DEEDP Broadband Research

Date: 2020

Keith Eisberg, Co-Director,

Dynamic Econometric Economic Development Program (DEEDP)

Consultant with FAPRI

Abner Womack MU Emeritus, Co-Founder FAPRI

Co-Director, DEEDP

Contact: EisbergK@missouri.edu / Womacka@missouri.edu

Missouri University, CAFNR, DEEDP year 2020

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SYNOPSIS OF DEEDP RESEARCH—WOMACK/EISBERG

Dynamic Econometric Economic Development Program (DEEDP)

University of Missouri /CAFNR/Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020

Dates of Research: August 2017 through June 2020, a three-year project

Research Project:

The Economic and Social Impact of Broadband on Rural Missouri Utilizing Sample Regional Surveys and Economic Data Collected from 7 Electric Coops

And, ***The Economic and Policy Implications for FCC Broadband Funding / Changes to FCC Funding Equations and Formulas***

University of Missouri /CAFNR/Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020

Beginning in mid-2017, DEEDP endeavored to answer several questions arising surrounding broadband and its impact on rural Missouri. Key questions included broadband's impact on outmigration and in-migration, the impact of low services, slow speed broadband and relatively high prices compared to areas with fiber's high-speed broadband and low prices. In the analysis the economic and social impact of high-speed broadband was both qualitatively and quantitatively presented in an easy to understand format designed for policy makers and business executives.

A representative sample of economic and social data was collected and analyzed from seven geographic regions of the state. The regional areas of the project included Northwest Missouri, Northeast Missouri, North Central Missouri, East Central Missouri, West Central Missouri, Southwest Missouri, and Southeast Missouri. Seven electric coops that were the first to invest in broadband introduction and expansion in their territory of service agreed to work with the University of Missouri, CAFNR, DEEDP team of Womack and Eisberg. Early results describe some of the economic and social impact of high-speed fiber on rural communities compared to previous broadband providers of low service and slow speed broadband.

Regarding the electric coop's data, outside the employees of the electric coops, our team leaders, Dr. Abner Womack and Keith Eisberg are the only two people in the state that *have exclusive proprietary rights* with access to confidential financial data from the electric coop records for use in the team's research project. The financial data is so confidential that the electric coops will not allow the Womack/Eisberg team to share it with other electric coops let alone the public. Our project team leaders coded the financial data to keep it confidential allowing it to be used in the DEEDP economic analysis on broadband. Data made available to the public has been approved by each electric coop.

The recent Covid 19 Pandemic has high-lighted the strengths and weaknesses of broadband in rural Missouri. As such, it is even more important for an analysis of the economic development and social impact of high-speed broadband's critical infrastructure in rural Missouri—before and after introduction of fiber. The importance of high-speed broadband in economic development planning is even more critical as this research project results indicate. The impact of broadband's increasing, sometimes essential role of economic sustainability, resiliency, recovery and growth to minimize outmigration and create opportunities for rural communities to grow and have all access to all the benefits that are expected in a 21st century America is quite evident in DEEDP research results.

To better understand the issues of the ”digital divide” resulting in what we term as a “broadband desert” in rural Missouri, one must first review the history of how rural Missouri got to where it is on broadband. The controversy over the allocation of Federal Communication Commission (FCC) funding is associated with the likely short and longer run economic and social consequences resulting from FCC weighting rate formulas that are intentionally designed to favor the greatest coverage of rural area at the least cost to the government. Issues of concern for further discussion for the FCC broadband funding model can best be described as “*one size shoe fits all*”. Fiber providers structural cost at, 1000 megabits per second download and upload, is a much higher cost per mile than the lower levels of service--fixed wireless, satellite, and cable at, (25 to 100 megabits per second). Controversy on the consumer side of the debate is associated with the fact that fiber providers charge considerably less for higher levels of service than the lower level providers charge at lower levels of service.

To provide more qualitative and quantitative information surrounding these public concerns our first phase of research has concentrated on measures that reflects both social and economic changes by fiber providers in seven regions of Missouri. Seven Rural Electric Cooperatives in each of these regions were among the first to invest in and offer fiber broadband services to their consumers. Through several meetings and discussions each of the seven have agreed to work with our university research team in quantifying areas and categories of growth whether positive or negative. Electric Coops were chosen as a starting research base because they are publicly owned and willing, as a team, to cooperate with this study solely and exclusively with our team leaders, Womack and Eisberg.

Comparing these results of social and economic analysis of fiber to non-fiber providers in each region will benefit economic development planning for the desired regional levels of economic and social growth in different regions of rural Missouri. "Phase two" of DEEDP's research (if necessary funding becomes available at a future date) will focus on building at least one *sample* dynamic econometric model with the capability to provide longer run (at least 10 year) projections reflecting the likely social and economic growth consequences. The models will also have the necessary formula capacity to react to continual changes under consideration by the public and government in designing appropriate weight formulas for the *one* selected region of the sample model. The same model can be duplicated and applied *with regional modifications* of the economic development and social growth in the different regions of rural Missouri.

If the necessary funding becomes available at a future date, the DEEDP team will proceed with "Phase three". This phase will build upon the *sample dynamic econometric model* and then, will focus on building regional dynamic econometric models with the capability to provide longer run (at least 10 year) projections reflecting the likely social and economic growth consequences for each selected region of the seven electric coops. The models will also have the necessary formula capacity to react to continual changes under consideration by the public and government in designing appropriate weight formulas for each region.

As stated earlier, Electric Coops were chosen as a starting research base because they are publicly owned and willing, as a team, to cooperate with our team leaders for this study. Since they are publicly owned their data is more readily accessible in the near term. Should we have chosen the lower level providers of broadband that have received federal funding support as a starting point, release of their economic and social information will not be available for 3 years after their receipt of federal funds. At that time "Phase four" (in a later study if the necessary funding is available) will be conducted utilizing the same research base as described for the fiber section above. Comparisons of the results in each region of the rural areas can then be utilized to complement the necessary design of FCC weight funding formulas, complementing FCC allocations, government's decisions and the public's best interest.

The Covid 19 Pandemic is having a major negative impact on economic development in Missouri and highspeed broadband is playing a major role in economic activity. During the Covid 19 Pandemic businesses rely heavily on highspeed broadband as more people are working from home telecommuting. The overall research base includes the total areas of service provided by each fiber provider. Two are located in the northern part of Missouri, United Electric on the west side and Ralls on the east side. United's area reaches into industrial areas and includes a wide region of agricultural lands. Ralls on the East side is 95% agriculture. Two are located in central Missouri, one on the west, Co Mo Electric and Callaway Electric on the east side. CO MO is primarily agricultural, however there are several small towns; and on the southside they border the Lake of the Ozarks, a vacation paradise, and the Missouri River on the north east side. Callaway is centrally located near the University of Missouri and the Capital at Jefferson City. Their larger rural area of coverage includes large crop farming in the north and rolling grass/cattle land in the south. Three Electric Coops are in southern Missouri. Barry Electric is in the south west part of Missouri whereas both Semo Electric and Pemiscot Dunklin are in the south east part of Missouri. Both are in highly productive crop land regions bordered on the east side by the Mississippi River. Barry Electric is in the rolling Ozarks that borders northern Arkansas.

DEEDP's research project will provide qualitative and quantitative analyses and beneficial economic development and social-economic information for decision makers, regionally, statewide and nationally. Educational presentations of our surveys, research findings and analyses were provided to selected CEO's of businesses and cooperatives impacting broadband and being impacted in their business by the lack of broadband, the Governor's office, the Missouri Department of Economic Development, the Missouri Director of Agriculture, selected members and their staff of the Missouri US Congressional Senate and House Delegations, the College of Agriculture, Food and Natural Resources (CAFNR) Dean and the President of Missouri University.

B. Addressing economic development needs

Similar to "food deserts" in urban areas, rural Missouri has what is best described as A "*broadband desert"*. The lack of high-speed broadband existence in rural Missouri are creating many desperate economic conditions for our rural citizens. Long standing businesses are closing, young adults are leaving the region due to the lack of broadband and the lack of job opportunities that are needed with 21st century businesses, all of which consider Broadband access at both work and at home as ESSSENTIAL (refer to Outmigration graph and cost of education chart).

High-speed broadband is needed in rural Missouri to "close the digital divide" and provide for economic development, provide for on-line education, to improve educational opportunities that only broadband can provide, is complementary and essential for telehealth, and many other factors needed to stimulate economic growth and development. All the things that high-speed broadband brings that are expected in a 21st century economy and society. Broadband is no longer a luxury but is essential.

C. Twelve Categories Quantifying the Impact of High-speed Broadband on Economic and Social Growth in Rural Missouri.

Areas of Social and Economic Development research, survey and analysis by the DEEDP Team included the following categories of study:

a. In-Home Business Entrepreneurs
b. Extending the Seasonal Vacations
c. Expanding On-Line business by traditional Brick and Mortar
d. Remote employment
e. Real Estate and Development
f. Community Support and Household
g. Agriculture
h. Precision Agriculture
i. Industrial
j. Telemedicine and Emergency Services
k. Information Technology

D. Strategic partners and organizations engaged in the DEEDP research project on broadband include:

1. College of Agriculture, Food and Natural Resources (CAFNR), University of Missouri
2. The Womack Foundation
3. The Food and Agricultural Policy Research Institute (FAPRI)
4. CoMo Electric and CoMo Connect Broadband
5. Callaway Electric and Callabyte Broadband
6. Barry Electric and GoBec Fiber Broadband
7. Semo Electric and GoSemo Broadband
8. Pemiscot Dunklin Electric and Pemiscot Dunklin Fiber Broadband
9. United Electric and United Fiber Broadband
10. Ralls Electric (RCEC) and Ralls Technologies Broadband
11. Chariton Valley Telephone Coop
12. Missouri Farm Bureau
13. US Senatorial Staff
14. US House Congressional Staff

DEEDP

RESEARCH RESULTS

of

The Economic and Social Impact of Broadband on Rural Missouri Utilizing Sample Regional Surveys and Economic Data Collected from 7 Electric Coops

And,

The Economic and Policy Implications for FCC Broadband Funding / Changes to FCC Funding Equations and Formulas

Dynamic Econometric Economic Development Program (DEEDP)

***Objective**: provide 10 year projections of likely longer run economic consequences of policy options under consideration by the U.S. Congress and the business community for fiber broadband expansion in rural areas.*

***Expected Research Consequences**:*

Footprint of what works and does not work - in a net return framework for expansion of broadband by current electric Co-ops already invested in broadband or considering investing in broadband.

Model projections capabilities will complement decision making relative to funds being made available over the next 10 years

$254 million for broadband expansion in Missouri through the FCC, 2018. An additional $20 Billion of FCC funds will be dispersed in USA in the next round.

Specifically this research will provide analytical data necessary to insure that rural areas are adequately served with broadband capacity to attract major industry to rural areas and perhaps, slow the trend of outmigration from rural America.

MU CAFNR/ Dynamic Econometric Economic Development Program (DEEDP) Womack/Eisberg 2020

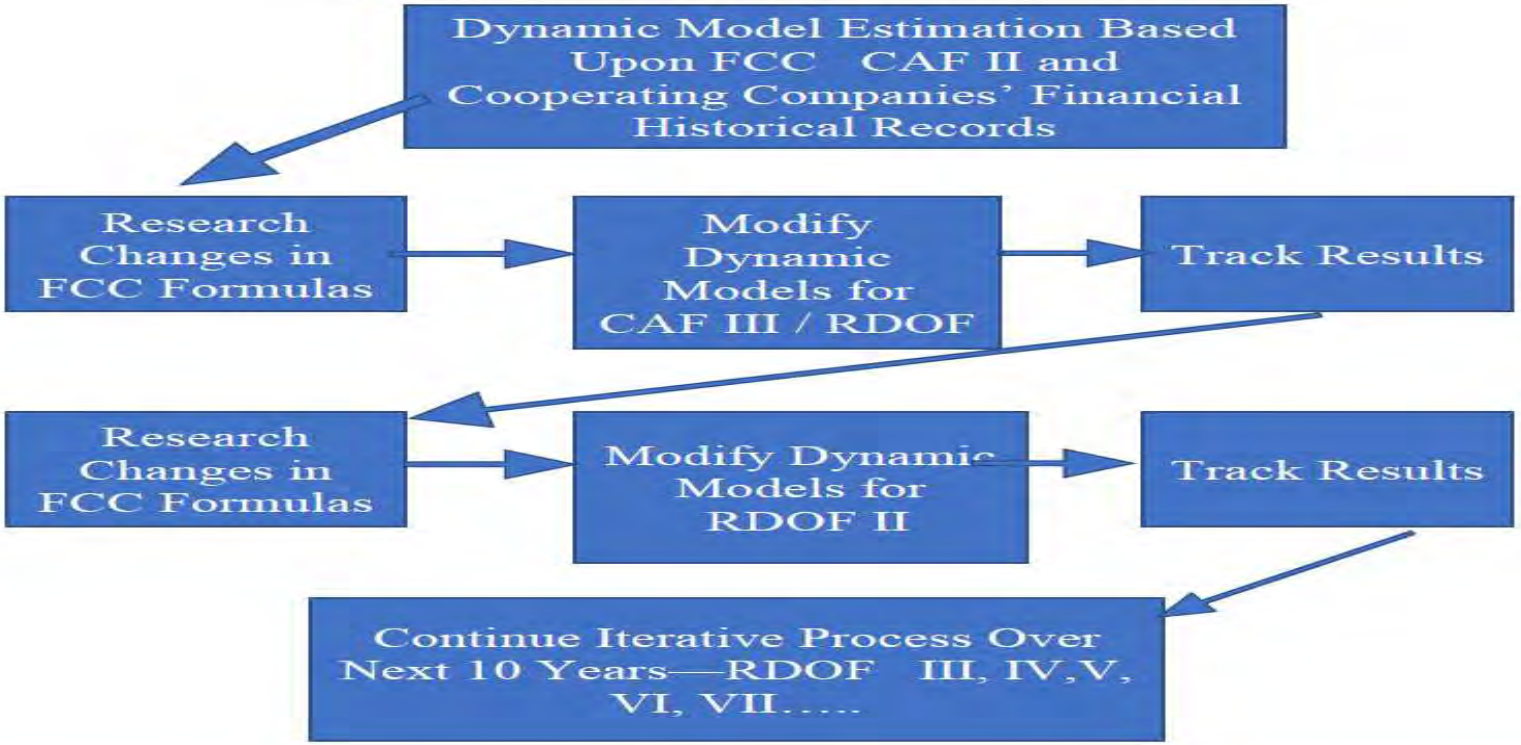
Dynamic Econometric Modeling of Current and Future Investments for Broadband in Rural America

1. **The objective of this proposed economic development research project is to enhance the effectiveness of Federal investment in rural Broadband. The project will lead to the development of comprehensive, quantitative dynamic econometric models designed to estimate, annually, the likely longer run (10 year) economic growth consequences of policy options under considerations for funding by Congress for expansion of broadband in rural areas.**
2. **Results of the dynamic econometric models are designed to complement the decision-making process of Congress, FCC, their staffs and businesses to assist in modifications of formulas used for the "weighting criteria" in the performance tiers of the FCC auctions for rural America; and, for iterations of future CAF II, RDOF I, II, III, IV,V.....funding.**
3. **These dynamic econometric models shall provide annually, 10-year long-term projections utilizing a dynamic global econometric economic model with a time-tested history of econometric modeling and projections.**

4. **These dynamic econometric models shall be developed utilizing historical financial records from companies that have invested in and are providing broadband service in rural areas. The research program must demonstrate that existing historical financial data files from each cooperating company are accessible.**
5. **These dynamic econometric models will measure the likely longer-run economic consequences regionally of allocations associated with Congressional funding under the current set of FCC formulas and, under various modifications to formulas under consideration for future FCC funding. Specifically, economic consequences of various speeds associated with FCC funding; for example, CAF II:**
   a. **≥ 10/1 Mbps**
   b. **≥ 25/3 Mbps**
   b. **≥ 100/20 Mbps**
   d. **≥ 1 Gbps / 500 Mbps**
6. **With appropriate funding this dynamic econometric research project shall be expanded to determine the likely economic consequences for broadband development in other regions of America including rural communities, small towns, and private corporations that are considering investing in broadband service. Locations for additional regions will be determined using stratified random sampling techniques.**

Proposed Econometric Economic Development Research Project:

Flow Chart—10-year Projections Annually



OBJECTIVES

Improvements in FCC Formulas:

a. Reflecting economic growth potential
b. Spur development of up to gigabit-speed broadband in rural America
c. Expand broadband for rural Americans who need broadband to start a business, educate a child, grow crops, raise livestock, get access to telehealth, and do all the things that the online world allows

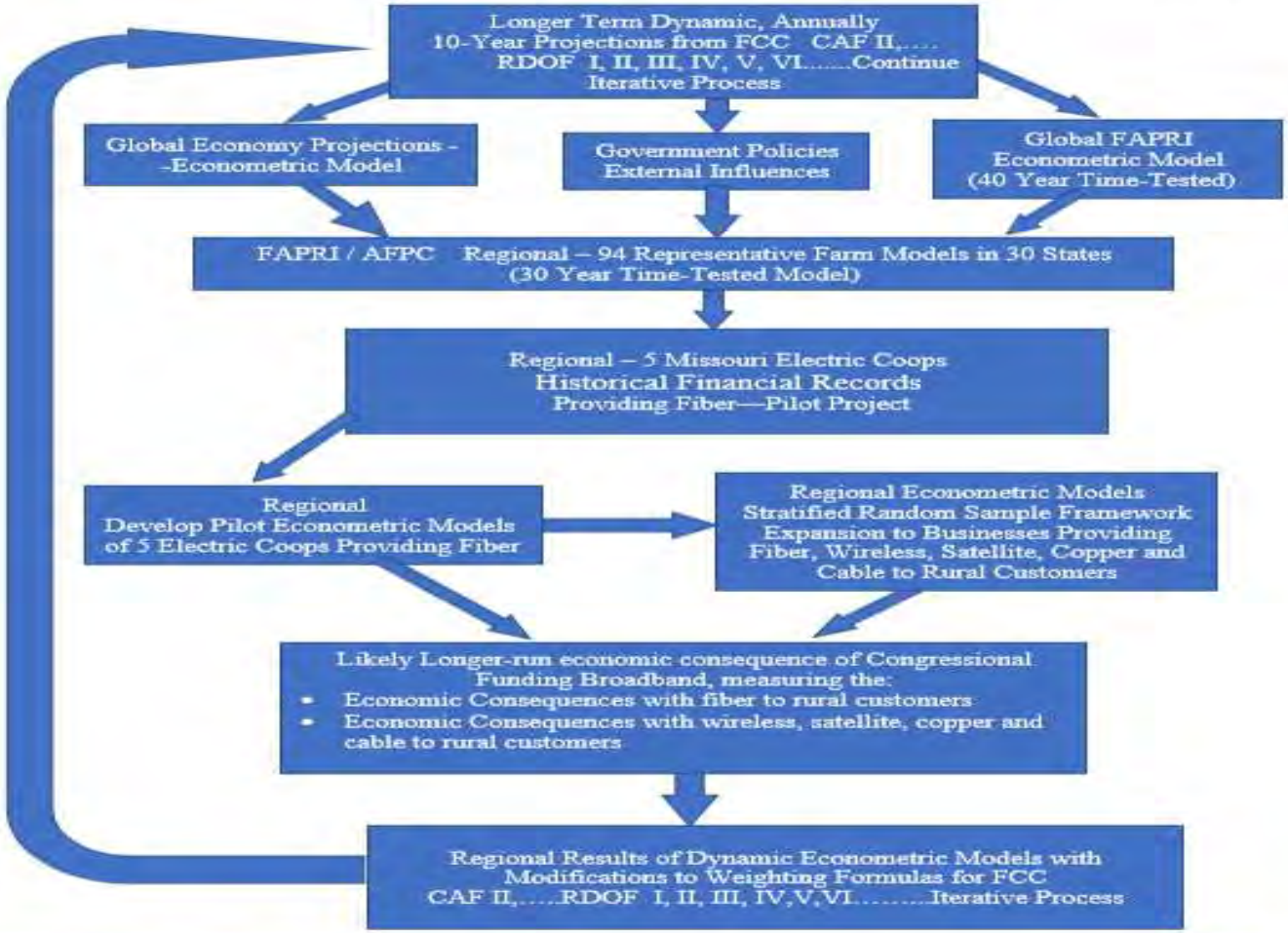
ADVANTAGES

Assisting Congress, FCC and their staffs to:

a. Attract more businesses to rural America
b. Slow out-migration from rural America
c. Spur economic growth / economic development in rural America
d. Efficient use of federal dollars
e. Academic research, training and publications

Proposed Econometric Economic Development Research Project on Broadband

Measuring the Economic Consequences of Broadband Funding
Flow Chart—10-year Projection



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College of Agriculture Food and Natural Resources

CAFNR

BROADBAND SURVEY SUMMARY

IN RURAL MISSOURI

DATES: 2019-2020

University of Missouri /CAFNR/Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020

CAFNR BROADBAND SURVEY SUMMARY

This survey, by the College of Agriculture Food and Natural Resources (CAFNR) at the University of Missouri beginning in 2018, was conducted to determine the likely rural economic and social consequences associated with fiber broadband providers that received FCC funding in the open bidding process in 2018. Seven Electric COOPs in Missouri received federal support funding and represent the survey base- 2 in northern Mo., 2 in Mid Mo and 3 in Southern MO.

Survey results indicates that fiber broadband providers with service of 1000 Mbps download and 1000 upload speeds at rates to consumers much lower than other competitors is likely to be one of the major reasons for finally reversing the outflow of businesses and individuals from rural areas.

An overview of the study includes:

- ***Two schools in southern MO saved $42,000 per year***
- ***One Cotton Gin saved $4,000 per month***
- ***New homes in North East MO increased in value $7000 with fiber***
- ***Tele Med minimized in- home – health care cost***
- ***Increases in start-up businesses, business expansion and recruitment***
- ***Reduction in out-migration and migration increases***
- ***Enhances home employment and remote employment***
- ***Community support via streaming church services and social events***

UNIVERSITY OF MISSOURI INTEREST

The University via CAFNR decided to be involved in the broadband issues for two major factors:

1. **Economic Development— determining the measured amount of economic growth associated with broadband service and costs in real time.**
2. **Policy— Timely information—Real Time information compliments policy decision makers associated with allocation of funding formulas**

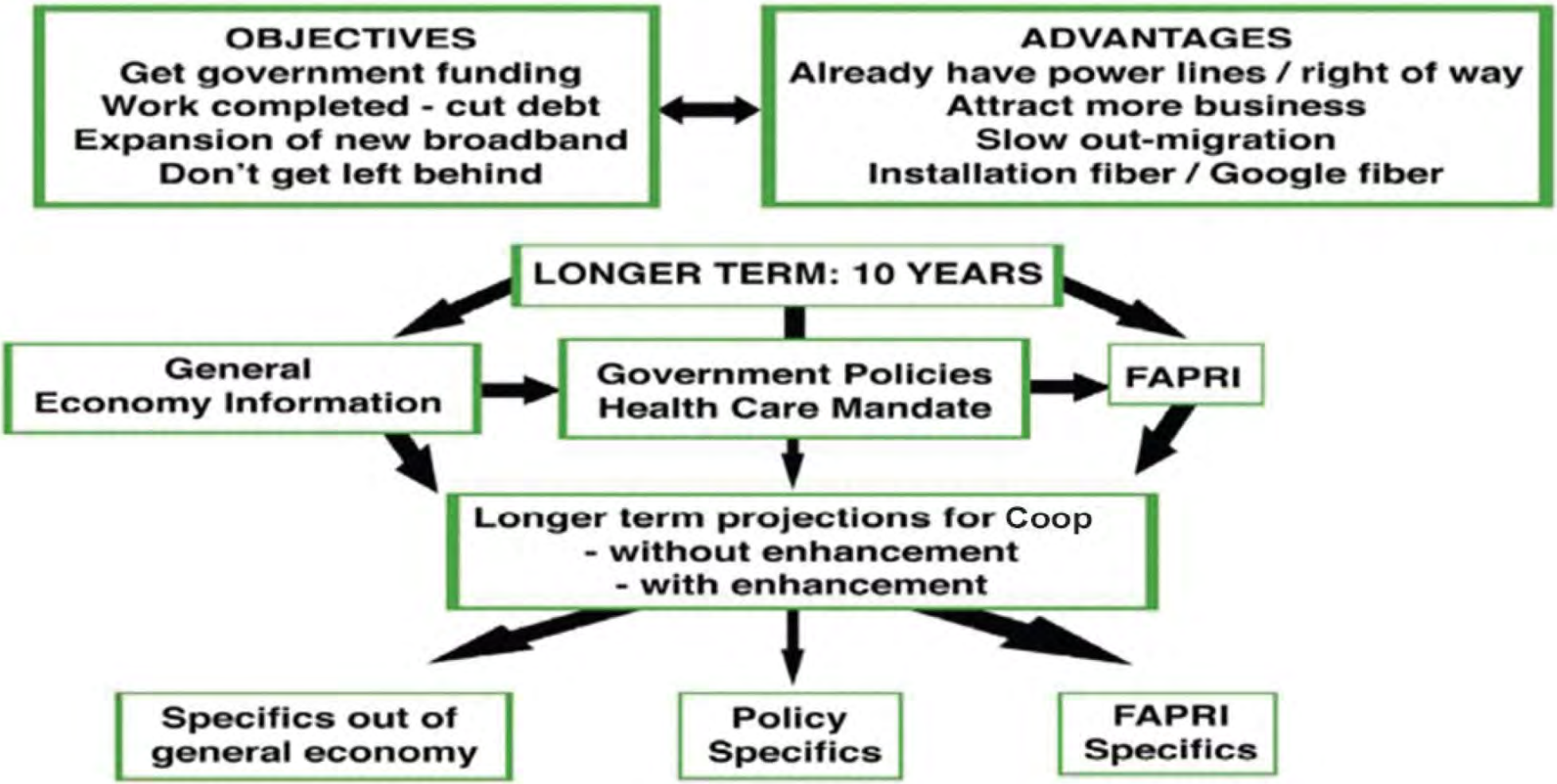
CAFNR's Dynamic Econometric Economic Development Program (DEEDP) is a mirror image of the FAPRI model successfully used by Congress for all farm programs.

CAFNR's DEED Program concentrates on economic development issues and policy implications associated with broadband expansion and development in rural areas.

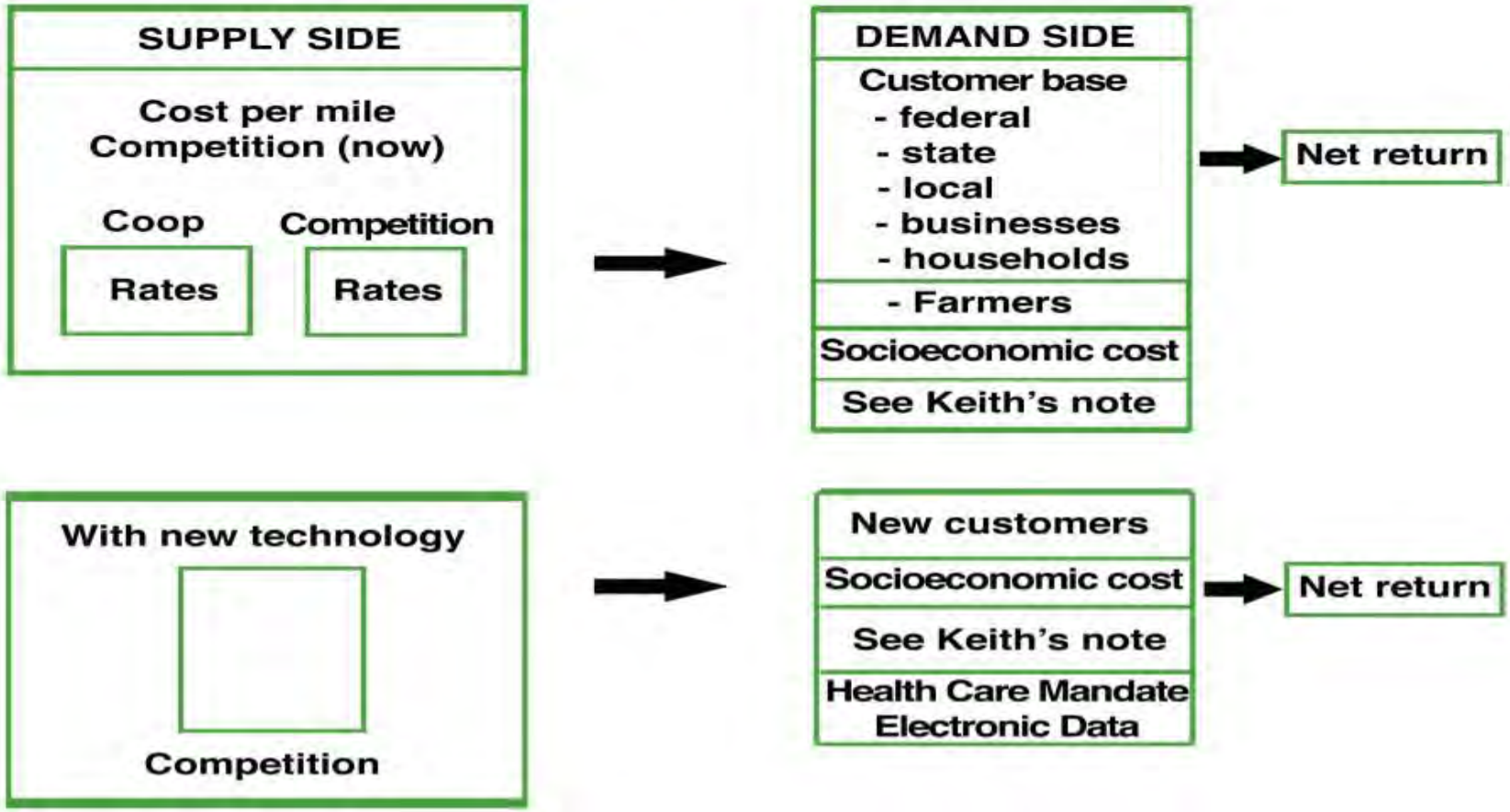
Discussions with DC staff regarding Broadband expansion into rural areas in Missouri

- Possibility of building dynamic business econometric models for the CO OP industry?
- Similar to the Rep Farm system?
- 10 year projection capabilities?
- Enough CO Ops to get a State profile?
- Linkage to the general economy and FAPRI projections?
- Estimated longer run consequences of different levels of Federal and State subsidies per CO OP?

COOP BROADBAND



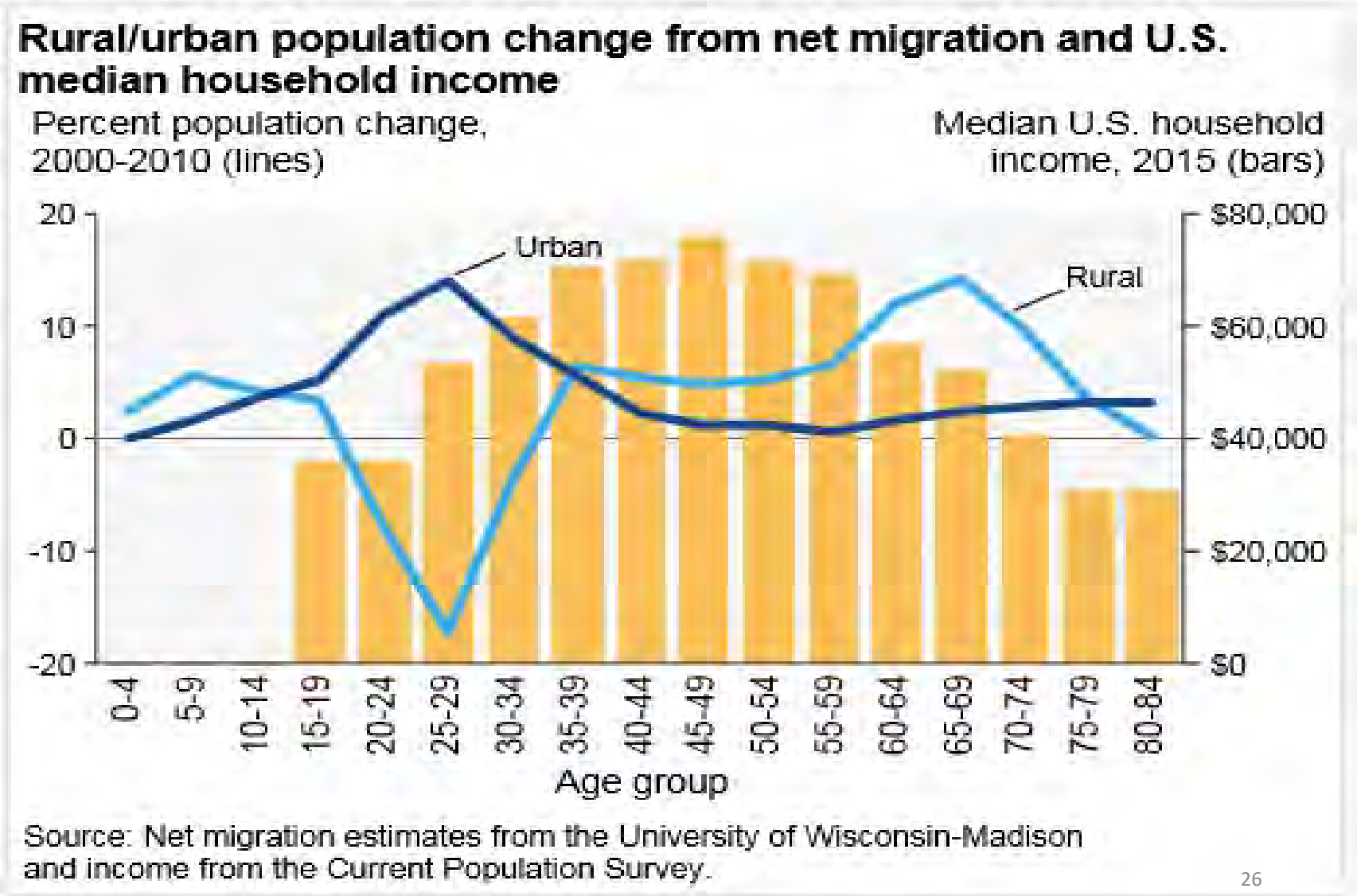
DATA FLOW CHART FOR MODELING



CAFNR DEEDP Question:
How can rural Missouri stop the out-migration of our younger generation?

CAFNR DEEDP Question:
Can high speed broadband be an answer to stop out-migration?

CAFNR DEEDP Question:
Can the Midwest compete with the East Coast / West Coast to stop out-migration?



HOW MUCH INVESTED IN THE 20 - 22 YEAR OLDS THAT MIGRATE TO OTHER STATES?
BY AGE 22 $500,000/child

- Cost of raising a child to age 18 $14,000/yr/child $252,000.
- Federal/State/ Local $ spent K-12 $12,500/yr/child $162,000.
  - Total Money Invested to Age 18 $400,000.
- Add 4 Yr College Federal Money $5,000/yr/child
- Add 4 Yr family $ cost College $20,000/yr/child
  - With College Total Money Invested to Age 22 $500,000.

- **HUMAN EQUITY LOST TO OUT-MIGRATION**: $400,000. to $500,000 / person

SOURCES FOR DEEDP COST OF INVESTMENT PER CHILD

- USDA, Expenditures on Children by Families, 2015, Center for Nutrition Policy and Promotion, March 2017
- US Department of Education, Expenditures per Pupil, National Center for Education Statistics
- USDA, Center for Nutrition Policy and Promotion: Official USDA Food Plans: Cost of Food at Home at Four Levels, 2016
- The College Board, Trends in College Pricing 2016

5 KEY TAKE-A-WAYS FOR BROADBAND FEDERAL PROGRAMS

1. The FCC Urban Survey and its formulas are used to set the FCC Regulations
   a. Used the 13 large telecoms as a base for the survey formula to distribute funds
   b. FCC admission that providers that report deployment in a census block **may not necessarily offer that service everywhere in the census block**

2. FCC Funding Results from CAF II auction of 2018
   a. 69% of funds in Missouri went to one wireless provider

3. Why did this inequity occur?
   a. Costs and speed comparison

4. Moving Toward a Fair and Equal Playing Field
   a. Will require a larger footprint for the electric coops doing broadband
   b. Will require greater exposure for electric coops costs and services offered
   c. Re-evaluation of formulas for Urban Survey
      i. Cost and services weighting factors
   d. Footprint example FAPRI Rep Farms

5. Why should we be concerned?
   a. Outmigration rates for rural America

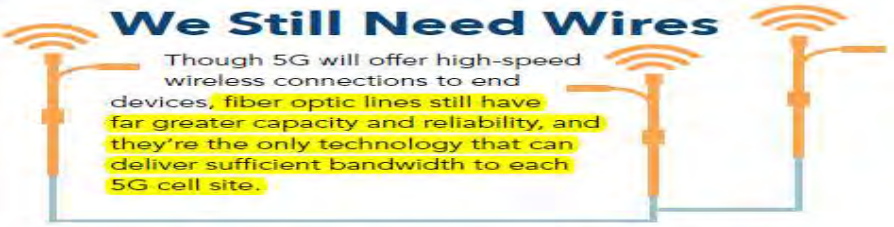
- **INTERNET SPEED COST COMPARISON**
- **DIFFERENCES IN UPLOAD SPEEDS BY PROVIDER**
- **REGULATIONS OF THE FCC CAF II**
- **ELECTRIC COOPS CLAIM FOR LOSS OF $100 MILLION IN CAF II AUCTION**
  - **WITH CORRESPONDING LOSS OF FIBER DEPLOYED TO RURAL MISSOURI COMMUNITIES**

A Pocket Guide To 5G HYPE

5G, or "fifth generation" wireless, is a set of new standards and technological improvements that will enable faster wireless connectivity once implemented.

Compared to current 4G LTE networks, in which users connect to towers thousands of feet away, typical 5G networks require much more densely deployed infrastructure, with small cell base stations less than 1,000 feet from devices. The cell sites will be connected to each other and the broader Internet by fiber optic cables. 5G networks are being marketed both for mobile (e.g., cell phones) and fixed (e.g., home Internet access) uses and as smart city infrastructure.

We Still Need Wires



Though 5G will offer high-speed wireless connections to end devices, fiber optic lines still have far greater capacity and reliability, and they're the only technology that can deliver sufficient bandwidth to each 5G cell site.

5G Won't Fix the Broadband Market

Competition is limited by economic considerations, not technology. 5G providers are unlikely to rival cable directly because big companies prefer to divide markets rather than engage in robust competition. 5G development won't open the market to new competition because only the biggest telephone companies, like AT&T and Verizon, have access to the volume of spectrum needed.

5G Won't Solve the Digital Divide

Since 5G connectivity relies on fiber optics that aren't available in many rural areas, these communities won't receive 5G access anytime soon. The same market reality discouraging investment in rural broadband will also discourage 5G investment. Even in urban areas, companies like AT&T and Verizon are unlikely to start investing in the low-income neighborhoods they have neglected for years.

There's No 5G Race

The "5G Race" is marketing hype designed to scare governments into giving companies large subsidies and consumers into paying a premium for prototype devices. To achieve widespread 5G deployment, we need abundant, open fiber networks, not corporate handouts.

Community Networks

ILSR INSTITUTE FOR Local Self-Reliance

MuniNetworks.org | ILSR.org
Published August 2019

5G and Fiber-to-the-Home (FTTH) are complementary technologies that are each best suited to different applications.

	RELIABILITY	SPEED	AFFORDABILITY	BEST USES
5G	Requires line-of-sight. Trees, buildings, and sometimes weather can impact reliability.	Eventually more than 1 gigabit to devices in ideal conditions, but often slower based on environmental factors and congestion.	Mobile plans often have restrictive data caps with overage fees and throttling.	Well suited for mobile uses, like cell phones and smart transportation, in densely populated areas.
FTTH	Very reliable connectivity not impacted by environmental conditions.	No known limits on speed with providers commonly offering 1 gigabit or even 10 gigabits.	Varies by the provider with locally-based networks offering the best prices.	Ideal option for fixed Internet access at a home or business in both urban and rural areas, using Wi-Fi to connect most devices.

FCC Small Cell Order Hurts Local Control

In late 2018, the Federal Communications Commission (FCC) adopted an Order that limits how municipalities and local governments can negotiate with carriers over 5G small cell deployments. By preempting local authority, the FCC has undermined the ability of communities to promote digital equity, to the benefit of national telecom companies.

Don't Fall for Big Telecom's 5G Hype

Wireless technologies like 5G are complementary to robust, wired networks. On their own, 5G networks will not achieve key goals, such as connecting rural America and closing the digital divide.

https://www.lifewire.com/5g-speed-4180992

LifeWire **How fast is 5G, and how does it compare to 4G and LTE?**

Sections from article:

Verizon is one of the first to release 5G in the United States, so data from their actual customers to see how fast 5G is right now, with current technology. Looking at those numbers specifically, we can see that a Verizon 5G Home user with FWA can get anywhere from 300 Mb/s to 1 Gb/s. …..possible to get if using a dedicated, fixed wireless access (FWA) system where you don't have to split the bandwidth with other users.

Actual 5G Network Speeds……. reflection of 5G speeds in ideal conditions with basically no latency or interference, and only if your device is the only one using that 5G cell.

9/12/2019 EXCERPTS: COMMUNITY BROADBAND NETWORK—INTERVIEW SACHA SEGAN, PC MAG LEAD MOBILE ANALYST

https://muninetworks.org/content/transcript-community-broadband-bits-episode-371

Sascha Segan: When we're talking about millimeter wave, we are talking about a new, very high speed, short range, high frequency network technology that is going to require thousands of new small cell sites probably on lampposts and the sides of buildings placed either every 1,200 feet or every 2,400 feet

SURVEY RESULTS

BROADBAND SPEEDS AND RESIDENTIAL

COST COMPARISONS

INTERNET PROVIDERS IN MISSOURI

CAF II SELECTED WINNERS

FIBER INTERNET SPEED COST COOP TO NON-COOP COMPARISON IN RURAL MO–MU/DEEDP

Data Compiled by MU CAFNR Dynamic Econometric Economic Development Program (DEEDP)
Eisberg / Womack 2019 / 2020

Phone and web survey with the following internet service providers (ISP) of costs and speeds provided in rural Missouri. The survey included both download and upload speeds and the price per speeds offered.

Terminology:
- Mbps: Megabits per second = 1,000,000. Bits (1 million Bits)
- Gbps: Gigabits per second = 1,000,000,000. Bits (1 billion Bits)
- MB: Megabytes 1 MB = 8 Mb
- GB: Gigabyte 1GB = 8 Gb
- 1 Byte = 8 Bits

Data Speeds reported in this Survey are in bits, either Mbps or Gbps

COLOR CODES SERVICE PROVIDERS: Green=FIBER Yellow=Satellite/Fixed Wireless/Copper Cable
Outlier in Fiber is in Yellow

COLOR CODES SERVICE PROVIDERS: Green=FIBER Yellow=Satellite/Fixed Wireless/Copper Cable
Turquois= FIBER OUTLIER at Astronomically High Rates compared to other Fiber Providers in rural MO

RESIDENTIAL CUSTOMER PRICES

SURVEY OF UPLOAD AND DOWNLOAND SPEEDS BY SERVICE PROVIDERS IN RURAL MISSOURI

Century Link (in rural Chariton County)

Download	Costs	Upload
1.5 Mbps	$45 / mo.	----- (via copper wire)

Century Link (3 miles north of Columbia)

Download	Costs	Upload
• 10 Mbps	$35 /mo.	5 Mbps (via DSL)
• 40 Mbps	$55 /mo.	---

Wisper ISP (fixed wireless) biggest MO winner in FCC CAF II Auction
Bid in the Tier for 100 Mbps via wireless

Download	Costs	Upload
• 5 Mbps	$40 / mo.	-- ---- ---
• 10 Mbps	$60 / mo.	2.0 Mbps
• 15 Mbps	$85 / mo.	3.0 Mbps
• 20 Mbps	$100 / mo.	4.0 Mbps

Total High Speed Internet ISP (fixed wireless provider) CAF II winner

	Download	Costs	Upload
•	6 Mbps	$200 /mo.	3 Mbps
•	10 Mbps	$300 /mo.	10 Mbps
•	15 Mbps	$300 /mo.	5 Mbps
•	20 Mbps	$400 /mo.	20. Mbps

Cable One / New Wave Communications (cable internet provider)

	Download	Costs	Upload
•	10 Mbps	$50 /mo.	3 Mbps
•	100 Mbps	$65 /mo.	10 Mbps
•	300 Mbps	$90 /mo.	30 Mbps

AT&T / Direct TV (DSL internet provider)

	Download	Costs	Upload
•	6 Mbps	$45 /mo.	1 Mbps

Mercury Wireless Internet ISP (fixed wireless provider) CAF II winner

	Download	Costs	Upload	
•	3 Mbps	$40 /mo.	1 Mbps	
•	5 Mbps	$60 /mo.	1 Mbps	
•	7 Mbps	$80 /mo.	1 Mbps	
•	30 Mbps	$150 /mo.	6 Mbps	(only available if customer is close to company tower)

AirLink Rural Broadband ISP (fixed wireless provider in Chariton, Howard, Saline Counties)
CAF II winner Howard County Bid in the Tier for 100 Mbps

	Download	Costs	Upload
•	3 Mbps	$49 /mo.	1.5 Mbps
•	10 Mbps	$64 /mo.	5.0 Mbps
•	15 Mbps	$79 /mo.	7.5 Mbps
•	20 Mbps	$100 /mo.	10. Mbps

Use of CAF II FUNDS for Howard County

NOTE: OUTLIER IN FIBER use of CAF II FUNDS $11.4 Million
AirLink Rural Broadband ISP (fixed wireless provider providing Fiber in Howard)
CAF II winner Howard County ***Bid in the Tier for 100 Mbps winner of $11.4 Million***

	Download	Costs	Upload
•	10 Mbps	$60 /mo.	? Mbps
•	75 Mbps	$75 /mo.	? Mbps
•	100 Mbps	$100 /mo.	? Mbps

Source: www.airlinkrb.com/fiber-updates

COMPARE OUTLIER TO FIBER PROVIDER IN NEIGHBORING COUNTY AND OTHER FIBER IN MISSOURI

Chariton Valley Telephone Coop (telephone coop) internet costs

Winner in CAF II Provides Fiber optics FTTH

Download	Costs	Upload
• 75 Mbps	$40 /mo.	75 Mbps
• 150 Mbps	$50 /mo.	150 Mbps
• 300 Mbps	$60 /mo.	300 Mbps
• 500 Mbps	$70 /mo.	500 Mbps
• 1 Gbps (1000 Mbps)	$90 /mo.	1 Gbps (1000 Mbps)

Socket (Provides Fiber Optics FTTH)

Receives Federal Funds

Download	Costs	Upload
• 100 Mbps	$70 /mo.	10 Mbps
• 200 Mbps	$75 / mo.	20 Mbps
• 300 Mbps	$85 /mo.	30 Mbps
• 1 Gbps (Gigabit)	$125 /mo.	100 Mbps

Co-Mo Connect / Co-Mo Electric Coop (internet costs via fiber)

Winner in CAF II with coop association (RECC) Provides Fiber optics FTTH

	Download	Costs	Upload
•	100 Mbps	$50 /mo.	100 Mbps
•	250 Mbps	$60 /mo.	250 Mbps
•	1 Gbps (Gigabit) (1000 Mbps)	$100 /mo.	1 Gbps (Gigabit) (1000 Mbps)

GoSEMO / SEMO Electric Coop (internet costs via fiber)

Winner in CAF II with coop association (RECC) Provides Fiber optics FTTH

	Download	Costs	Upload
•	100 Mbps	$50 / mo.	100 Mbps
•	1 Gbps (Gigabit) (1000 Mbps)	$80 / mo.	1 Gbps (Gigabit) (1000 Mbps)

GoBEC / BARRY Electric Coop (internet costs via fiber)

Winner in CAF II (not in the RECC) Provides Fiber optics FTTH

	Download	Costs	Upload
•	250 Mbps	$50 / mo.	250 Mbps
•	500 Mbps	$75 / mo.	500 Mbps
•	1 Gbps (Gigabit) **(1000 Mbps)**	$100 / mo.	1 Gbps (Gigabit) **(1000 Mbps)**

UNITED Fiber / UNITED Electric Coop (internet costs via fiber)

Winner in CAF II with coop association (RECC) Provides Fiber optics FTTH

Download	Costs	Upload
• 200 Mbps	$50 / mo.	200 Mbps
• 500 Mbps	$70 / mo.	500 Mbps
• 1 Gbps (Gigabit) (1000 Mbps)	$100 / mo.	1 Gbps (Gigabit) (1000 Mbps)

CALLABYTE / CALLAWAY Electric Coop (internet costs via fiber)

Winner in CAF II with coop association (RECC) Provides Fiber optics FTTH

Download	Costs	Upload
• 100 Mbps	$65 / mo.	100 Mbps
• 500 Mbps	$75 / mo.	500 Mbps
• 1 Gbps (Gigabit) (1000 Mbps)	$95 / mo.	1 Gbps (Gigabit) (1000 Mbps)

PEMISCOT DUNKLIN FIBER / PEMISCOT DUNKLIN Electric Coop (internet costs via fiber)

Blocked from bidding in CAF II Auction Provides Fiber optics FTTH

Download	Costs	Upload
• 100 Mbps	$50 / mo.	100 Mbps
• 1 Gbps (Gigabit) (1000 Mbps)	$80 / mo.	1 Gbps (Gigabit) (1000 Mbps)

MU /CAFNR /DEEDP Sources for Broadband Costs and Speeds:

Wisper LLC, ISP: https://www.wisperisp.com/services/
AirLink Rural Broadband, LLC, ISP: http://www.airlinkrb.com/pricing/residential/
AirLink Rural Broadband, LLC, ISP: http://www.airlinkrb.com/fiber-updates
Chariton Valley Telephone: Salisbury, MO plus corporate officer, Donna Bell http://www.cvalley.net/services/internet/
Total High Speed Internet: company headquarters for prices & speeds https://totalhighspeed.com/
Co-Mo Connect: https://www.co-mo.net/residential/internet-for-residential/
GoSEMO: https://www.gosemofiber.com/
GoBec: http://gobec.net/
Callabyte: https://callabyte.com/#Products
United Fiber: https://unitedfiber.com/
Pemiscot Dunklin Fiber: https://www.pemiscotdunklinfiber.com/front_end/products
Century Link Costs, Speeds, availability: company web, telephone calls and Keytesville Library customers
Century Link: https://www.centurylink.com/home/internet/
Century Link: customer, 7201 N. Route E, Columbia, MO, director of software development for Veterans United
Cable One / New Wave: actual customers, 15911 CR 405, and 1505 Susan Street, Dexter MO 63841
Socket: headquarters plus customer, 3853 County Road 257, Fulton, MO 65251
AirWave Communications: http://www.airwaveonline.com/internet.html
Mercury Wireless: headquarters and https://www3.mercurywireless.com/residential-service/
AT&T Services Inc.: actual customers, 604 S Lewis St, Dexter MO, 63841

TABLES OF MISSOURI WINNERS OF CAF II FUNDS

- **FCC Funds Allocated to Missouri by Provider**
  - Funds each provider received for MO deployment
  - Percentage to each provider in Missouri bids
  - Total funds received to Missouri providers
  - Percentage Missouri received from USA total
- **CAF II Winning Bidders & All of States for Providers That Bid In Missouri**
  - Funds received per state for each provider
  - Number states per provider
  - Difference in funds per states per provider
- **CAF II Largest Bid in entire US in a Particular state**
  - **Missouri got the largest single bid from one company**
- **CAF II Largest Total Provider Bid in All States combined**

PERCENTAGES OF FCC FUNDS ALLOCATED TO MISSOURI BY PROVII		Auction: Summer 2018				
		Source: FCC CAF II https://www.fcc.gov/auction/903				
FCC's CAF II AUCTION (903) RURAL BROADBAND		**Funds 10 Years**		**Funds 10 Years**		
Total Assigned Winning Bids Missouri's Share		$254,773,118				
Total CAF $ to Providers in States Won				$450,540,377		
(of providers that bid in Missouri)						
Percentage to Highest Winning Bidders Missouri				**Percentage of Total Win Bids**		
Wisper ISP, Inc. --highest percentage of $ in MO		**69%**		$254k	**57%**	
Rural Electric Coop Consortium % of $ in MO		**18%**		$196k	**43%**	
Air Link Rural Broadband, LLC % of $ in MO		**4%**		$450k	Total MO CAF II Funds	
Total USA CAF II Funds						
Total Funds Available entire USA	$2.0 Billion	$ 1,980,000,000				
Total Funds Assigned for Bid USA	$1.5 Billion	$ 1,488,329,864				
Un Used (unassigned) Funds from CAF II		$ 491,670,136				
Missouri Percentage of Total USA		**17%**				

FCC FUNDS ALLOCATED TO MISSOURI BY PROVIDER Auction: Summer 2018

Source: FCC CAF II https://www.fcc.gov/auction/903

auctic	FCC's CAF II AUCTION (903) RURAL BROAI bidder	state	Funds 10 Years Missouri CAF $ Per Provider	location assigned	Bidder % MO	No. State	Provider's Combined States Winning CAF II	States Won by Provider in CAF II
903	Air Link Rural Broadband, LLC	MO	$ 11,371,438	2321	4%	1	$ 11,371,438	MO
903	ArisWave Consortium	MO	$ 3,001,545	788	1%	5	$ 12,298,810	MO AR IL MS OK
903	Barry Electric Cooperative	MO	$ 6,103,454	2308	2%	1	$ 6,103,454	MO
903	Chariton Valley Communications Corp	MO	$ 4,179,666	847	2%	1	$ 4,179,666	MO
903	Fidelity Communications Company	MO	$ 24,367	9	0%	2	$ 72,827	MO AR
903	Mark Twain Communications Compan	MO	$ 3,053,366	676	1%	1	$ 3,053,366	MO
903	Mercury Wireless	MO	$ 1,641,845	1954	1%	5	$ 4,610,331	MO IN KS MI OH
903	Mid-States Services, LLC	MO	$ 1,868,060	358	1%	1	$ 1,868,060	MO
903	Rural Electric Cooperative Consortium	MO	$ 46,569,407	17214	18%	8	$ 186,022,490	MO AR KY MI OK OR TN VA
903	Total Highspeed LLC	MO	$ 640,560	386	0%	1	$ 640,560	MO
903	Wisper ISP, Inc	MO	$ 176,319,409	68269	69%	6	$ 220,319,375	MO AR IL IN KS OK
	Total Assigned Winning Bids Missouri's		**$ 254,773,118**		100%			
		Total CAF $ to Providers in States Won					**$ 450,540,377**	
		(of providers that bid in Missouri)						

	COMPARISON OF FUNDS ALLOCATED TO WIRELESS VERSES FIBER							
	FCC FUNDS ALLOCATED TO MISSOURI BY PROVIDER			Auction: Summer 2018				
	CAFNR / Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020							
			Source: FCC CAF II https://www.fcc.gov/auction/903					
	FCC's CAF II AUCTION (903) RURAL BROADBAND		**Funds 10 Years**					
			Missouri CAF $	locatio	Bidder	No.	***Service Provider Type***	
auction_	**bidder**	state	**Per Provider**	assigne	% MO	States	**Fixed Wireless**	**Fiber**
903	Air Link Rural Broadband, LLC	MO	$ 11,371,438	2321	4%	1		$ 11,371,438
903	ArisWave Consortium	MO	$ 3,001,545	788	1%	5	$ 3,001,545	
903	Barry Electric Cooperative	MO	$ 6,103,454	2308	2%	1		$ 6,103,454
903	Chariton Valley Communications Corporation	MO	$ 4,179,666	847	2%	1		$ 4,179,666
903	Fidelity Communications Company	MO	$ 24,367	9	0%	2	Defaulted	
903	Mark Twain Communications Company	MO	$ 3,053,366	676	1%	1	Wireless using Fiber for backbone	
903	Mercury Wireless	MO	$ 1,641,845	1954	1%	5	$ 1,641,845	
903	Mid-States Services, LLC / Grundy Electr Coop	MO	$ 1,868,060	358	1%	1		$ 1,868,060
903	Rural Electric Cooperative Consortium (RECC)	MO	$ 46,569,407	17214	18%	8		$ 46,569,407
903	Total Highspeed LLC	MO	$ 640,560	386	0%	1	Defaulted	
903	Wisper ISP, Inc	MO	$ 176,319,409	68269	69%	6	$ 176,319,409	
	Total Assigned Winning Bids Missouri's Share		**$ 254,773,118**		100%			
	Total CAF $ to Providers in MO by Service Type						**$ 180,962,799**	$ 70,092,025

Missouri's Highest CAF II Winning Bidders & All States of Their Bids

Source: FCC CAF II https://www.fcc.gov/auction/903

HOW MUCH DID THE PROVIDERS GET IN MISSOURI COMPARED TO OTHER STATES OF THEIR BID

auctio	Winning Providers	state	CAF II Funds Per State Per Provider	Number Locations	US Total CAF II To Provider In All States Bid	No. States Won
903	Air Link Rural Broadband, LLC	MO	$ 11,371,438	2,321	$ 11,371,438	1
903	Rural Electric Cooperative Consort	AR	$ 40,849,218	11,934		
903	Rural Electric Cooperative Consort	KY	$ 412,624	119		
903	Rural Electric Cooperative Consort	MI	$ 6,214,668	2,743		
903	Rural Electric Cooperative Consort	MO	$ 46,569,407	17,214		
903	Rural Electric Cooperative Consort	OK	$ 36,843,580	14,876		
903	Rural Electric Cooperative Consort	OR	$ 3,475,834	533		
903	Rural Electric Cooperative Consort	TN	$ 808,942	217		
903	Rural Electric Cooperative Consort	VA	$ 50,848,217	18,686	$ 186,022,490	8
903	Wisper ISP, Inc	AR	$ 399,566	102		
903	Wisper ISP, Inc	IL	$ 35,079,138	8,907		
903	Wisper ISP, Inc	IN	$ 123,648	14		
903	Wisper ISP, Inc	KS	$ 1,607,524	414		
903	Wisper ISP, Inc	MO	$ 176,319,409	68,269		
903	Wisper ISP, Inc	OK	$ 6,790,090	2,443	$ 220,319,375	6

FCC's CAF II Winning Bid by Largest Total Provider Bid in All States Combined for Provider					
	Source: https://www.fcc.gov/auction/903		**Provider Combined**		
		No. of	**States Winning CAF II**		
	Largest Total Provider Bid in All States Combined	States	**Provider Total**		
No. 1	AMG Technology Investment Group LLC	6	$281,283,794		
No. 2	Wisper ISP, Inc	6	$220,319,375		
No. 3	Rural Electric Cooperative Consortium	8	$186,022,490		
				Number of	
Auctio	**Largest to Smallest bidder combining states of bidder**	state	Total CAF II Funds	Locations	
903	3E8 Broadband Solutions, LLC	AR	$3,621,847	811	
903	Air Link Rural Broadband, LLC	MO	$11,371,438	2321	
903	Allen's T.V. Cable Service, Inc.	LA	$1,776,733	794	
903	AMG Technology Investment Group LLC	TX	$75,855,975	33803	
903	AMG Technology Investment Group LLC	IA	$50,614,528	15097	
903	AMG Technology Investment Group LLC	OK	$41,285,224	17883	
903	AMG Technology Investment Group LLC	NE	$40,848,390	8768	
903	AMG Technology Investment Group LLC	KS	$37,349,711	10088	
903	AMG Technology Investment Group LLC	IL	$35,329,966	15022	
903	ArisWave Consortium	AR	$7,069,003	3191	

FCC's CAF II Winning Bids by Largest Bid in a Particular State					
	Source: https://www.fcc.gov/auction/903				
			Summer 2018 Auction		
	Largest Bid in Entire US in A Particular State	State	Total Bid in State	% of State Received	
No.1	Wisper ISP, Inc	MO	$176,319,409	69%	
No. 2	California Internet, L.P.	CA	$82,629,018		
No. 3	AMG Technology Investment Group LLC	TX	$75,855,975		
				Number	
Auction	Largest to Smallest bidder	state	CAF II Winning $	locations_assigned	
903	Wisper ISP, Inc	MO	$176,319,409	68269	
903	California Internet, L.P.	CA	$82,629,018	10922	
903	AMG Technology Investment Group LLC	TX	$75,855,975	33803	
903	Rural Electric Cooperative Consortium	VA	$50,848,217	18686	
903	AMG Technology Investment Group LLC	IA	$50,614,528	15097	
903	Cal.net, Inc.	CA	$50,516,652	20859	
903	Rural Electric Cooperative Consortium	MO	$46,569,407	17214	
903	AMG Technology Investment Group LLC	OK	$41,285,224	17883	
903	Rural Electric Cooperative Consortium	AR	$40,849,218	11934	
903	AMG Technology Investment Group LLC	NE	$40,848,390	8768	
903	AMG Technology Investment Group LLC	KS	$37,349,711	10088	
903	Rural Electric Cooperative Consortium	OK	$36,843,580	14876	
903	AMG Technology Investment Group LLC	IL	$35,329,966	15022	
903	Wisper ISP, Inc	IL	$35,079,138	8907	

Connect America Fund Phase II Auction (Auction 903) **Source: https://www.fcc.gov/auction/903**

Tier Bid areas of Wisper & Electric Coops (RECC)

FCC CAF II Regulations:

..”***Winning bidders must offer the service associated with their winning bid.***”

Wisper Bid Tier area: Above Baseline Tier ≥ 100/20 Mbps Speed Weight 15

RECC Electric Coops Tier area: Gigabit Tier ≥ 1 Gbps/500 Mbps Weight 0

Wisper and RECC Low Latency ≤ 750 ms & <MOS of ≥4 (Mean Opinion Score (**MOS**).

Census Block Areas of bidding by Wisper and RECC.

Wisper bidding in 100/20 Mbps Tier.

RECC Coops won the bid against Wisper that forced down Coop’s bid in following census blocks.

Electric Coop	**Sample Census Blocks**	**Final Two Bidders**	**Winner**
Co-Mo	290154601002	Co-Mo & Wisper	Co-Mo
Callaway	290270706003	Callaway & Wisper	Callaway
SEMO	290318802002	SEMO & Wisper	SEMO
Wisper winning area	290099602003		Wisper

Questions raised for CAF II

Credibility from Recipient of Federal dollars

a. Are they reporting actual facts of service
b. Are they reporting speeds
c. Are they servicing all potential customers

Source: Quote, SEMO CEO: "*The difference between bidding at the 10 Mbps tier or 25 Mbps tier and bidding at the 100 Mbps tier was the difference in winning and losing the bids.*"

Source: Quote, SEMO CEO: "*In the100 Mbps tier the fixed wireless bidders are being awarded $200 million in Missouri alone for bidding beyond their capability.*"

Source: Quote, SEMO CEO: "*Had the fixed wireless companies bid at their capabilities, Missouri's rural electric coops would have won $100 million more in the auction and fiber networks would have been more widely deployed.*"

Missouri Public Service Commission (PSC) Intervention on CAF II Auction Awards

MO PSC Case No. 2019-0196 Questions whether the wireless providers that won bids in the Above Baseline Tier for providing 100 Mbps can technically provide the service for which they received the award.

Issues with Broadband Reporting For Federal $

- Problem for Competition in Areas on FCC Map

- Two Areas where Federal Funds are Distributed
  - USF (Universal Service Funds)
  - CAF II (Connect America Funds) 2018 / RDOF 2020 (Rural Digital Opportunity Fund)

- When Telecoms and Telephone Coops report coverage in areas where USF funds are received, then additional funds are not distributed in the same area

- Once CAF II /RDOF Funds have been distributed to a census block area, no other Federal Funds may be distributed in the same area for a period of 10 years.

- Can Electric Coops compete against companies receiving USF funds?

- Can Electric Coops enter a market on a level playing field whenever NO Federal Funds are distributed in an area?

WEIGHTING TABLES FCC CAF II

PERFORMANCE TIERS FCC CAF II

AND

WEIGHTING TABLES FCC RDOF

PERFORMANCE TIERS FCC RDOF

ISSUES WITH BROADBAND DATA REPORTING

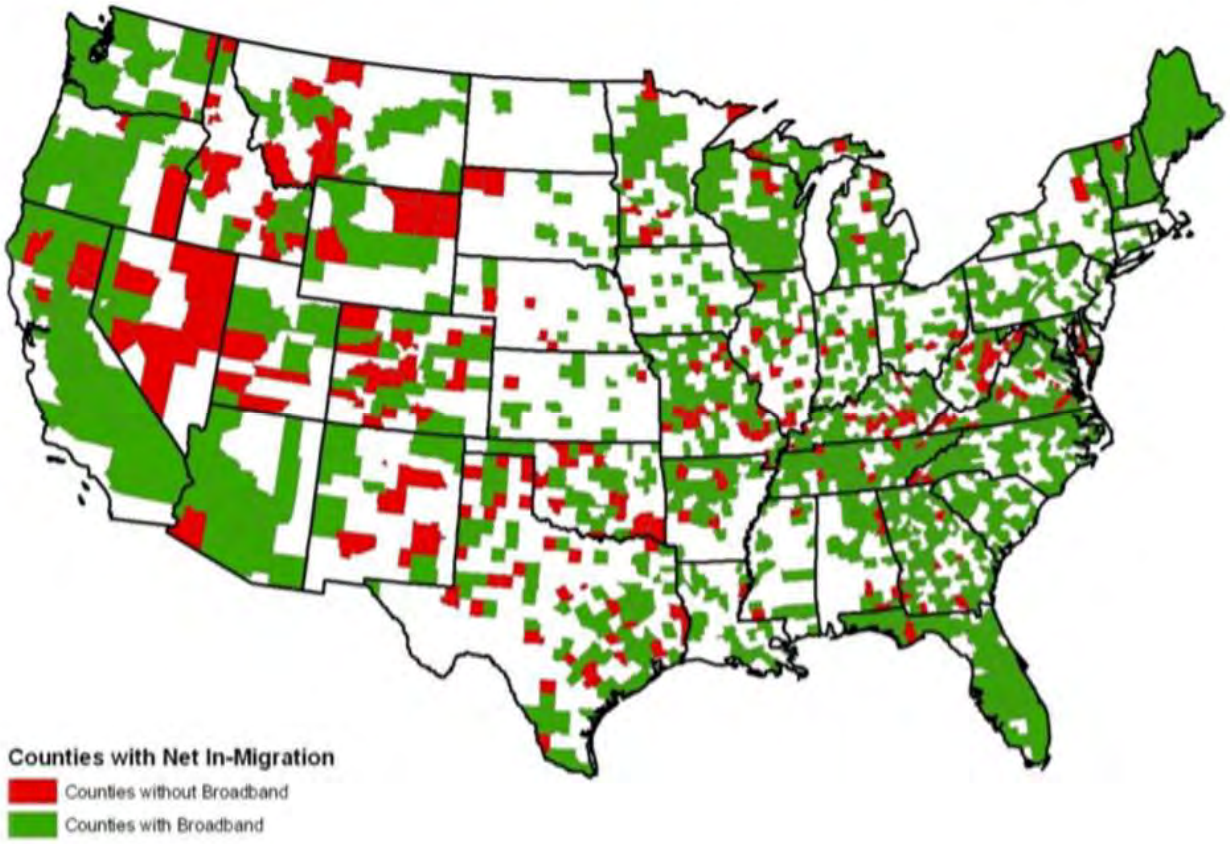
- AREAS IN GREEN ON MAP SHOW COUNTIES WITH BROADBAND COVERAGE.

- DATA USED IS REPORTED BY THE TELECOMS TO THE FCC ON **Form 477**

- IT IS INCOMPLETE, INACCURATE AND NOT TIMELEY ---- ACCORDING TO THE FCC BY THEIR OWN ADMISSION IN THE FOLLOWING:

Source: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477

FIGURE 1. U.S. Counties with Net In-Migration, 2000-2006



Source: U.S. Census Bureau.

- **FCC Urban Survey Uses Form 477 Completed by Providers**
- **COMPARABLE TO MAPS Reflecting Broadband Service**

- *__Note__: A provider that reports deployment of a particular technology and bandwidth in a **census block** **may not necessarily offer that service everywhere in the block**.
- Accordingly, a list of providers deployed in a census block **does not** necessarily reflect the number of choices available to any particular household or business location in that block,
- and the number of such providers in the census block **does not** purport to measure competition.
- Source: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477

URBAN RATE SURVEY BENCHMARK TABLE FOR CAF II

The table provides the 2019 benchmark for different broadband service offerings, though providers will need to determine the benchmark for services with characteristics not shown in the table:

Download Bandwidth (Mbps)	Upload Bandwidth (Mbps)	Capacity Allowance (GB)	2019 U.S. ($)	2019 AK ($)
4	1	200	66.12	113.19
4	1	Unlimited	70.76	119.06
10	1	200	72.31	121.54
10	1	Unlimited	77.30	127.75
25	3	200	77.65	129.52
25	3	Unlimited	82.66	135.75
25	5	200	78.49	129.78
25	5	Unlimited	83.50	136.01
50	5	Unlimited	100.85	153.64
100	10	Unlimited	106.23	161.16
250	25	Unlimited	128.69	203.67
500	50	Unlimited	148.35	223.87
1000	100	Unlimited	162.33	232.38

Source: https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources

Formula for Urban Survey

$$\text{Average Monthly Rate (\$)} = Y = f(D, U, A, ST)$$

$$\text{U.S. Average Monthly Rate (\$)} = \sum_{i=1}^{n} \gamma_i \, E(Y \mid D, U, A, ST = ST_i)$$

Formula Symbols:

Average Monthly Rate Formula

- Where D is download bandwidth in Mbps, U is upload bandwidth in Mbps, and A is the inverse of usage allowance in GB. ST includes 15 stratum groups.
- The average monthly rate estimate is a function of D, U, A, and ST.

U.S. Average Monthly Rate Formula

- Where n = 13, which represents 13 stratum groups in the continental U.S. $E(Y \mid D, U, A, ST = ST_i)$ is the expected value conditioned on combinations of download bandwidth, upload bandwidth, and capacity allowance for a given stratum group.
- The γ_i is the proportion of total continental U.S. potential subscribers in a given stratum group.
- D is download bandwidth in Mbps, U is upload bandwidth in Mbps, and A is the inverse of usage allowance in GB. ST includes 15 stratum groups

BASIS OF THE FCC FORMULA

Following Quotes from FCC website for FCC Funding:

- **Service providers must "*offer at least one broadband and voice service at rates that are reasonably comparable to the rates for similar service in urban areas.*"**

- ***"The FCC uses its annual Urban Rate Survey to determine the range of rates that are reasonably comparable."* The FCC Urban Survey uses Form 477 completed by internet service providers.**

- ***"Fixed providers file lists of census blocks in which they can or do offer service to at least one location, with additional information about the service.*"***

- ***“ *Note: A provider that reports deployment of a particular technology and bandwidth in a census block may not necessarily offer that service everywhere in the block……a list of providers deployed in a census block…does not necessarily reflect number of choices available.….and the number of such providers in the census block does not purport to measure competition.”***

Source FCC statement “may not offer”: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477
Source FCC statement “reasonably comparable”: https://www.fcc.gov/auction/903
Source FCC Formula: https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources

REQUIREMENTS FCC CAF II and TYPE OF FORMULAS USED BY FCC

1. Urban Survey/Urban Rate formula – electric coops do not have the footprint
2. Performance Tier Weights formula in the CAF II where 0 is for 1 Gig (fastest delivery)
3. Latency Requirement Weights formula in the CAF II where 0 is low latency (fastest delivery)
4. Largest Areas covered formula—**the greatest area of coverage gets a higher weight for winning**

FOUR PERFORMANCE TIERS CAF II Source: FCC 18-6 Feb.1, 2018

Performance Tier	Speed	Monthly Usage Allowance	Weight
Minimum	≥ 10/1 Mbps[15]	≥ 150 gigabytes (GB)	65
Baseline	≥ 25/3 Mbps	≥ 150 GB or U.S. median, whichever is higher	45
Above Baseline	≥ 100/20 Mbps	≥ 2 terabytes (TB)	15
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB	0

LATENCY REQUIREMENTS

Low Latency	≤ 100 ms	0
High Latency	≤ 750 ms & MOS ≥ 4[17]	25

NUMERICAL REPRESENTATION FINDING AN EQUILIBRIUM THAT CURBS RURAL OUT-MIGRATION

CAFNR/ University of Missouri Abner Womack and Keith Eisberg 2020

IMPACT ON RURAL AMERICA FROM THE DIFFERENTIAL SPREAD IN WEIGHTING FORMULAS

1. FCC (arbitrary sliding scale) weights are designed to cover the largest area at the least Government cost
   Expected consequences: **Consumer receives low levels of Mbps service at a relative higher cost**

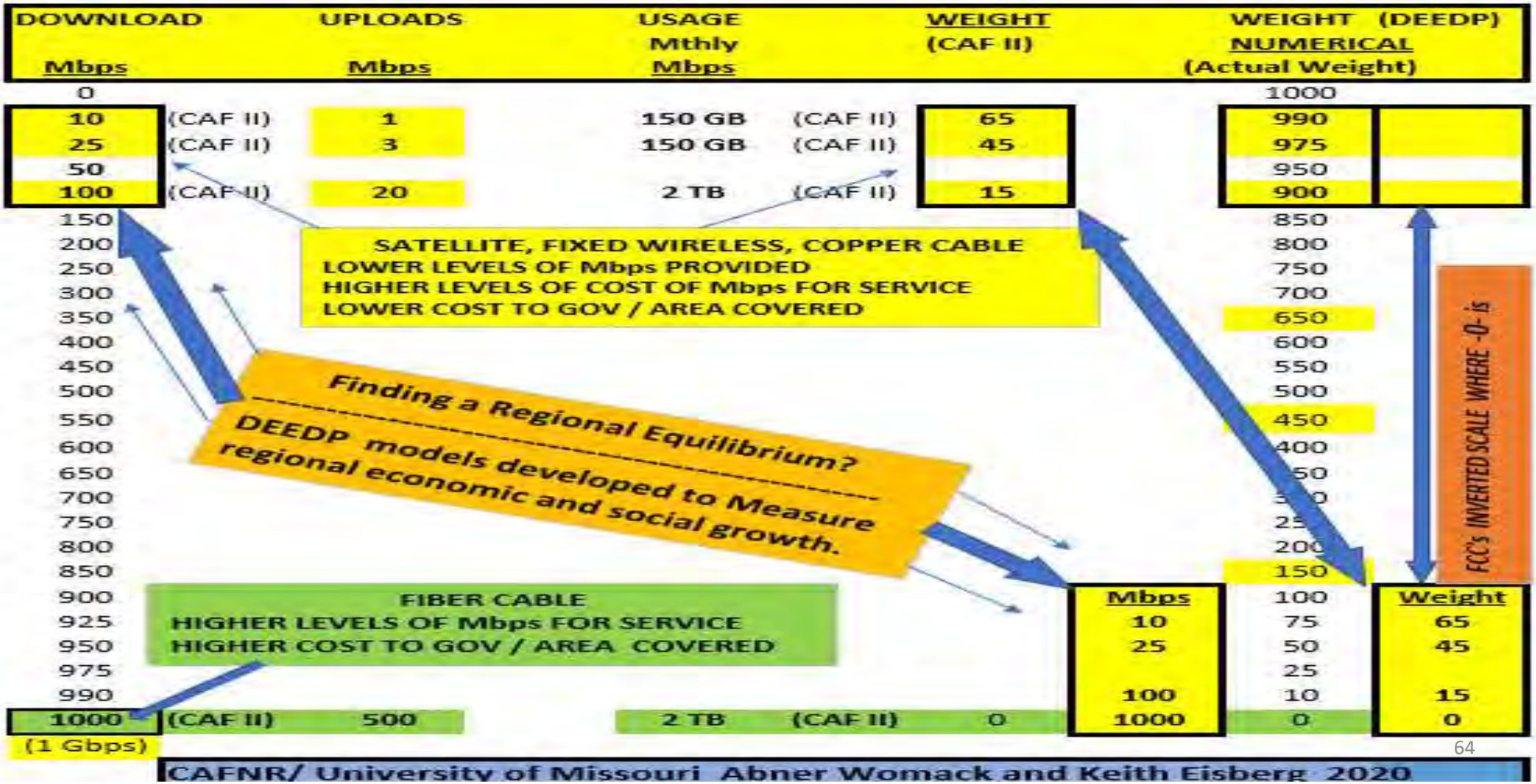
2. FCC (arbitrary sliding scale) weights designed to severely constrain higher Mbps providers (fiber) due to higher Government cost per area covered: Note **NO FCC WEIGHTS ASSIGNED For HIGHER THAN 1 G (1000Mbps) AND A TIGHT SET of WEIGHTS BETWEEN EXTREMELY HIGH Mbps and LOW Mbps SERVICE**
   Expected consequences: **Consumer severely constrained from receiving higher Mbps at a relatively lower cost**

3. Finding balanced set of FCC area weights and rate formulas (Note: **fiber provider rates are not reflected in FCC rate scale**)
   Consider modifying FCC weight and rate formulas to reflect the expected longer run economic and social consequences associated with each new round of FCC funding for high and low Mbps providers

4. **Utilizing time tested dynamic econometric models to estimate expected longer run social & economic consequences** associated with the level of service and cost to consumers
   - Model development based on historical financial records from each group of Mbps providers
   - Model estimated consequences serve as a factor in determining weighting and rate scales for each group of providers

FINDING AN EQUILIBRIUM THAT CURBS RURAL OUT-MIGRATION

FOUR PERFORMANCE TIERS FCC CAF II -- NUMERICAL REPRESENTATION
CAFNR / Dynamic Econometric Economic Development Program (DEEDP) 2020



CAFNR/ University of Missouri Abner Womack and Keith Eisberg 2020

2019 FCC OBJECTIVES

Source: **FCC Statements RDOF 19-126, CAF 10-90, FCC 19-77 August 2019**
https://www.fcc.gov/document/fcc-proposes-204-billion-rural-digital-opportunity-fund-0

1. Closing the digital divide, providing broadband to Americans to those the FCC knows that don't have access to it and have been on the ***wrong side* of the digital divide.**

2. The Rural Digital Opportunity Fund (RDOF) initiative is meant **for rural Americans who need broadband to start a business, educate a child, grow crops, raise livestock, get access to telehealth, and do all the other things that the online world allows.**

3. **Spur the deployment of up to gigabit-speed broadband** networks to millions of rural Americans over the next decade.

4. **Demand for greater speeds will continue to rise**. The FCC proposes to take a flexible approach that prioritizes faster, **gigabit speeds**.

5. **Broadband access is critical to economic opportunity, job creation, education and civic engagement.** For communities throughout our nation to thrive and prosper, their residents must have the option to obtain high-speed Internet access.

6. **Closing the digital divide** and **bringing robust, affordable high-speed broadband** to all Americans is the FCC Commission's top priority.

URBAN RATE SURVEY BENCHMARK TABLE FOR RDOF

The following table provides the 2020 benchmark for a number of different broadband service offerings, though providers will need to determine the benchmark for services with characteristics not shown in the table:[1]

Download Bandwidth (Mbps)	Upload Bandwidth (Mbps)	Capacity Allowance (GB)	2020 U.S.	2020 AK
4	1	250	$73.81	$84.40
4	1	Unlimited	$78.92	$89.93
10	1	250	$76.73	$87.27
10	1	Unlimited	$83.13	$94.09
25	3	250	$82.32	$93.54
25	3	Unlimited	$88.83	$100.48
25	5	250	$83.55	$94.23
25	5	Unlimited	$90.06	$101.16
50	5	Unlimited	$98.22	$107.73
100	10	Unlimited	$111.88	$124.14
250	25	Unlimited	$134.43	$166.21
500	50	Unlimited	$152.25	$181.76
1000	100	Unlimited	$158.82	$190.37

Source: FCC DA 19-1237 December 5, 2019

Research of University of Missouri CAFNR / Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020

RURAL DIGITAL OPPORTUNITY FUND (RDOF) FCC

2019 FCC CAF III $20 BILLION AUCTION FORMULA FCC JULY 11, 2019

FCC-CIR1908-01

Proposed Performance Tiers, Latency, and Weights

Performance Tier	Speed	Monthly Usage Allowance	Weight
Baseline	≥ 25/3 Mbps	≥ 150 GB or U.S. median, whichever is higher	50
Above Baseline	≥ 100/20 Mbps	≥ 2 TB or U.S. median, whichever is higher	25
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB or U.S. median, whichever is higher	0

Latency	Requirement	Weight
Low Latency	≤ 100 ms	0
High Latency	≤ 750 ms & MOS ≥ 4	40

PERFORMANCE TIERS AND WEIGHT FORMULAS CAF II and RDOF USED BY FCC

FCC FOUR PERFORMANCE TIERS CAF II **$2. Billion** Source: FCC 18-6 Feb.1, 2018

Performance Tier	Speed	Monthly Usage Allowance	Weight
Minimum	≥ 10/1 Mbps[15]	≥ 150 gigabytes (GB)	65
Baseline	≥ 25/3 Mbps	≥ 150 GB or U.S. median, whichever is higher	45
Above Baseline	≥ 100/20 Mbps	≥ 2 terabytes (TB)	15
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB	0

FCC PERFORMANCE TIERS RDOF

$20. Billion over 10 years

Source: **FCC Statements RDOF 19-126, CAF 10-90, FCC 19-77 August 2019**
https://www.fcc.gov/document/fcc-proposes-204-billion-rural-digital-opportunity-fund-0

Performance Tier	Speed	Monthly Usage Allowance	Weight
Baseline	≥ 25/3 Mbps	≥ 150 GB or U.S. median, whichever is higher	50
Above Baseline	≥ 100/20 Mbps	≥ 2 TB or U.S. median, whichever is higher	25
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB or U.S. median, whichever is higher	0

Adopted: January 30, 2020 **Released: February 7, 2020**

By the Commission: Chairman Pai and Commissioners O'Rielly and Carr issuing separate statements; Commissioners Rosenworcel and Starks approving in part, dissenting in part and issuing separate statements.

40. We decline to modify the 90-point maximum spread between the tiers that the Commission used in the CAF II auction. Many commenters argued that we should increase the 90-point spread between the highest and lowest tiers to favor higher speeds even more.[1] Others argue that the Commission should narrow the weighting spread.[2] Although we do value higher speed services, we also recognize that different technologies may be better suited for different areas.[3] Based on our experience with the CAF Phase II auction and its weights, we believe the weights we adopt will provide an opportunity for providers using various technologies to participate in the auction and to compete for appropriate levels of support while providing a minimum level of service to consumers in all awarded areas.

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[1] *See, e.g.*, Illinois DoIT Comments at 7; North Carolina Department of Information Technology at 4; ACA Connects Comments at 8 ("[T]he Commission should widen the spread between the highest and lowest performance tier by significantly raising the weight associated with the RDOF Baseline performance tier beyond the relatively minor five percent increase proposed in the NPRM."); Fiber Broadband Comments at 7 (urging Commission to increase the discount of lower service tiers to better reflect relative value of the higher tier services); ADTRAN Comments at 10 (urging Commission to adopt 95-point spread by increasing weight of high-latency service to from 40 to 50, while decreasing weight for baseline speed from 50 to 45); UTC Comments at 10 (recommending 120-point spread and weighting factor to favor symmetrical speeds); NTCA Comments at 7 (Commission should adjust weights and tiers to better anticipate the increased need for high-speed broadband in the future); INCOMPAS Comments at 12 (supports Commission increasing weight for baseline and high-latency services to total of 95 or above in order to account for consumer preferences, and positive externalities associated with terrestrial, fixed broadband services that increase fiber deployment; WTA Comments at 11-15 (proposing weighting preference for symmetrical service; unlimited monthly usage; localized maintenance; voice service integrated into local E911 services); North Dakota Joint Comments at 2-3 (arguing that the point spread between the gigabit tier and the above baseline tier should not merely recognize differences in speed but should also consider longevity, ubiquity of service, and service consistency, and that the 25-point spread is too low to take these factors into account); Conexon Comments at 11 (arguing Commission should award different weight to bids with full authorization and available spectrum. Bidders with licensed spectrum should have 0 weight and bidders with secondary, shared, or unlicensed spectrum should get 40 weight).

[2] U.S. Cellular at 7 (urging Commission to adopt a weighting mechanism that does not freeze out lowest tier applicants from realistic participation in auction); Sacred Wind comments at 6 (arguing that 25-point spread between Gigabit and Above-Baseline is unnecessarily high).

[3] *See* WISPA Reply at 11 (citing Verizon Comments).

Performance Tiers, Latency, and Weights

Minimum	≥ 25/3 Mbps	≥ 250 GB or U.S. average, whichever is higher	50
Baseline	≥ 50/5 Mbps	≥ 250 GB or U.S. average, whichever is higher	35
Above Baseline	≥ 100/20 Mbps	≥ 2 TB	20
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB	0

Low Latency	≤ 100 ms	0
High Latency	≤ 750 ms & MOS ≥ 4	40

SIGNIFICANT FACTORS AFFECTING BROADBAND AND IT'S IMPACT ON ECONOMIC GROWTH / DEVELOPMENT FCC CAF II ISSUES FOR FURTHER VISITATION

SIGNIFICANT FACTORS FOR BROADBAND FUNDING---- FCC CAF II ISSUES FOR FURTHER VISITATION

Missouri University, CAFNR's Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2019

1. Rate Differential and Urban Rate Formula--Fiber providers do not have a footprint in FCC formulas
    a. No FCC representation of weights and rates above 1 Gbps
    b. Lack of transparency of how formulas work and expected consequences of rates / weights formulas
2. Broadband Speed Performance Tier Weight Formulas
    a. Weighting differential spread in scoring is designed to cover more area—greater the area gets higher weight
    b. Largest Area Weight Formula—One Size Shoe Fits All
    c. For farm program, FAPRI uses the Representative Farm model to solve the issue of *one size shoe fits all*
3. MO Fiber consortium lost over $100 million in CAF II resulting from inadequate representation in FCC formulas according to SEMO CEO Sean Vanslyke
4. Territorial—10 years blocks out competition of receiving federal funds limiting areas for better service at low costs

5. Lookback of 3 years formula constrains fiber providers that made investments prior to the period of FCC funds

6. Cherry picking small areas of higher population within a region of a fiber provider without providing to remote areas

7. Lack of Due Diligence for 3 years and continually 24/7—1st Report to FCC occurs in year 3

8. Due Diligence Required—associated with dynamic econometric analysis—similar to FAPRI 24/7 to Congress
    a. Economic development—a measured amount of economic growth associated with broadband service and costs in real time
    b. Timely information—Real Time information compliments policy decision makers associated with allocation of funding formulas

9. Why should we be concerned? Outmigration rates for rural America

TWO FCC PROGRAMS FUNDING RURAL BROADBAND IN 2020

1. **RDOF (Rural Digital Opportunity Fund) $20 Billion**
2. **Mobility 5 G Fund $9 Billion with 1 Billion for Precision Agriculture**

FCC LAUNCHES $20 BILLION RURAL DIGITAL OPPORTUNITY FUND TO EXPAND RURAL BROADBAND DEPLOYMENT

Represents FCC's Largest Investment Ever to Close Digital Divide

WASHINGTON, January 30, 2020 **FCC SELECTED COMMENTS**

...establishing the new Rural Digital Opportunity Fund (RDOF) to efficiently fund the deployment of hihg-speed broadband networks in rural America. Through a two-phse reverse auction mechanism, the FCC will direct up to **$20.4 billion over ten years** to finance up to gigabit speed broadband networks inunserved rural areas, ...

Without access to broadband, rural American cannot participate in the digital econmy of take advantage of the opportunities broadband brings for beter eduction, healthcare, and civisc and social engagement.....

RDOF auction will prioritize networks with hihger speeds, greater usage allowances, and lower latency.....the auction will prioritize bidders committing to provide fast service with low latency. This will encourage the deplyment of networks that will meet with needs of tomorrow as well as today.....'

CHAIRMAN PAI ANNOUNCES PLAN TO LAUNCH $9 BILLION 5G FUND FOR RURAL AMERICA

5G Fund Would Replace Mobility Fund Phase II and Focus on Bringing the Most Advanced Wireless Services to Rural Areas

WASHINGTON, December 4, 2019

FCC Chairman Pai announced that he intends to establish the 5G Fund,…..$9 billion…to carriers to **deploy** advance **5G mobile** wireless services **in rural America**……allowed through a reverse auction and would **target** hard-to-serve areas with sparse ppulaitons and/or **rugged terrain.** The $9 billion Fund also would **set aside at least $1 billion specifically for deployments** facilitating **precision agriculture** needs.

FCC SELECTED COMMENTS

……**America's farms and ranches have unique wireless connectivity needs.**

….**funding for 5G networks that promote precision agriculture**. We must ensure that 5G **narrows rather than widens the digital divide** and that rural Americans receive the benefits that come from wireless innovation. ……

" Mobile carriers must submit accurate broadband coverage data to the Commission. Simply put, we need to make sure that federal funding goes to areas that need it the most, said Chairman Pai.

Source: https://www.fcc.gov/document/pai-announces-plan-launch-9-billion-5g-fund-rural-america

NRECA
America's Electric Cooperatives

NRECA COMMENTS FCC RDOF REPORT AND ORDER

RDOF Report and Order Adopted by FCC 1/30/2020

It will take a few days for the final text of the R&O to be released but we learned several things about what we expect to be in the R&O from description by bureau staff and the statements of the commissioners at the open meeting.
Some key points:

- Clearing round proposal supported by NRECA was included which will award funding to the highest speed, lowest latency, and therefore lowest weighted, bidder after the clearing round (meaning below the assigned budget). **Note:** *A big win!*
- Eligible locations chosen not solely based on CAF II areas, but based on eligibility criteria laid out in the order. **Note:** *This is a change from CAF II auction and we don't know the full impact yet.*
- Areas that received or are slated to receive ReConnect and state broadband funds will be excluded from RDOF. They didn't want to give money for carriers to deploy where they are already receiving government money to deploy (state or federal monies). **Note:** *The draft order stated ReConnect areas were not eligible but didn't mention state funding. This could slow things down and could cause areas to be excluded. We welcome your thoughts and experience with state programs, their data collection processes and granularity, and potential impact this will have.*
- Winning RDOF bidders will be required to serve *all* homes and businesses in the bidding area, regardless of the number of locations identified by the FCC, which will determine the level of funding per area. **Note:** *This is new from CAF II which only required winners to serve specific locations. If there are more locations no additional money will be provided.*

Some other things said of note:

Electric cooperatives were specifically mentioned by Commissioner Starks in his comments.

- Cited electric cooperative support for the clearing round proposal as a key driver for his support of the provision
- Cited electric cooperatives stats that rural consumers will choose higher speed broadband when it is offered to them and don't want to only have the minimum.

Note: *NRECA, along with Curtis Wynn (Roanoke Electric), Glenn Martin (Carolina Connect) and Mike Keyser (BARC Electric), met directly with Commissioner Starks last Thursday and made these points. Our meeting definitely influenced his decision.*

Link to FCC News Release (not much information in it): https://www.fcc.gov/document/fcc-launches-20-billion-rural-digital-opportunity-fund

The written statements by Commissioners and a link watch the meeting video will be posted to the open meeting page: https://www.fcc.gov/news-events/events/2020/01/january-2020-open-commission-meeting

Brian O'Hara
Senior Director Regulatory Issues – Telecom & Broadband
National Rural Electric Cooperative Association (NRECA)
4301 Wilson Blvd. Arlington, VA 22203
703-907-5798 (o) 571-255-9858 (c)
brian.ohara@nreca.coop

The Rural Digital Opportunity Fund: Conexon's Comments filed with the FCC

Comments Filed on RDOF September 25, 2019

Selected Comments:

...The Connect America Fund Phase II auction was a partial break from the past, but one in which the FCC continued to reward subpar services in rural and high cost areas.

The Rural Digital Opportunity Fund is a true opportunity for rural America. It is also an opportunity for the Commission to begin to redeem itself for past mistakes. With one modification to the proposed rules, the Commission can better meet its requirements under Section 254of the Communications Act. The Commission should amend its auction rules to award funds to the highest tier bidder in each geographic area eligible for auction, provided the total amount awarded is within the RDOF budget. By declaring that the highest bidder wins at the clearing round price, the Commission will make the most efficient use of the budget, cover a greater number of locations and, most important, more closely adhere to the Communications Act's mandate of service availability in rural, high cost and insular areas that is reasonable to the services available to those living in urban areas.

....Conexon's request to the Commission is simple and achievable within the budget already established for the RDOF auction, award funding to the highest tier bidder in each geographic area. In short, at the auction clearing round, where there is a Gigabit tier bidder, Gigabit wins. Where the is no Gigabit tier bidder, 100 Mbps wins. And, only where there is no Gigabit or 100 Mbps tier bidder, the 25 Mbps tier bidder wins. With such an approach, rural America wins,

Source: https://www.conexon.us
Conexon's Comments Filed with FCC September 25, 2019

FCC REPORT AND ORDER NO.13, 21,38

Adopted: January 30, 2020 EXCERPTS Released: February 7, 2020

https://www.fcc.gov/document/fcc-launches-20-billion-rural-digital-opportunity-fund-0

13. Second, we will exclude those census blocks where a terrestrial provider offers voice and 25/3 Mbps broadband service according to the most recent publicly available FCC Form 477 data. In addition, we will exclude those census blocks which have been identified as having been awarded funding through the U.S. Department of Agriculture's ReConnect Program, or awarded funding through other similar federal or state broadband subsidy programs to provide 25/3 Mbps or better service.31 This is consistent with our overarching goal of ensuring that finite universal service support is awarded in an efficient and cost-effective manner and does not go toward overbuilding areas that already have service.32 Although we sought comment on whether there are any other areas that we should include in the initial list of eligible areas, such as areas in legacy rate-of-return areas that are almost entirely overlapped by an unsubsidized competitor, we decline to expand the list of eligible areas at this time and instead focus Phase I on the known wholly unserved census blocks.

21. In the CAF II auction, the Commission adopted an auction that considered all bids simultaneously, "so that bidders that propose to meet one set of performance standards will be directly competing against bidders that propose to meet other performance standards."In the Rural Digital Opportunity Fund auction, we will continue to accept bids committing to different performance levels. In Phase I, however, once the budget has cleared, we will prioritize bids with lower tier and latency weights, thereby encouraging the deployment of networks that will be sustainable even as new advancements are made and which will be capable of delivering the best level of broadband access for many years to come, all while keeping funding within the Phase I budget.55 Although this approach could result in less intraarea competition after the clearing round in some areas, the auction will have selected the best possible service, at a competitive level of support, for the same number of consumers living in those areas, and this will result in more rapid and efficient funding for such deployment.56 In other words, our goal to close the digital divide is balanced against our goal to support the deployment of future-proof networks by this auction. Overall, we do not expect this approach to adversely impact competition. We still will accept competitive bids proposing to offer performance that meets or exceeds the minimums at each performance tier and latency, but for those areas where there is still competition as of the clearing round, we will prioritize selection of bidders that propose to offer the highest speeds, most usage, and lowest latency for each area.

38. As in the CAF Phase II auction, we adopt weights that reflect our preference for higher speeds, higher usage allowances, and low latency. We also anticipate that terrestrial fixed networks will likely result in significant fiber deployment that can serve as a backhaul for rural 5G networks. Accordingly, we choose performance tier and latency weights to encourage the deployment of higher speed, low-latency services. Specifically, we adopt weights of 50 for the Minimum performance tier, 35 for the Baseline performance tier, 20 for the Above Baseline performance tier, and 0 for the Gigabit performance tier, as well as a weight of 40 for high-latency bids and 0 for low-latency bids to favor higher-than Baseline speeds and low-latency services. Under the descending clock auction format we will use the weights, when subtracted from the clock percentage for the round, to indicate the percentage of an area's reserve price that a winning bidder would receive in per-location support for serving the locations in that area.

PUBLIC COMMENT March 2, 2020

EXCERPTS Pages 21, 22, 23

COMMENT SOUGHT ON COMPETITIVE BIDDING PROCEDURES….. RDOF

PAGE 21 V. *PROPOSED BIDDING PROCEDURES*

70. The bidding procedures we propose for the Rural Digital Opportunity Fund auction are the same as those used in the CAF Phase II auction, with several modifications. As adopted in the *Rural Digital Opportunity Fund Order*, once the budget has cleared, the bid processing procedures will prioritize bids with lower T+L weights.[1]……

PAGE 22

Bid Collection **Round Structure**

Clock Percentages and Implied Support Amounts Based on Performance Tier and Latency Weights

72. We propose that under our descending clock auction format, the clock will be denominated in terms of a percentage, which will be decremented for each round. To determine the annual support amount for an area implied at each percentage, the percentage is multiplied by the reserve price of the area, adjusted for the T+L weight of the bid, as in the formula set forth below……

PAGE 23

75. We propose that the clock percentage in each round will imply a total amount of annual support in dollars for each area available for bidding, based on the area's reserve price and the T+L weight specified in the bid. The annual support amount implied at the clock percentage will be the smaller of the reserve price and the annual support amount obtained by using a formula that incorporates the T+L weights. Specifically:

Implied Annual Support Amount (at the clock percentage) = $\min\left\{R, \left(\frac{C-(T+L)}{100}\right) R\right\}$

where:

R denotes the area's reserve price
T denotes the tier weight
L denotes the latency weight
C denotes the clock percentage

Under this proposal, because the highest implied support amount can never exceed an area's reserve price, when the clock percentage is greater than 100,.....

77. The formula above (the "implied support formula") can be used to determine the implied support at any price point percentage by substituting a given percentage for the clock percentage. **We seek comment on these proposals.**

[1] For example, consider a bid at the clock percentage at the Baseline performance tier with low latency, which has a T+L weight of 35. If the clock percentage is 170, the implied support for the bid is equal to the lower of the reserve price for the area, R, and {(170-35)/100}*R, which is (135/100)*R or 1.35*R. Since R is less than 1.35*R, the implied support for the bid is equal to the reserve price.

Federal Communications Commission

EXCERPTS APRIL 3, 2020

https://www.fcc.gov/implementing-rural-digital-opportunity-fund-rdof-auction

Implementing the Rural Digital Opportunity Fund (RDOF) Auction

RDOF Auction Procedures Public Notice

In the Report and Order, the Commission left the specific details of the RDOF auction to be developed as part of the pre-auction process. Accordingly, on February 28, the Commission adopted a Public Notice: *Comment Sought on Competitive Bidding Procedures and Certain Program Requirements for the Rural Digital Opportunity Fund Auction* (Public Notice). Through this Public Notice, the Commission is initiating the pre-auction process for Phase I of the Rural Digital Opportunity Fund auction (Auction 904). In accord with the framework adopted in the Report and Order, Auction 904 will award up to $16 billion over ten years to service providers that commit to offer voice and broadband services to fixed locations in eligible unserved high-cost census blocks. The Public Notice states that the Commission currently expects bidding in Auction 904 to begin on October 22, 2020.

The **Commission is seeking comment on the Public Notice** as follows:

- **Comments are due: March 27, 2020**
- **Reply Comments are due: April 10, 2020**

CONTRAST USDA FARM PROGRAM PAYMENTS TO FCC's FORMULA FCC CAF II Auction 903

CONTRASTING THE USDA FARM PROGRAM PAYMENTS TO THE FCC's FORMULA

UNLIKE USDA PROGRAMS, FCC FORMULAS ARE DESIGNED WHERE "ONE SIZE SHOE FITS ALL"

CAFNR / Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020

Source: FAPRI Baseline April 2019

USDA NET GOVERNMENT OUTLAYS

Fiscal Year Year 2021

USDA Ranking HIGH $ TO LOW	USDA FORMULAS *Commodity*	IN ORDER OF FUNDING (million dollars)
1	Corn	$ 1,756
2	Upland Cotton	$ 1,047
3	Soybeans	$ 838
4	Wheat	$ 826
5	Rice	$ 460
6	Peanuts	$ 274
7	Sorghum	$ 231
8	Other oilseeds	$ 124
9	Barley	$ 95
10	Oats	$ 8

Source: FAPRI Baseline April 2019

USDA POLICY CROP PROVISIONS

Fiscal Year 2019

Marketing Loan Program

USDA	Crop/provision	Loan Rate
	Corn	$1.95 per bu.
	Soybeans	$5.00 per bu.
	Wheat	$2.94 per bu.
	Rice	$6.50 per cwt.
	Upland Cotton	$0.520 per lb.

Source: DEEDP Research, Womack/Eisberg 2020

CONTRAST TO FCC' FORMULA FOR LOWEST PRICE FOR GOVERNMENT COST OF PROGRAM/ SERVICE TYPE

Equivalent FCC Ranking Fiscal Year 2021

LOWEST $ TO HIGHEST	FCC FORMULAS *Commodity*	IN ORDER OF FUNDING (million dollars)
1	Oats	$ 8
2	Barley	$ 95
3	Other oilseeds	$ 124
4	Sorghum	$ 231
5	Peanuts	$ 274
6	Rice	$ 460
7	Wheat	$ 826
8	Soybeans	$ 838
9	Upland Cotton	$ 1,047
10	Corn	$ 1,756

Source: DEEDP Research, Womack/Eisberg 2020

CONTRAST TO FCC' FORMULA FOR LOWEST PRICE FOR GOVERNMENT COST OF PROGRAM / SERVICE TYPE

FCC CAF II Funds Allocated in Missouri by Type	
Fixed Wireless	$ 180,962,799
Fiber Optic	$ 70,092,025

TITLE: CONTRAST FCC WEIGHTING SCALE TO A REVERSE OF USDA FUNDING COMMODITIES

CAFNR / Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020

Source: USDA Crop $

FAPRI-MU Report 01-19

REVERSED USDA FUNDING CROPS

FOUR PERFORMANCE TIERS CAF II Source: FCC 18-6 Feb.1, 2018

Performance Tier	Speed	Monthly Usage Allowance	Weight
Minimum	≥ 10/1 Mbps[1]	≥ 150 gigabytes (GB)	65
Baseline	≥ 25/3 Mbps	≥ 150 GB or U.S. median, whichever is higher	45
Above Baseline	≥ 100/20 Mbps	≥ 2 terabytes (TB)	15
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB	0

Source: DEEDP 2020

EQUIVALENT REVERSED USDA FUNDING COMMODTY 2021

Crop	(Million dollars)
OATS	$ 8
BARLEY	$ 95
SORGHUM	$ 231
WHEAT	$ 826
SOYBEANS	$ 838
COTTON	1,047
CORN	$ 1,756

SOYBEANS	1.1 Gigabits ?	≥ 1.1 Gbps ? / 1.1Gbps ?	≥ 2.1 TB ?	(-10) (?)	
COTTON	1.4 Gigabits ?	≥ 1.4 Gbps ? / 1.4 Gbps ?	≥ 2.4 TB ?	(-45) (?)	
CORN	2.0 Gigabits ?	≥ 2.0 Gbps ? / 2.0 Gbps ?	≥ 4.0 TB ?	(-100) (?)	

EXAMPLE ABOVE DESCRIBED:

IF THE USDA APPLIED SIMILAR FCC RATES and WEIGHTS FORMULAS TO AGRICULTURE.....

1. Historically USDA has used rate formulas to support agriculture producers since 1930's
2. Farm bill rate formulas have been modified continuously on an average every 4 years
3. Farm bill Formulas differ for each commodity group.
4. This same set of outcomes and unexpected problems can be expected with each new allocation of FCC broadband funding.
5. Dynamic Econometric modeling systems are maintained on a 24/7 turn around basis to answer House & Senate Agriculture committee's "What If" Questions.

EXAMPLES

ECONOMIC AND SOCIAL DEVELOPMENT GROWTH RESULTING FROM FIBER OPTIC BROADBAND IN RURAL MISSOURI

SUMMARY OF SURVEY CONSEQUENCES

SAMPLE BASE
REFLECTING ECONOMIC AND SOCIAL CONSEQUENCES
OF

RURAL FIBER OPTIC BROADBAND
PROVIDED BY ELECTRIC COOPS

IN RURAL MISSOURI

DATES: 2019-2020

Summary: Sample base Reflecting Economic and Social Consequences of Rural Fiber provided by Electric Coops

***Sample Base*: Seven Rural Electric Coops located in Northern, Middle and Southern Missouri**

Summary of Survey Consequences:

1. ***In Home Businesses*:** Enhances school lessons, New startup businesses, High resident take rate, Reduction of out-migration, in-migration uptake.

2. ***Extended Seasonal Vacations*-**Lake Ozarks: Fiber service exceeds home service, Partial retirement increase-working at Lake property, Increase in home businesses from other locations

3. ***Brick and Mortar Businesses***: Significant increase in commercial business

4. ***Remote Employment***: Home fiber more efficient than office location of employment, more workdays at home, Tech employees work at home reporting to home office 1 day per month, Increase productivity- 1000 times faster internet than previous service

5. ***Real Estate***: Home and Business value increases, home value estimated increase in North East Mo, $7,000, Reduced outmigration-homes and businesses

6. ***Community Support***: Business expansion and recruitment, Streaming-Churches, Weather, Security systems, News, Sports, Entertainment.

1. ***Agriculture***: Remote monitoring; barns, gain mills, Milking systems, marketing, tracking real time business information, grain bins-moister content, production and input quantities and prices; Cotton Gin's saving $4000 per month on internet; Regional Implement dealer- Communication with various dealers plus marketing and tracking,

2. ***Precision Agriculture:*** Downloads data to field equipment and, at farm uploads data to farm files on crop production data, fertilizer and other relevant ag data to: farm operation, implement dealers, seed dealers and other agriculture businesses using precision agriculture.

3. ***Industrial:*** Manufacturing plant (500 employees) Eliminating shutting down all computers during download periods

4. ***Education***: Two schools 7 miles apart in Southeast Mo saved $42,000 per year with fiber service, Live streaming in classroom and school sport events.

5. ***Tele-Medicine***: Requires high speed broadband service, heath records, Ambulance and Doctor service, Minimizes care in-home cost by as much as $60,000 per year.

6. Information Technology: IT industries need high speed Gigabit speeds. IT company chose small rural community over larger micropolitan area to train and create a new middle-class workforce in rural communities

EXAMPLES
ECONOMIC AND SOCIAL DEVELOPMENT GROWTH RESULTING FROM FIBER OPTIC BROADBAND IN RURAL MISSOURI

RESEARCH
OF
The DYNAMIC ECONOMETRIC ECONOMIC DEVELOPMENT PROGRAM (DEEDP)

CAFNR, University of Missouri

2020

Keith Eisberg, Co-Director,

Dynamic Econometric Economic Development Program (DEEDP)

Consultant

Abner Womack MU Emeritus, Co-Founder FAPRI

Co-Director, DEEDP

Contact: EisbergK@missouri.edu / Womacka@missouri.edu

EXAMPLES--ECONOMIC DEVELOPMENT RESULTING FROM FIBER BROADBAND IN RURAL MISSOURI

RESEARCH OF MISSOURI UNIVERSITY / CAFNR, DEEDP (DYNAMIC ECONOMETRIC ECONOMIC DEVELOPMENT PROGRAM) WOMACK / EISBERG 2020

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
	1	1	1	1	1	1
	In Migration	Seasonal	Brick & Mortar	Friday Workdays	Fiber high speed	Fiber needed
	Internet Business	subscribers	small businesses	from Home and	broadband attracts	to create new
	Bought Home in	stay longer	difficulty paying	Farm because	buyers	Invention Scouts
	high speed Fiber area	at Lake of Ozarks	building expenses	fiber is better than	**Realtors confirm**	introducing
	relocated from Chicago	because they	opted for on-line	office's slower speeds	**home and business**	Scouts to cutting-edge
	Digital Entrepreneur	can work remotely	sales and are	Friday Workdays	**values increase**	technology to foster
CO-MO	working remotely in digital	from vacation home	even expanding	at home used to	**when Fiber available.**	interest for inventing
CONNECT	marketing. Search for	***BUSINESS NAME***	***BUSINESS NAME***	upload large	One of the top items	and marketing.
COOP	cheapest place to live, quality	Co-Mo Connect	Co-Mo Connect	media files on	requested just as much	
	of life with Gigabit speeds	Market Research	Market Research	fiber--faster than	as school districts.	***BUSINESS NAME***
	at low cost of internet.			in the office.		Invention Scouts
	BUSINESS NAME	2		***BUSINESS NAME***	***BUSINESS NAME***	Great Rivers Council
	Laura Cabrera and fiancé	Some are taking		ARC Media	Realtors and Home	
	Lake Ozarks	partial retirement		Jefferson City	Developers	
	relocated from Chicago	rather than				
		full retirement		2		
CO-MO	2	because they		Employees of both Co-Mo		
CONNECT	Entrepreneur	can work		Electric and Connect		
COOP	work from home	remotely		Fiber at residence allows		
	on computers and	***BUSINESS NAME***		free time and work for		
	internet with Gigabit	Co-Mo Connect		IT/Tech employees		
	speeds from fiber	Market Research		and other employees		
	BUSINESS NAME			waiting at home for		
CO-MO	Neal & Elisha Gist			repairman & other		
CONNECT	Gravois Mills			***BUSINESS NAME***		
COOP				CO-MO Electric		

SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY SERVICES	INFORMATION TECHNOLOGY
	1	1			1	1
CO-MO	Fiber operating	Ag data			Medical	IT Industries
CONNECT	Irrigation System	downloaded in			Industries	need high speed
COOP	Poultry Barns	field to cell tower			need high	Gigabit internet
	& Grain Mill	**When no cell**			speed Gig	***BUSINESS NAME***
	BUSINESS NAME	service , unit			***BUSINESS NAME***	Co-Mo Connect
	Poultry Farm	***stores and***			Co-Mo Connect	Market Research
CO-MO		downloads			Market Research	
CONNECT		to farm office on				
COOP	Fiber remote monitoring	fiber. Not enough				
	several >100 poultry barns	***cell towers to make***				
	BUSINESS NAME	Precision Ag useful				
	Tyson Poultry Farm	of its full potential				
		Cell towers require				
		Fiber backbone and				
		electricity to operate				
	Fiber to manage modern	***BUSINESS NAME***				
	table egg barns for	John Deere				
	automation and to monitor	MTG (Modular				
CO-MO	their poultry systems	Telematics				
CONNECT	***BUSINESS NAME***	Gateway)				
COOP	Tyson Poultry Farm					

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
CO-MO						
CONNECT		Seen Numerous examples on-line businesses from home due to high speed Fiber optics				
COOP		***BUSINESS NAME***				
		Co-Mo Connect				
		Market Research				
				3		
United Fiber				Several members		
COOP				work from home		
				Example: Janis		
				Drove to KC 75 miles		
				to work in office		
				After fiber in home,		
				now telecommutes		
				and trip to KC office		
				only 1 day per month		
				saving her time & $		
				Janis internet speed		
United Fiber				is faster than in KC		
COOP				office headquarters		
				BUSINESS NAME		
				Janis		
				United Customer		

SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY	INFORMATION TECHNOLOGY
CO-MO	4					
CONNECT	***BUSINESS NAME***					
COOP	Co-Mo Connect					
	Market Research					
	Benefits of Broadband					
	Boosts quality of rural life					
	with improved education					
	opportunities, flexible					
	employment options,					
	positive influence on					
CO-MO	economic development					
CONNECT	better training and					
COOP	communication for public					
	safety organizations,		1			
	advance telehealth		Manufacturing			
	services, increased home		plant with 500			
United Fiber	values, brings families		employees			
COOP	and communities together		operate 6			
	BUSINESS NAME		bonded T-1 lines			
	Co-Mo Connect		Fiber alleviated			
	Market Research		their bandwidth			
			issue that			
			required every-			
			one to get off			
			computers			
			during download			
			with previous			
United Fiber			internet			
COOP			***BUSINESS NAME***			
			Manufacturing			
			Plant			
			United Customer			

Ambulance facility
Converts to Fiber
Back up files
previously took
12 hours to download
Now only 21 minutes
since going to Fiber
BUSINESS NAME
Ambulance facility
United Customer

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
	3					
Callabyte	School work and					
COOP	Farm work from					
	home					
	BUSINESS NAME					
	Beth Houf					
	Principal					
	Fulton Schools					
	In Migration due to Fiber					
Callabyte	Work from home					
COOP	selected land located					
	in Callabyte service					
	area to get fiber,					
	high speed reliable					
	service which is a					
	necessity for work					
	BUSINESS NAME					
	Kelsay & Dallas					
	Fletchall					
	moved from KC					
	to Callaway Co					
	Photography					
Callabyte	business in home					
COOP	upload time with					
	fiber in minutes					
	verses hours					
	BUSINESS NAME					
	Shelly Sconce					
	Photography					

In Migration due to Fiber
Work from home
selected land located
in Callabyte service
area to get fiber,
high speed reliable
service which is a
necessity for work
BUSINESS NAME
Kelsay & Dallas
Fletchall
moved from KC
to Callaway Co

SERVICE PROVIDER	AGRICULTURE 5	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION 1	TELE MEDICINE and EMERGENCY SERVICES	INFORMATION TECHNOLOGY
Callabyte	Century Farm			School work and		
COOP	Farm work using internet			Farm work from		
	BUSINESS NAME			home		
	Beth Houf			***BUSINESS NAME***		
	Century Farm			Beth Houf		
				Principal		
				Fulton Schools		
			→	**Eliminated Travel to get WiFi**		
Callabyte				film from weekly		
COOP				football games		
				for players to watch		
			→	Prior to getting fiber		
				at home, he had to		
				travel to town to get		
				WiFi to download		
				the video.		
				BUSINESS NAME		
				Tucker Bartley		
				Director of Technology		
				Callaway Schools and		
				assistant football coach		
Callabyte						
COOP						

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
	6					2
Callabyte COOP	film from weekly football games for players to watch Prior to getting fiber at home, he had to travel to town to get Wifi to download the video. ***BUSINESS NAME*** Tucker Bartley Director of Technology Callaway Schools and Assistant Coach football					importance of students having connectivity to do school work ***BUSINESS NAME*** Tucker Bartley Director of Technology Callaway Schools and Assistant Coach football
Callabyte COOP						3 fiber to rural town New Bloomfield ***BUSINESS NAME*** New Bloomfield city
Callabyte COOP	**50% take rate** residents that had minimal access to decent internet speeds ***BUSINESS NAME*** New Bloomfield town				2 **Ave. Value of $7000 /hm** **Increase in Home value** over other new houses i **same new subdivision** that have no internet. Houses w/ no internet sit on market longer, so Agents pay fiber hookup Assume 1000 Homes ***relates to $ 7 Million*** ***BUSINESS NAME*** RALLS RCEC Coop	
RALLS RCEC COOP						

SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY	INFORMATION TECHNOLOGY
PEMISCOT - DUNKLIN FIBER COOP	Pilot project measuring amount of moisture in the ground Saving $			**Saving $42,000/yr** for 2 Schools 7 Miles apart currently receiving "dark fiber" from ATT **for $50,000/ yr** Pemiscot Dunklin will provide fiber for $8,000 / yr saving the schools $42,000/yr ***BUSINESS NAME*** Hornersville and Senath schools		
	7 **Saving $4,000 / mo. Internet** Savings of $4 / Mbps /mo. **Cotton Gin in Senath was** paying $900/mo. for 200 Mbps Pemiscot Dunklin providing 1 Gbps for $400/mo. For savings of over 1/2 previous service provider ***BUSINESS NAME*** **Farmers Union Gin Co.**					
PEMISCOT - DUNKLIN FIBER COOP				**During Coronavirus** Pandemic, Pemiscot Dunklin is prioritizing fiber installs ASAP **for students to have** access to high speed fiber optic internet to conduct their studies from home. ***BUSINESS NAME*** Pemiscot Dunklin Fiber		

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
	8					**During Coronavirus**
PEMISCOT -	Professional photographer					Pandemic, Pemiscot
DUNKLIN FIBER	previously had slow ATT DSL					Dunklin Fiber at no cost
COOP	DSL took 8 to 10 hours to Upload					to customers, is upgrade
	large photo files for clients					all 100 Mbps customers
	After fiber, now takes minutes					to full 1 Gigabit internet
	Saving $ on time spent.					at No Additional charge.
	Saving both time and money.					Savings to customers
	BUSINESS NAME					of $30/month which is
						a $37,500. / month
PEMISCOT -						donation to the Service
DUNKLIN FIBER						Area. More family
COOP						members at home
						relates to higher usage
						of the internet.
						BUSINESS NAME
						Pemiscot Dunklin Fiber
PEMISCOT -						**During Coronavirus**
DUNKLIN FIBER						**Pandemic, Pemiscot**
COOP						Dunklin Fiber is offering
						installing Free WiFi
						at Outdoor public places
						throughout service area.
						Including schools,church
						and public places where
						people drive up with
						vehicles to connect to
PEMISCOT -						free WiFi
DUNKLIN FIBER						Donation to Service area
COOP						by Pemiscot Dunklin
						BUSINESS NAME
						Pemiscot Dunklin Fiber

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
GoSemo	*Reliable Fiber Connection*			*Fortune 100*		*Online Payments*
	Earns Promotion for			*company Employee*		Business Owner
	home-based Hotline Counselor			network engineer		Huge improvement w/
	And Saving $2,000/yr. internet			plus wife's business	*In Migration*	continuous internet
	hotline service counselor			Two remote workers	*Internet Business*	allowing for no issues
	greatly improved her ability			Improved work	***Bought Home in***	for credit card
	previously had hotspot			Hugh difference in	***high speed Fiber area***	online payments.
	It did not have the capacity			internet speed and	Moved specifically	Benefits included
	to handle the phone system			reliability with Fiber.	for high speed fiber.	reliability, price and
	for her hotline counseling.			Previously $250/mo.	Internet based	paying less for better
GoSemo	Changing to high-speed fiber			to two different	business trouble-	service at lower price.
	she can counsel more callers.			service providers that	shooting computers	***BUSINESS NAME***
	With more callers she got			offered minimal	and other technology	Roger Slinkard
	the promotion which provided			bandwidth. Now	for bands and	Business Owner
	more income for her family.			receiving high-speed	performers on the	
	BUSINESS NAME			1 Gig for $80 / month.	road for shows.	*Church/School/Sport*
	Sally Schatte			Saving over $2000/yr.	gig fiber-fast internet	IT Director
	Hotline Counselor			***BUSINESS NAME***	will change his life	Advance Baptist Ch
				Rob Bryant,	and business model	Church offering free
GoSemo	*Cloud BasedTech Business*			Network Engineer	significantly.	WiFi to community.
	requires high speed fiber				Believes Fiber makes	Giving internet to
	Prior to fiber, had slow speed			*1000 Times Faster!*	southeast Missouri	those who never had
	internet allowed one email			Remote worker	a more attractive	access to internet.
	taking a long time to send.			Fiber providing her	place to live & work	Livestream services
	Business has developed due			capability to increase	***BUSINESS NAME***	seamlessly with Fiber.
	to high speed fiber.			productivity of work	Mike Cooper	Advance Schools
	BUSINESS NAME			1000 times faster	Internet-based	sports broadcaster
	PumpTrakr			than previous provider	Businessman	livestream the games
GoSemo	Nathan Holmes			Seen improvement		School offering free
				in call logs, internet		WiFi to community.
				speed & reliability.		Paying less for WiFi
				BUSINESS NAME		***BUSINESS NAME***
				Mrs. Lantz		Eric Shrum
GoSemo				Remote worker		IT Director Advance

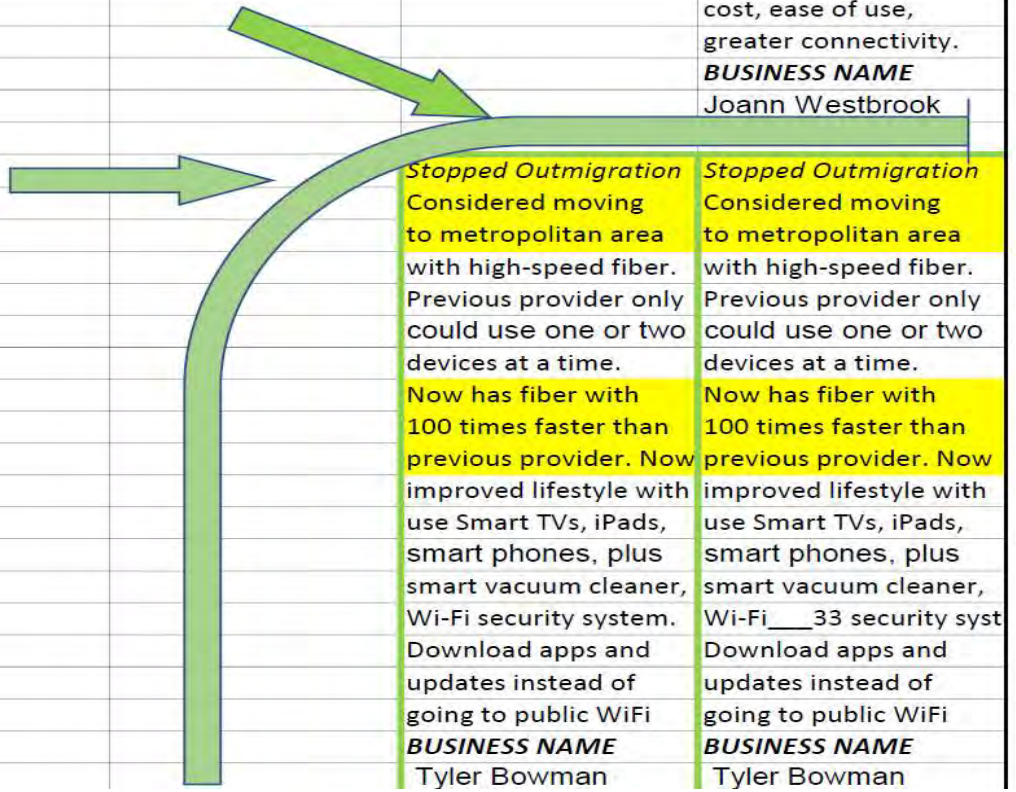
SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY	INFORMATION TECHNOLOGY
GoSemo	*Dairy Farm*			*Advance Schools*		*In Migration*
	Farms critical			IT Director		*Internet Business*
	milking equipment			Sports Broadcaster		***Bought Home in***
	controlled by two			School offering free		***high speed Fiber area***
	separate companies			WiFi to community.		Moved specifically
	via internet,			Giving internet to		for high speed fiber.
	making it crucial			those who never had		Internet based
	for fast speeds &			access to internet.		business trouble-
	reliable connection			Advance Schools		shooting computers
	Fiber enhanced			sports broadcaster		and other technology
	day to day			livestreaming games		for bands and
	business operations			Paying less for WiFi		performers on the
	allowing farm to			than previous service		road for shows.
	become more			***BUSINESS NAME***		gig fiber-fast internet
	productive and			Eric Shrum		will change his life
GoSemo	efficient.			IT Director and		and business model
	BUSINESS NAME			Sports Broadcaster		significantly.
	Tribute Farms			***Advance Schools***		Believes Fiber makes
	in Scott County					southeast Missouri
						a more attractive
GoSemo	Farm & Golden Retrievers					place to live & work
	Internet service					***BUSINESS NAME***
	changed from					Mike Cooper
	2 mbps to 100mbps					Internet-based
	keeping up to date					Businessman
	with Ag technology					
	more competitive					
	on-line auctions					
	& markets. Install					
	internet security					
	Raises Golden					
	Retriever puppies.					
	BUSINESS NAME					
	Rick Aufdenberg Farm					

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
GoSemo	*Freelance Photographer* *Transfer Huge Files Quickly* major enhancement in work Transferring and uploading files is much more efficient. complete orders more quickly Accessing internet with reliable connections and faster speeds than previous provider. Photographers need reliable high speed connections for large digital files for both uploading and transferring files to clients. ***BUSINESS NAME*** Cara Hill Freelance Photographer					*Internet, Movies, and Security System* for $45 less per month To get good internet signal with previous provider, family had to move their service box from window to window to get signal. Now with high speed fiber internet, they stream movies, have a security system and a consistent reliable internet connection.
GoSemo						Higher speeds for $45 less money, eliminating slow speeds and poor internet connection. ***BUSINESS NAME*** Josh Carmack
						Better Quality of Life
GoSemo						With previous internet had to walk outside to use cell phones, slow internet speeds, unreliable TV. Now fiber-fast service reliable internet with better quality of life. Faster service/lower $ ***BUSINESS NAME*** Gavin Miller

SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY	INFORMATION TECHNOLOGY
GoSemo	*Family Farm*					
	No longer does the farm					
	business need to worry about					
	slow, unreliable internet					
	connections as provided by					
	a previous service provider.					
	Instead, now with Fiber					
	the farm operates with high					
	speed reliable connectivity					
	This high speed allows the					
	farm management team to					
	operate more efficiently					
	and increase productivity in					
	the farm's daily tasks.					
GoSemo	***BUSINESS NAME***					
	Magarity Farms					

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
						Internet Service
GoSemo						*During Storms*
						fiber-fast service
						reliable and staying
						connected during
						storms. Previous
						provider dropped
						service during storms
						when most needed
						for weather reports.
GoSemo						Fast internet allowed
						family to do on-line
						Christmas shopping.
						TV service is now
						Fiber high definition
						quality pictures and
						stay on during storms.
						BUSINESS NAME
						Bob Bye
						Savings & Reliability
GoSemo						higher speed low price
						Significantly lower
						price than ATT the
						previous provider.
						Now internet faster
						and more reliable,
						plus TV channels
						much clearer.
GoSemo						***BUSINESS NAME***
						Larry Jarrell

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
						Reducing Utility Bill
GoSemo						*by over $100/mo. thru*
						switch to streaming TV
						Fiber better. Family 5
						now connects multiple
						devices throughout
						home with no lagging
						or slow speeds as with
						previous provider.
						Faster speed, lower
						cost, ease of use,
GoSemo						greater connectivity.
						BUSINESS NAME
						Joann Westbrook
					Stopped Outmigration	*Stopped Outmigration*
GoSemo					Considered moving	Considered moving
					to metropolitan area	to metropolitan area
					with high-speed fiber.	with high-speed fiber.
					Previous provider only	Previous provider only
					could use one or two	could use one or two
					devices at a time.	devices at a time.
					Now has fiber with	Now has fiber with
					100 times faster than	100 times faster than
					previous provider. Now	previous provider. Now
					improved lifestyle with	improved lifestyle with
					use Smart TVs, iPads,	use Smart TVs, iPads,
					smart phones, plus	smart phones, plus
					smart vacuum cleaner,	smart vacuum cleaner,
					Wi-Fi security system.	Wi-Fi___33 security syst
					Download apps and	Download apps and
					updates instead of	updates instead of
GoSemo					going to public WiFi	going to public WiFi
					BUSINESS NAME	***BUSINESS NAME***
					Tyler Bowman	Tyler Bowman



SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
CHARITON						*In Migration Business*
VALLEY TEL						Professional IT
COOP						to Fortune 2000 clients
						Chose rural Macon, MO
						over larger micropolitan
						communities like
						Columbia & Hannibal
						Employs over 200
						people in Macon with a
						second office in rural
						Georgia. Goal to create
						new middle-class IT
CHARITON						professional workforce
VALLEY TEL						in rural communities
COOP						***BUSINESS NAME***
						On-Shore Outsourcing
						CEO Shane Mayes
						5
						Rural economic
						development to be
						competitive needs
						affordable, reliable
						broadband service.
						Fiber optics is near
CHARITON						the top list of
VALLEY TEL						requirements for
COOP						business expansion
						and recruitment.
						BUSINESS NAME
						Macon County
						Economic
						Development

SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY SERVICES	INFORMATION TECHNOLOGY
CHARITON VALLEY TEL COOP	11 Fiber internet, Hosted PBX (Private Branch Exchange) increasing efficiency, faster speeds internet with fiber which is used in marketing and tracking special advertising and determining number calls per month. Communication with various dealers throughout the state ***BUSINESS NAME*** Skydenstricker John Deere Dealer Lee Ann, Skydenstriker VP of Marketing				Fiber for electronic health records internet connections between clients, community and connection to 3 office locations ***BUSINESS NAME*** Mark Twain Behavioral Health Rhonda Byers Director of Marketing	***In Migration Business*** Fiber internet Professional IT **to Fortune 2000 clients** Chose rural Macon, MO over larger micropolitan IT include HighFive video conferencing Employs over 200 people in Macon with a second office in rural Georgia that employs **over 100 employees.** **Train courses teaching** under-utilized rural **community developmer** **resources mid-level IT** professional skills. ***BUSINESS NAME*** **OnShore Outsourcing** **CEO Shane Mayes**

SERVICE PROVIDER	IN-HOME BUSINESS ENTREPRENEURS	EXTEND SEASONAL VACATIONS	BRICK & MORTAR EXPAND ON-LINE	REMOTE EMPLOYMENT	Real Estate Home Developers	COMMUNITY Support & Household
CHARITON						6
VALLEY TEL						Building out fiber providing high speed internet was paramount in attracting one new company and retaining an existing company for business expansion
COOP						
CHARITON						
VALLEY TEL						
COOP						
						BUSINESS NAME
						City of Marceline
						Industrial Development Authority,
CHARITON						
VALLEY TEL.						Darrell Gardner
COOP						Executive Director
TOTAL SUCCESS	10	3	1	5	4	14
BY CATEGORY						

SERVICE PROVIDER	AGRICULTURE	PRECISION AG TECHNOLOGY	INDUSTRIAL	EDUCATION	TELE MEDICINE and EMERGENCY	INFORMATION TECHNOLOGY
CHARITON VALLEY TEL COOP	12 State-of-the-art Ag supply facility requires fiber optic communications for operation of the facility ***BUSINESS NAME*** Nutrient Ag Solutions Keytesville Plant			4	**In-Home Care** **Saving > $60,000/yr.** **for additional in-home** Care-givers of 89 Yr. old Fiber allows 89 Yr. old to stay in her home. Fiber **allow live feed cameras** in home. Daughter can monitor her mother while working as a graphic artist living on **the property. Fiber of** of 1 Gig allows graphic artist to send files from in-home remotely. Without fiber, the cameras would not work, nor would live-feed monitoring of heart monitor if ever required by a Doctor. Family is saving from the added cost of bringing in outside caregivers. Saving > $60,000/yr. ***BUSINESS NAME*** Rebecca Parks and Ann Parks family rural Keytesville	
TOTAL SUCCESS BY CATEGORY	12	1	1	4	4	3

MU/ CAFNR /DEEDP Sources for:

Survey from Sample Base

Reflecting Economic and Social Consequences of Rural Fiber Optic Broadband Provided by Electric Coops in Missouri:

Survey Data Compiled by Womack/Eisberg from Coop Data and Coop Customers in 2019/2020

Co-Mo Electric / Co-Mo Connect: https://www.co-mo.net
SEMO Electric / GoSEMO:https://www.gosemofiber.com/
Barry Electric / GoBec: http://gobec.net/
Callaway Electric / Callabyte: https://callabyte.com/
United Electric / United Fiber: https://unitedfiber.com/
Pemiscot Dunklin Electric /P.D. Fiber: https://www.pemiscotdunklinfiber.com

Ralls County Electric Coop (RCEC) / RCEC Fiber: http://www.rallscountyelectric.com

Chariton Valley Telephone Coop: http://www.cvalley.net

College of Agriculture Food and Natural Resources

CAFNR

SELECTED EXCERPTS FROM SURVEY

EXAMPLES
ECONOMIC GROWTH DUE TO FIBER BROADBAND

IN RURAL MISSOURI

DATES: 2019-2020

SELECTED EXCERPTS FROM SURVEY

EXAMPLES--ECONOMIC GROWTH DUE TO FIBER BROADBAND

MU CAFNR / DEEDP Womack / Eisberg 2019/2020

RALLS Technology Electric Coops

- Houses that have FTTH (fiber to the home) sell for $7000. more than those that don't in the same new housing development.
- In new housing development projects, RALLS offers to run fiber to the new house for the developer if they pay for the FTTH
- When a house in a new development does not have FTTH because the developer did not pay for the fiber run, then the real estate agent pays for FTTH
- Houses that do not have FTTH sit on the market for much longer than those with FTTH

PEMISCOTT-DUNKLIN Electric Coop

- Pilot project using fiber to assist in measuring the amount of moisture in the soil
- Education: Two schools 7 miles apart saving $42,000 per year by switching from ATT Dark fiber charged at $50,000 per year changing to PD Fiber for $8,000. per year.
- Cotton Gin saving $4,000. per month on internet by switching to PD Fiber
- Prioritizing Fiber installs for families with students to have high speed internet during Coronavirus and upgrading all families to 1 Gigabit at No Added expense to customer.

SEMO Electric Coop

- Stopping / slowing Outmigration: Prior to getting Fiber optic internet, family considered moving to metropolitan area to get high-speed Fiber in the home because the previous service provider was slow that family members could only use one device at a time.
- In-Migration: Internet business bought a home in high-speed Fiber internet area specifically to have Fiber to the home office. Owner believes Fiber makes southeast Missouri a more attractive place to live.
- Freelance photographer needs reliable, high-speed fiber internet connections to both uploading large files and transferring to clients. Fiber allows for quick transfer of photos.
- Home-based Hotline Counselor earned a promotion after installing fiber optics. The person also added savings of over $2,000. per year on the cost of internet over previous internet provider that was slow, expensive and unreliable.

Co-MO Connect / Co-Mo Electric (examples written by Co-Mo)

Economic Development

- Early on in our research and planning to build a Fiber Network, we recognized the link back to our former leaders and members who faced similar challenges in the 1930's when they decided to take on the challenge of forming cooperatives to bring electricity to rural America so they wouldn't be left behind or in the dark. Today we find ourselves in a similar situation with the new modern necessity being "High Speed Broadband Internet Access".

- **Benefits of Broadband**…Boosts Quality of Life with…Improved Educational Opportunities, Flexible Employment Options, Positive Influence on Economic Development, Better Training & Communication for Public Safety Organizations, Advanced Telehealth Services, Increased Home Values and Brings Families & Communities Together.
- At the time Co-Mo started our Pilot, we had 81 employees; however, today we have added 52 employees to increase our total employee base to 133 (125 FT and 8 PT) and we're still growing. We have also had hundreds of contractors on Co-Mo's system throughout the build out of our fiber project who stayed in our local area and contributed to our local economy.
- Co-Mo has heard and seen numerous examples of subscribers who were able to setup online businesses from their homes due to having high speed broadband internet. Also, some smaller businesses who struggled to pay building expenses have had an option to setup their business for online sales and keep their businesses going and even expand their businesses.

- Our seasonal subscribers at the lake stay longer due to having high speed broadband internet because they can remotely log in and take care of priority work projects without having to travel back to their businesses/offices. By extending their stays at the lake, they're investing more into the local economy (i.e. purchasing more fuel, food, entertainment, etc.).

- Remote Employment Opportunities
    - Some subscribers are submitting for "partial" retirement because they can work remotely utilizing their high speed broadband internet instead of putting in for "full or early" retirement.
    - Other industries are creating remote employment opportunities. The Medical and IT/Tech industries are a couple areas that we saw immediately take advantage of having high speed broadband internet.
    - Co-Mo has employees that do remote work and we're looking at expanding those employment options. Some of the first remote work opportunities we saw were with our IT/Tech employees who have work issued laptops that could easily VPN into the office if they had a high speed broadband internet connection.
        - Example: Employee needs to meet a repairman at their house, so they had to be at their home for several hours waiting on that repairman to arrive. During the time they were waiting, they could be remoted into work for a better utilization of their time.

- **Attracting Residents/Entrepreneurs/Businesses**
  - Neal and Elisha Gist
    - Maintaining personal liberty: this is the overarching goal for Neal and Elisha Gist in their quest to build a self-sustaining sandbag home in Gravois Mills. The couple plans to continue their current use of filtered rainwater for water needs in the kitchen and bathroom. Electricity is currently being provided to the land, but they hope to install solar panels in the future to become independent. **As both Gists have at-home work, they also use Co-Mo internet for computer use.** So, even though it may seem outside the norm to construct and live in a house in this design, the living opportunities are nothing short of modern.
    - https://www.lakenewsonline.com/news/20190516/home-sweet-home-couple-chooses-liberty-over-mortgage-in-gravois-mills

- Laura Cabrera
  - Two years ago, Cabrera and her fiancé decided to quit their corporate jobs in downtown Chicago to work on a tech project together. But they soon realized that the cost of living in Chicago was dragging them down. "We wanted to take more risks in our careers, work from home and start up our own projects," says Cabrera. "We realized we didn't need to live in Chicago anymore paying more than $2,000 in rent a month. We could live anywhere."
  - Their solution: to search for land in the United States with fiber-optic internet. "Maybe we had it backwards before," says Cabrera. "What if the best places to launch a startup aren't in the most expensive cities? Perhaps it's in the cheapest places wired with the fastest internet."
  - https://www.forbes.com/sites/laurabegleybloom/2017/09/06/quit-your-job-7-places-in-the-u-s-so-cheap-you-can-afford-to-be-an-entrepreneur/#7a903598533f
- Forbes Lake of the Ozarks article
  - #10. Lake of The Ozarks: This vacation destination is cheap enough that you won't need venture capital funding, has areas with no building codes and comes wired with gigabit fiber optic internet. You can build whatever you want as your startup keeps growing, including your sustainable dream smart home at a fraction of the cost to build anywhere else. - Thomas Griffin, OptinMonster
  - https://www.forbes.com/sites/forbestechcouncil/2017/10/17/wheres-the-next-silicon-valley/#4e4b2cae37f0

- ARC Media
  - At ARC media they say "We admire and applaud the individuals who work hard day in and day out in order to ensure our light turns on. In a nutshell, this is why we are excited to be spending our days developing communication partnerships between these electric cooperatives, their member-owners, and influencers. Through creation, management, and placement of communication plans our goal is to help statewide electric associations, distribution cooperatives, and power generators convey their goals of safety, efficiency, public policy awareness, and above all member-owner activation."
  - ARC Media's office is in Jefferson City, Missouri but they have "Friday Workdays" at the Farm or the lake so they can upload large media files because of their high speed broadband internet with us. Uploading large media files from their Jefferson City office is an excruciating painful process because of their low speed internet connection.

- **Home Developers and Relators**
  - Home builders want to build in areas where high speed broadband internet is available because it attracts prospective homeowners to those neighborhoods.
  - Realtors confirm the value of homes and businesses increase when high speed broadband internet is available. Our local realtors advise this is one of the top items that go into the listing details. It's ranking up high on the list of importance just like what school district the property resides in.

- **Community Support Example**
  - The video link below showcases how Invention Scouts - Great Rivers Council are changing scouting at the Lake of the Ozarks Scout Reservation in Laurie, MO and how Co-Mo Connect helped! Great Rivers Council, Boy Scouts of America, Lake of the Ozarks West Chamber of Commerce.
  - Invention Scouts was founded to introduce Scouts to cutting-edge technology in the hopes of fostering interests in inventing/marketing.
  - https://www.facebook.com/CoMoConnect/videos/2322193974665326/

- https://www.facebook.com/ComoConnect/videos/2322193974005920/

Agriculture

- Poultry Farms
  - We have many poultry farms on our system. Some of these farmers have tapped into newer technology because they have high speed broadband internet. This can include modern table eggs barns where they use automation and the fiber to monitor their systems.
- Security/Alarm Systems/Remote Monitoring
  - Tyson has been using remote monitoring for 20+ years, our fiber system has strengthened and enhanced their ability for sure. We have 100's of Tyson barns scattered through our service territory.

- Irrigation Farms
  - Co-Mo doesn't have as many farmers using irrigation systems as other cooperatives in the state of Missouri; however, we do have an example where one of our members uses our fiber system to assist in operating their irrigation system, poultry barns, and grain mill.

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- **Precision Ag Technology**
  - Some models still rely heavily on wireless connections; however, farmers have options to utilize our fiber system to improve their experience with Precision Ag Technology.
  - For example, John Deere's Modular Telematics Gateway "MTG" technology relies on a cell/data connection for immediate access to certain data or features in the field. As we all know, cell phone coverage can still be a challenge in rural Missouri; however, Co-Mo has helped to improve cell phone coverage by installing fiber to multiple cell phone towers throughout our service territory.
  - Also, if a farmer doesn't have good enough cell/data coverage in the field, the data on those units will be stored locally on the unit and once they get back in coverage, it will resume communication.
  - Farmers also have the option to connect some of those units to their fiber at home or their shops so that they can access their connection wirelessly to help with the length of time it takes to download and upload data.

Barry Electric / GoBec

This coop has seen first-hand and believes that the fiber availability in their service area has had a tremendous positive impact for their members and the community at large.

- **In-home business / entrepreneurs** – We have many members that have in-home businesses. The fiber in the home has allowed them to be productive and to keep their business running over the internet. Many positions are also moving to work-from-home. During the recent pandemic events, the fiber has allowed many to work from home effectively, **some have been able to make that a permanent situation due to the availability of the fiber**.

- **Extend seasonal vacations** – our seasonal members are in the area that has just finished construction and it is currently undergoing testing.

- **Brick & mortar expand on-line** – many stores have been required to move their business online from restaurants to retail. The fiber allows people to get messages out reliably to social media

- **Remote employment** – many members are able to work from home, lessening the amount of time required at the office. For some, this is a beneficial alternative – providing more flexible work/life arrangements.

- **Real estate home developers** – many use the presence of the fiber to market their home for sale. We do not have hard data of home value increases due to the fiber; however, it is certainly a beneficial selling factor.

- **Community support & household** – the fiber has proved to have a huge impact to provide social connection during the recent pandemic events.
  - Churches have been able to stream services, and their members have been able to connect without the frustration of continual buffering/timing-out;
  - Customers/coop members can monitor security of their home using current self-monitoring products available;
  - Businesses are able to entertain work from home, providing flexibility for their employees that are located on the fiber network

- **Agriculture** – the fiber provides a reliable network for poultry farmers to be able to monitor systems such as chicken houses.
    - Modern chicken houses have intricate computerized systems due to the necessity to maintain certain temperature, feeding and watering schedules.
    - The ability to monitor these schedules with reliability determines the success or failure of a flock for those chicken farmers.
- **Precision agriculture technology** (this is different than regular agriculture) –is early in its stages of growth as it relies heavily on cell towers with high bandwidth and fiber connections. In the GoBec region high bandwidth cell tower coverage is minimal to non-existent in the area of farm production.

- **Education** – fiber availability at the local schools has proved to be very beneficial.
  - The schools have been able to provide distance learning to students.
  - The benefit even reaches to extracurricular activities such as coaching staff.
    - Before the fiber network, for example, the local football coaching staff would have to come to town and sit in an office to be able to review film (which takes hours each week).
    - The addition of fiber to the home has allowed football coaching staff to be able to stay home to review film, lessening the time they are spending outside of their home and away from their family.
    - This has been a great benefit to those families.

- **Tele-medicine and emergency services** –
  - The fiber enables the local clinics to be able to utilize the tele-medicine options rather than bringing patients in the office.
  - This will ultimately reduce the cost to the patient and clinics.

ISSUES AND CONCERNS ASSOCIATED WITH 5 G SERVICE FOR RURAL AMERICA

5 G stands for 5th Generation

Not 5 Gigabits

9/12/2019 EXCERPTS: COMMUNITY BROADBAND NETWORK—INTERVIEW SACHA SEGAN, PC MAG LEAD MOBILE ANALYST

https://muninetworks.org/content/transcript-community-broadband-bits-episode-371

Sascha Segan: When we're talking about millimeter wave, we are talking about a new, very high speed, short range, high frequency network technology that is going to require thousands of new small cell sites probably on lampposts and the sides of buildings placed either every 1,200 feet or every 2,400 feet,

depending on who you believe, that is easily capable of multi-gigabit speeds but has trouble with rain, trouble with trees, trouble with windows.

Second Source: www.counterpunch

The effort to provide FTTH to all Americans has ended. As the Electronic Frontier Foundation noted: "Wireless carriers are working hard to talk up 5G (Fifth Generation) wireless as the future of broadband. But don't be fooled—they are only trying to focus our attention on 5G to try to distract us from their willful failure to invest in a proven ultrafast option for many Americans: fiber to the home, or FTTH."

Sadly, the U.S. is likely to remain a second-tier communications nation for the foreseeable future.

LifeWire

5G Speed: How to Understand the Numbers

How fast is 5G, and how does it compare to 4G and LTE?

Sections from article:

Verizon is one of the first companies to release 5G in the United States, so we can look at data from their actual customers to see at how fast 5G is right now, with current technology. Looking at those numbers specifically, we can see that a Verizon 5G Home user with FWA can get anywhere from 300 Mb/s to 1 Gb/s. Not only does Verizon's 5G broadband service guarantee such speeds, users reports the same.

Actual 5G Network Speeds

..... reflection of 5G speeds in ideal conditions with basically no latency or interference, and only if your device is the only one using that 5G cell.

In other words, mobile users probably won't experience peak download/upload speeds. However, it is possible to get those speeds if you're using a dedicated, fixed wireless access (FWA) system where you don't have to split the bandwidth with other users.

For example, UK's Three mobile network operator achieved a whopping 2 Gb/s download speed on a fixed wireless access (FWA) environment, but Three expects the typical user to pull in just 80 to 100 Mb/s.

That being said, how fast is 5G, *really*? If you were to sign up right now, what internet speeds could you expect?

Unfortunately, the answer isn't so straightforward. Actual 5G speeds depend on not only where you're located when you access the network but other factors like the hardware you're using, the speeds the network is capable of, how many other users are sharing the 20+ Gb/s, and what type of interference is at play between you and the cell delivering 5G.

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Sascha Segan: Oh no, we absolutely do need wires. Wired broadband has so much more capacity even than the best 5G system. It's so much more reliable. I mean, we use the phrase backbone in the Internet world, and wired broadband is the backbone of all networking and will continue to be the backbone for the foreseeable future. 5G relies on fiber intensely. You can't have 5G without extensive widespread fiber. So these are two technologies that 5G is going to be able to reach some places where fiber can't reach because of physical or economic reasons, and at the same time, 5G is not going to be able to exist without fiber supplying the basic backbone, the big pipe that goes into the 5G radios.

Sascha Segan: Yeah, I somewhat disagree because I do think there are two areas where there are real problems installing fiber and they aren't technical problems. They're in general economic and political problems that I don't see any time horizon necessarily curing. And one of them is truly rural installation, and that's a situation where it just costs costs a lot of money to build it out. The companies involved do not see the ROI, they don't see the return on investment, because the structure of our economy is about short term return. They don't see short term return in laying fiber way out into the farmlands. I

Christopher Mitchell: Without getting lost in this rabbit hole, I think that's why, in fact, I actually think we'll see fiber to almost every rural household before we'll see it in every urban area. I think the cable monopolies and that Right-of-Way issue will be a challenge. I'll send you our rural fiber map. I think that you may be interested in checking out how far the rural fiber's already gotten from the co-ops. But I do want to move on to "5G won't fix the broadband market" — that was another one of our bolded ones — "5G won't solve the digital divide," and then "there's no 5G race." So with our bold headlines, any quibbles?

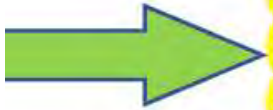
Sascha Segan: The problem with the broadband market, once again, is more economic than it is technical. If we had, for instance, common carrier regulations on fiber, if we had a requirement for unbundling, if we had, what is it, UNEP the way we had in the late nineties —

coming years, we will see people in rural areas having phones that say 5G on them, but probably not experiencing what they would experience if they took those same phones into a major urban.

Sascha Segan: Right. So as I said earlier, a hertz as a hertz, right? And T-

Sascha Segan: One of the things people are talking about with rural 5G is the future of private networks. And with a private network, you would as a farmer license some of this bandwidth for your own use. Where I was talking to — who was I talking to? — John Deere about this. And so this becomes a situation where — so you have fiber to the edge of your property because you're a farmer, and you have the option of either setting up one 600 Megahertz 5G tower on that fiber line at the edge of your property to manage all your, you know, 25,000 agricultural sensors and fleet of robotic autonomously controlled threshers, or you can grid it with 5 Gigahertz Wi-Fi by every thousand feet or so

that's that, you know, we say that all the 5G antennas would need to be connected by fiber. You know, we said that even though I'd previously interviewed Doug Dawson, a consultant who's very good, writes the POTs and PANs blog, and he had mentioned that he thinks the low earth orbit satellites are going to be connecting a lot of these rural towers. And so, I don't think we



that I think that you and I can agree vigorously about and that I hope we back each other up on Twitter about a lot, is that no technology is really going to solve what is a regulatory and market structure problem more than anything else. That the digital divide is not going to be solved by a new wave, it's not going to be solved by a "G," it's not going to be solved by magic satellites in the sky, when the real issue is a lack of regulatory backbone, when the real issue is a small providers and community and municipal providers getting beaten down by unjust laws designed to maintain monopolies. This is an economic structure problem, not a technological problem, that we have in the U.S.

PARTIAL
LIST OF SOURCES
FOR
DEEDP Broadband
Research

Years 2017-2020

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Includes the following Strategic partners and organizations:

1. CoMo Electric and CoMo Connect Broadband
2. Callaway Electric and Callabyte Broadband
3. Barry Electric and GoBec Fiber Broadband
4. Semo Electric and GoSemo Broadband
5. Pemiscot Dunklin Electric and Pemiscot Dunklin Fiber Broadband
6. United Electric and United Fiber Broadband
7. Ralls Electric (RCEC) and Ralls Technologies Broadband
8. Chariton Valley Telephone Coop
9. Missouri Farm Bureau
10. US Senatorial Staff
11. US House Congressional Staff

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- USDA, Center for Nutrition Policy and Promotion: Official USDA Food Plans: Cost of Food at Home at Four Levels, 2016
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AirLink Rural Broadband, LLC, ISP: http://www.airlinkrb.com/fiber-updates
Chariton Valley Telephone: Salisbury, MO plus corporate officer, Donna Bell http://www.cvalley.net/services/internet/
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Century Link Costs, Speeds, availability: company web, telephone calls and Keytesville Library customers
Century Link: https://www.centurylink.com/home/internet/
Century Link: customer, 7201 N. Route E, Columbia, MO, director of software development for Veterans United
Cable One / New Wave: actual customers, 15911 CR 405, and 1505 Susan Street, Dexter MO 63841
Socket: headquarters plus customer, 3853 County Road 257, Fulton, MO 65251
AirWave Communications: http://www.airwaveonline.com/internet.html
Mercury Wireless: headquarters and https://www3.mercurywireless.com/residential-service/
AT&T Services Inc.: actual customers, 604 S Lewis St, Dexter MO, 63841

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  https://muninetworks.org/content/transcript-community-broadband-bits-episode-371

  Transcript: Community Broadband Bits Episode 371 | community broadband networks

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Missouri's Highest CAF II Winning Bidders & All States of Their Bids
Source: FCC CAF II https://www.fcc.gov/auction/903

FCC's CAF II Winning Bid by Largest Total Provider Bid in All States Combined for Provider

Source: https://www.fcc.gov/auction/903 **Provider Combined**

FCC's CAF II Winning Bids by Largest Bid in a Particular State
Source: https://www.fcc.gov/auction/903

FCC FUNDS ALLOCATED TO MISSOURI BY PROVIDER Auction: Summer 2018
Source: FCC CAF II https://www.fcc.gov/auction/903

COMPARISON OF FUNDS ALLOCATED TO WIRELESS VERSES FIBER
FCC FUNDS ALLOCATED TO MISSOURI BY PROVIDER Auction: Summer 2018
CAFNR / Dynamic Econometric Economic Development Program (DEEDP) Womack / Eisberg 2020
Source: FCC CAF II https://www.fcc.gov/auction/903

PERCENTAGES OF FCC FUNDS ALLOCATED TO MISSOURI BY PROVII Auction: Summer 2018
Source: FCC CAF II https://www.fcc.gov/auction/903

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Source: Quote, SEMO CEO: *"The difference between bidding at the 10 Mbps tier or 25 Mbps tier and bidding at the 100 Mbps tier was the difference in winning and losing the bids."*

Source: Quote, SEMO CEO: "*In the100 Mbps tier the fixed wireless bidders are being awarded $200 million in Missouri alone for bidding beyond their capability."*

Source: Quote, SEMO CEO: "*Had the fixed wireless companies bid at their capabilities, Missouri's rural electric coops would have won $100 million more in the auction and fiber networks would have been more widely deployed."*

Missouri Public Service Commission (PSC) Intervention on CAF II Auction Awards

MO PSC Case No. 2019-0196 Questions whether the wireless providers that won bids in the Above Baseline Tier for providing 100 Mbps can technically provide the service for which they received the award.

DEEDP Question: What Happened to Missouri's Middle-Mile Investment? MoBroadband 2012 / Missouri Middle-Mile and Last-Mile Awards, March 2012

Figure 1/ US Map Counties with Broadband (shown in green) Source: FCC 2006

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FCC Broadband deployment Data, FCC Form 477--Source: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477

URBAN RATE SURVEY BENCHMARK TABLE FOR CAF II

DA- 18-1280

URBAN RATE SURVEY BENCHMARK TABLE FOR RDOF

DA 19-1237

Source FCC statement "may not offer": https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477

Source FCC statement "reasonably comparable": https://www.fcc.gov/auction/903

Source FCC Formula: https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources

FOUR PERFORMANCE TIERS CAF II Source: FCC 18-6 Feb.1, 2018

FCC PERFORMANCE TIERS RDOF

$20. Billion over 10 years

Source: FCC Statements RDOF 19-126, CAF 10-90, FCC 19-77 August 2019

https://www.fcc.gov/document/fcc-proposes-204-billion-rural-digital-opportunity-fund-0

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2019 FCC OBJECTIVES

Source: **FCC Statements RDOF 19-126, CAF 10-90, FCC 19-77 August 2019**
https://www.fcc.gov/document/fcc-proposes-204-billion-rural-digital-opportunity-fund-0

2020 FCC RDOF **$20 BILLION AUCTION FORMULA** **FCC FEBRUARY 7, 2020**

Federal Communications Commission **FCC 20-5**

FCC REPORT AND ORDER **PAGE 21, ITEM NO. 40**

Adopted: January 30, 2020 **Released: February 7, 2020**

FCC LAUNCHES $20 BILLION RURAL DIGITAL OPPORTUNITY FUND TO EXPAND RURAL BROADBAND DEPLOYMENT

Represents FCC's Largest Investment Ever to Close Digital Divide

Source: https://www.fcc.gov/document/fcc-launches-20-billion-rural-digital-opportunity-fund-0

CHAIRMAN PAI ANNOUNCES PLAN TO LAUNCH $9 BILLION 5G FUND FOR RURAL AMERICA

Source: https://www.fcc.gov/document/pai-announces-plan-launch-9-billion-5g-fund-rural-america

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RDOF Report and Order Adopted by FCC 1/30/2020

Rural Digital Opportunity Fund: Conexon's Comments filed with the FCC

Source: https://www.conexon.us
Conexon's Comments Filed with FCC September 25, 2019

Federal Communications Commission

FCC REPORT AND ORDER NO.13, 21,38

Adopted: January 30, 2020 EXCERPTS Released: February 7, 2020
https://www.fcc.gov/document/fcc-launches-20-billion-rural-digital-opportunity-fund-0

Federal Communications Commission

PUBLIC COMMENT March 2, 2020

EXCERPTS Pages 21, 22, 23

COMMENT SOUGHT ON COMPETITIVE BIDDING PROCEDURES….. RDOF

SOURCES FOR DEEDP Broadband Research

Federal Communications Commission

EXCERPTS APRIL 3, 2020

https://www.fcc.gov/implementing-rural-digital-opportunity-fund-rdof-auction

Implementing the Rural Digital Opportunity Fund (RDOF) Auction

RDOF Auction Procedures Public Notice

Source: FAPRI Baseline April 2019	
USDA NET GOVERNMENT OUTLAYS	
Fiscal Year	Year 2021

Source: FAPRI Baseline April 2019		
USDA POLICY CROP PROVISIONS		
Fiscal Year	2019	
Marketing Loan Program		

PUBLIC PRESENTATIONS BY DEEDP
On BROADBAND RESEARCH

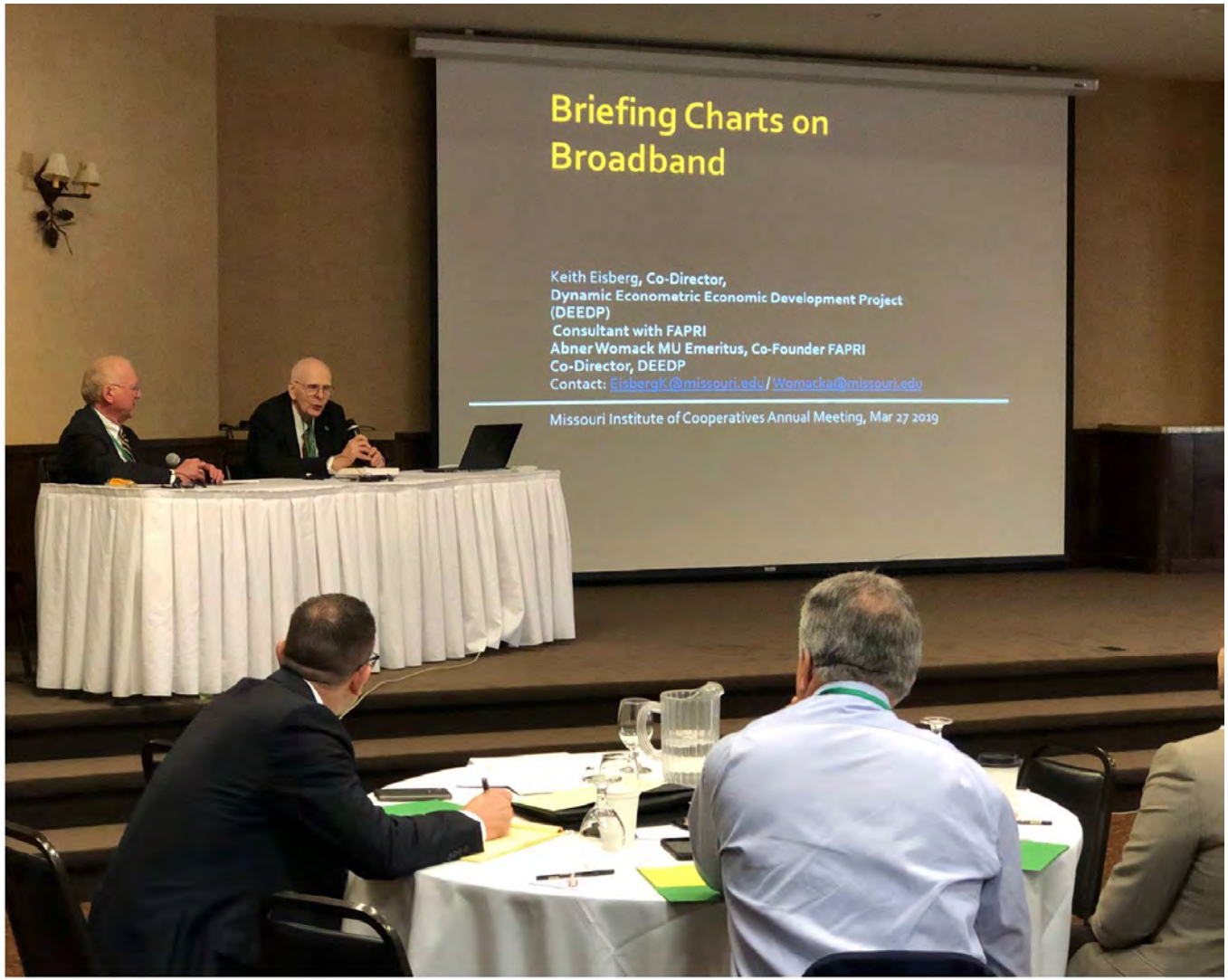
DEEDP / ABNER WOMACK AND KEITH EISBERG HAVE GIVEN
WELL OVER 200 PRESENTATIONS FROM 2017 THROUGH 2020
TO THE PUBLIC, TO ORGANIZATIONS, TO CONGRESSIONAL STAFF, TO PRIVATE SECTOR COMPANIES AND TO COOPS.

UPON REQUEST, WOMACK/EISBERG ARE AVAILBLE TO PROVIDE PRESENTATIONS

FOLLOWING PICTURE OF ABNER WOMACK AND KEITH EISBERG

CONDUCTING A PRESENTION TO

THE ANNUAL MEETING OF THE MISSOURI INSTITUTE OF COOPERATIVES IN 2019


Briefing Charts on Broadband
Keith Eisberg, Co-Director,
Dynamic Econometric Economic Development Project (DEEDP)
Consultant with FAPRI
Abner Womack MU Emeritus, Co-Founder FAPRI
Co-Director, DEEDP
Contact: EisbergK@missouri.edu / Womacka@missouri.edu
Missouri Institute of Cooperatives Annual Meeting, Mar 27 2019