-Income Counties Lag Nation in Internet Subscription. Retrieved from <https://www.census.gov/library/stories/2018/12/rural-and-lower-income-counties-lag-nation-internet-subscription.html>

¹⁶ Gagnon, Douglas J. and Mattingly, Marybeth J. (2015 Winter). Limited Access to AP Courses for Students in Smaller and More Isolated Rural School Districts. Retrieved from

https://scholars.unh.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1234&context=carsey&utm_campaign=clearingindustry.com&utm

resources.¹⁷ Those schools represent 47% of students in the United States, including over 6 million high school students, almost exclusively in rural areas. This is one reason why 5G development and implementation will be so important, since one of 5G’s improvements will be to accommodate more simultaneous users.

- According to the Education Superhighway’s 2018 State of the States report, students who do not have access to the educational applications and content available in connected classrooms are at a significant disadvantage in trying to compete in today’s digital world. The sad fact is that rural students without adequate connectivity don’t even try for education beyond high school. Part of this is impacted by the fact that almost all colleges and universities application processes are now online. Statistics show that a student living in an urban area has a 10 to 15 percent higher chance of going to college than a comparably achieving student living in a rural area.
- For example, the Tyler Independent School District in Texas had a fast connection, but without enough bandwidth. With limited bandwidth, the speed alone wasn’t adequate – it wasn’t until they upgraded to 1 MBps per student connection that they were finally able to offer an online Early College High School, where 300 students are taking classes for high school and college credits simultaneously.¹⁸
- According to a study done by Harvard Political Review, across the country rural districts in 6 states received 50 percent less funding from the federal government per poor pupil than urban counties. Across the country, urban districts received between 20 to 50 percent more funding than their rural counterparts.
- Lack of technology also contributes to shortages of teachers in rural areas, where more than 6 million high school students are educated. It is already hard to persuade young teachers to settle in rural areas because of the lack amenities of high value to young adults, like social activities. Limited technology access means a significant increased burden on teacher expertise and preparation, which contributes to the fact that rural teachers who work at the high school level overwhelming leave rural schools in their first 3 years of teaching. A science teacher in a rural school district might be required to teach high school biology, chemistry, and physics. Although related, these subjects require individual expertise and preparation. A teacher able to access online lessons and demonstrations is miles ahead of a teacher who has to plan lessons and obtain materials and set up labs for all three subjects simultaneously.

¹⁷ COSN The Consortium for School Networking (November, 2018) 2018-2019 Infrastructure Survey. Retrieved from <https://www.cosn.org/Infrastructure>

¹⁸ Real Clear Education. Making Broadband a Priority Makes Education Better. Retrieved from https://www.realcleareducation.com/articles/2017/10/06/making_broadband_a_priority_makes_education_better_110211.html

- Even if students have access to broadband connectivity at school, there is no question that having connectivity at home has major impacts in students’ ability to complete homework and explore in greater depth areas of special interest to them. Nationally, 78 percent of households have Internet access, but households in rural counties trail that national average by 13 points, and by as much as 70 points in some rural counties.

In health care:

- The FCC project “Mapping Broadband Health in America,” using health data from the Robert Wood Johnson Foundation’s County Health Rankings, has revealed that connected communities versus digitally isolated communities have vastly different pictures of health.
- In communities where 60 percent of households lack access to broadband and over 60 percent lack basic Internet connections at home, obesity prevalence is 25 percent higher and diabetes prevalence is 35 percent higher. All of the rural population with poor connectivity has significantly higher rates of those in poor health and preventable hospitalizations.
- In areas without connectivity linking doctors, social services, pharmacies, caregivers and others, health care is significantly more expensive, requiring more people, and thus greater salary expense, than in areas where connectivity streamlines medical processes. For example, Towers Watson has figured out that telemedicine could potentially deliver more than \$6 Billion a year in health care savings to U.S. companies, most especially in rural areas. The Federal Communications Commission (FCC) estimates that Electronic Health Records and Remote Monitoring technology could alone create over \$700 billion in net savings over 15-25 years. More importantly, these savings are paired with better outcomes for patients. These numbers are only expected to increase with our aging population.
- By the way, we are proud of the fact that South Dakota, thanks in part to the work of the Center for Health Information Technology at Dakota State University, is the first state in the country to have more than 85% of health care providers using Electronic Health Records.

In business and job success:

- As a recent Hudson Institute report emphasizes: “Rural broadband services are necessary in an economy where the ability to complete a transaction electronically has become indispensable.”
- An **unemployed person** who has the internet at home **will be employed seven weeks faster** than one who does not and **will earn more than \$5,000 in additional income** annually
- Community leaders finally recognize that they cannot attract new businesses or slow declining populations if citizens don't have a fast internet connection. Some 19 million Americans have no access to broadband internet. In these areas, it is impossible to set up any company that requires connectivity to be successful, which today, is almost every endeavor.

- Shifting industry characteristics explains a large part of migration. Farming, logging, and mining populate the rural employment sector. Unfortunately, these rural area job sectors relied on human capital, which has dramatically shifted to automation, outsourcing, and foreign direct investment. The evolution of agriculture and mining into today’s technology dominated economy has left rural inhabitants jobless. It has also profoundly increased production per working person: today’s average American farmer provides food to about 155 people compared to 26 people in 1960, meaning that in 1960 food demand provided jobs to close to 7 million people. Today, even though the U.S. population has increased from 181 million in 1960 to approximately 329 million people in 2019, today we need only 2 million farmers to feed our country. That is a loss of over 5 million jobs, the vast majority in rural areas.
- Rural broadband is often dependent on one provider, which means there is no competition and rate setting can go as high as the market can bear. This puts connectivity out of the financial reach of more businesses and individuals.
- IT professionals can command higher wages than many small rural businesses can offer, so in-house or even local tech support is limited. Tech skills among employees limit digital adoption as well, depending on the access to training. New technologies, such as the use of blockchain to manage the supply chain of small farms, would be a boost for these businesses' economic success, but they require workers who understand and can implement these digital options, or the ability to access online training, an impossibility without broadband connectivity.

In community services:

- Communities across the country are continuously facing challenges that can affect their long-term stability and relevance. Deciding where to focus community resources is a daunting task. We need to communicate more clearly to communities that broadband access is fundamental to their existence.
- It continues to be the case that in rural America thousands of young people leave home and never return. That number has soared since the 1990’s.
- Rural areas lack academic and economic opportunity compared to metropolises. Because of this, a large portion of those leaving rural areas are talented high school graduates. This cause-effect relationship, this “brain drain,” robs rural areas of intellectual capital. This further reduces the number of educated people in a community able to effectively provide community and business leadership to the area.
- When young people leave an area, older adults are trapped in the areas they have left. Rural populations governments lose their local tax base. Subsequently, local governments must cut spending. The budget cuts hurt infrastructure, community centers, and most importantly public

schools. As the population drops, schools close and local businesses suffer. The cutbacks drive more people to cities. It is a vicious cycle.

- Low population deflates property values. Many elderly American rely on their home equity as their savings. When property values drop, they cannot afford to sell their homes to move. The median age in rural communities has been rising. In South Dakota, for example, from 2010 to 2017 the population of those 65 years old and older grew from 14% of total population to 16%, an increase of 25,000 people.
- Geographical inequality traps rural Americans as evidenced by job creation location, new business location, and employment rate. For example, the rural poverty rate is 15.1% contrasted against 12.9% for cities.

As a country we must decide whether we are going to make it possible for ALL U.S. citizens to have equal access to high-speed internet, or abandon rural users to slow smartphones, library parking lots, and limited unreliable home connections. There is no question that real high-speed internet could change the lives and futures of the 1 in 5 Americans, 60 million people, who live in rural areas. Changing their lives means the life of the entire United States would change for the better as well. Can we really afford, in this ever more competitive global marketplace, to throw away \$130 million of economic activity a day?

Fundamentally, it is a question of values. In the 1930’s and 1940’s, the United States decided that everyone in this country was entitled to reasonably comparable electricity and telephone service. There was universal agreement that this was a requirement to ensure that every American could fully participate in the life and economy of the country. The federal government created a system of loans and grants to ensure that communities across the country, regardless of their geography, had access to these key utilities. In addition, the FCC set up a system to charge businesses and customers in urban areas slightly more

The question facing us today is whether we still hold to that American value, that every American citizen is entitled to have access to the resources necessary to fully participate in the life and economy of their country. It was a simple decision for our government in the 1930’s and 1940’s. It should be an easy decision for our government today.

South Dakota is committed to the American values that built this country. Consistent with that, we are energetically working to ensure that our state becomes a cyber state, leading the nation in equitable high-speed Internet access for every one of our citizens.

However, we cannot do it on our own. It is going to take national leadership and national resources to fix this national problem.

As I said earlier, rural America's tech void is primarily in four areas, whether we are looking at education, health care, business and industry, or community services. It is these areas where the FCC and Congress must focus efforts to make improvements. Congress and the FCC – supported by the entire country – must move rapidly to create systems, funding, and expertise to provide effective, affordable, broadband services equitably to both urban and rural Americans. We must ensure that every single American has access to:

- Reliable, robust, fast Internet service;
- Reliable cell phone service;
- Competitive, affordable technology services; and
- A large skilled tech workforce.

In closing, I remind us all of some of the responsibility with which we are entrusted to serve each American by serving all Americans, as proclaimed at the beginning of the United States Constitution: “We the people....establish justice, insure domestic tranquility...promote the general welfare, and secure the blessings of liberty to ourselves and our posterity...”

A little dramatic? Perhaps. But cutting off 60 million people from the life of this country would also be dramatic, in terrible ways, not just for these individuals but for the whole country. We can do better. We must. And we need our federal government to lead the way.

Thank you.