Rural Broadband Benchmarking Report

RESULTS AND INSIGHTS FROM A COMPREHENSIVE DATA GATHERING EXERCISE

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May 2025

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Introduction

The Rural Broadband Benchmarking Report Refresh

THE LATEST IN OUR BENCHMARKING SERIES

The number of co-ops bridging the broadband divide continues to grow. More than 240 of our electric members have deployed broadband for their communities, while leveraging these technologies for a smarter grid.

Previous benchmarking studies

We've published several reports on Broadband and Smart Grid technologies. NRTC and NRECA collaborated on our last broadband report published in 2022. We also published an operations benchmarking report that is an additional reference point for those looking for benchmarking results for these operating metrics.

The 2025 Rural Electric Broadband Benchmarking Report Refresh

Much can change in three years, from technologies, to costs, to the competitive environment. Our members asked us for a refreshed view focusing on these factors. This report does this while highlighting technology and business trends.

This report consists of six main sections:

- Executive summary
- Use cases & technologies
- Deployment statistics
- Subscribers & revenues
- Business considerations
- Operations

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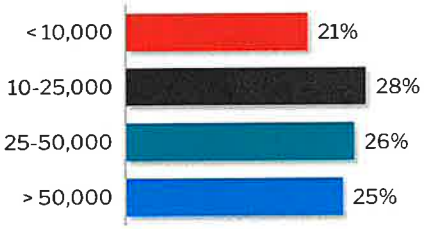
Survey population

Survey participants:

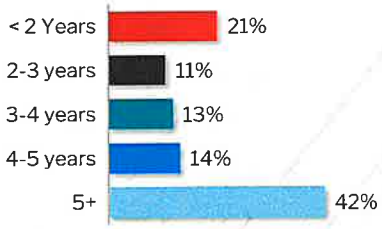
- **78 electric cooperatives** that have deployed broadband
- Members of **various sizes** (as measured by electric meters), representative of the membership as a whole
- Members from **29 states** with diverse characteristics

Participants by meter count



Participants by state

Time since live network



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Executive summary

Continued momentum for trends identified in past reports

Members are **expanding** their impact on their communities

50% More miles, locations & investment compared to our 2022 report

91% Focus is on expansion as 91% are still building and 89% saw an economic benefit in their area

100% All respondents using grants to fund expansion

Competition is increasing, yet members are competing well

90% Have seen increased competition and 88% expect more to come

48% Take rates approaching 50%, and 52% for those in business for more than five years

88 Net Promoter Score of 88 far exceeds the median ISP NPS of -3

Networks are more **capable** and used for **broadband** & **smart grid**

64% Using XGS-PON , capable of higher speeds

2+ Gbps More members are offering 2 Gbps residential plans

81% Using fiber to connect substations and downline devices

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Executive summary

Members are expanding their networks and their impact on their communities

- As we're now years into the movement of electric co-op broadband, we're seeing projects **expand** as co-ops continue to benefit their communities. **89% saw an economic benefit** in their area due to broadband.
- Compared to our 2022 report, projects covered roughly **50% more miles, locations, and dollars invested** and **91% are still building** to new locations. Members **continue to increase their impact** on their communities.
- Every respondent is **leveraging grants to fund this expansion** and 57% have received three or more grants.

Competition is increasing significantly, yet our members are competing well

- **90% have seen increased competition** and **88% expect increased competition in the next 3 years**.
- We continue to see **take rates approaching 50%,** and 52% for those in business for more than five years.
- Extraordinary average **Net Promoter Score of 88** far exceeds the median ISP NPS of -3 in the overall U.S. market.

Costs continue to increase: Cost per aerial mile & per passing for newer projects are >**50% higher** than earlier ones.

Networks are increasingly more capable

- **64% are using XGS-PON** and therefore many more members are offering 2 Gbps residential plans, while more members are using **fiber to connect substations and downline devices** for smart grid.

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Use cases and technologies

Definitions

Correlations and trends by tenure and density groupings

In this report, we use correlations in the data to draw insights and highlight key technology and business trends.

Two types of groupings draw out these trends:

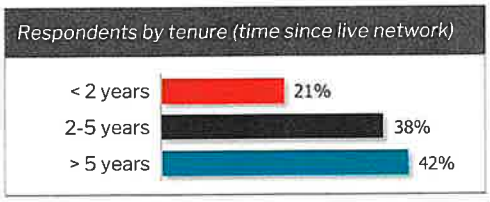
- Groupings by "tenure," defined as the time since having a live network with customers
- Groupings by density, defined as locations passed per mile of fiber

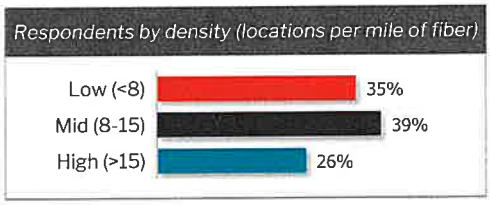
Box and whisker charts display deployment statistics and results

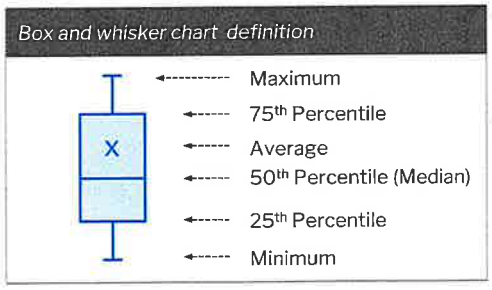
Co-op deployments vary widely in many aspects, such as technologies used and household density. Therefore, benchmarking results require looking at more than just averages.

To display results, we use "box and whisker" charts that allow us to:

- Show the range of results from minimum to maximum
- Show both the median and average results
- Show the most common results, defined as the 25th to the 75th percentile range







Fiber is the overwhelming choice for broadband and smart grid

- Most respondents have a **fiber backbone to their substations**; some use wireless for more remote substations
- Most use **fiber to connect downline assets** such as capacitors, switches, voltage regulators, and reclosers
- Some report using fiber for metering; the most common use case is backhaul to access points, but WiFi meters and other solutions closer to the consumer location are emerging

Use cases and technologies employed (1)

% using each technology	Fiber	Wireless (2)	AMI Network (3)
Consumer broadband	99%	13%	0%
Substation connectivity	96%	13%	7%
Downline assets	81%	25%	14%
Metering	32%	16%	74%

Key trends

Fiber is being pushed deeper into broadband & smart grid networks

- Most respondents that have recently deployed broadband have used **only fiber for both broadband and smart grid**

Fiber-only use by tenure

	<2 yrs	2-5 yrs	5+ yrs
Broadband	93%	85%	80%
Downline	63%	80%	52%

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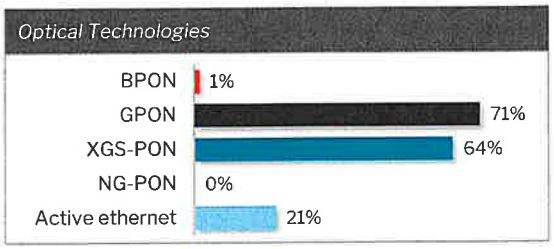
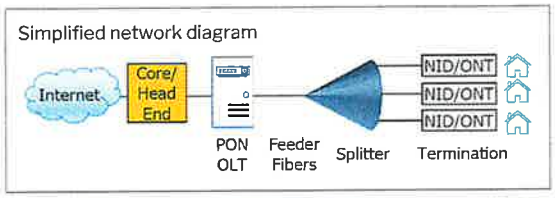
(1) Total can be greater than 100% as more than one technology can be used
(2) Private wireless network operated by the co-op or public wireless service from mobile operators
(3) Purpose-built metering network from AMI vendors

Optical networking technologies

Optical technology has evolved to meet bandwidth demand

- **Passive optical networks (PON)** provide access using centralized electronics and passive splitters in the field; can be upgraded over time to meet bandwidth growth and provide higher throughput
- **GPON (Gigabit PON):** The most widely used technology, operating at 2.5 Gbps downstream & 1.2 Gbps upstream; supports 1 Gbps service
- **XGS-PON:** Next-gen PON; more costly but delivers higher symmetrical throughput (10 Gbps); supports more 1+ Gbps services per port; can be overlayed on a GPON network for easy upgrade and migration
- **Active ethernet:** Provides subscribers with their own fiber link; usually an option for business customers used along with a PON technology

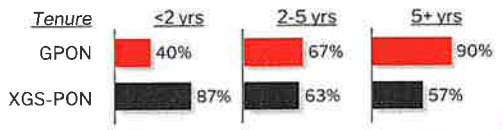




Key trends

XGS-PON more common in recent deployments

- **XGS-PON used by 87%** of newer deployments
- Mature networks are **upgrading their electronics**, confirming the expectation of a five-to-seven-year upgrade timeframe



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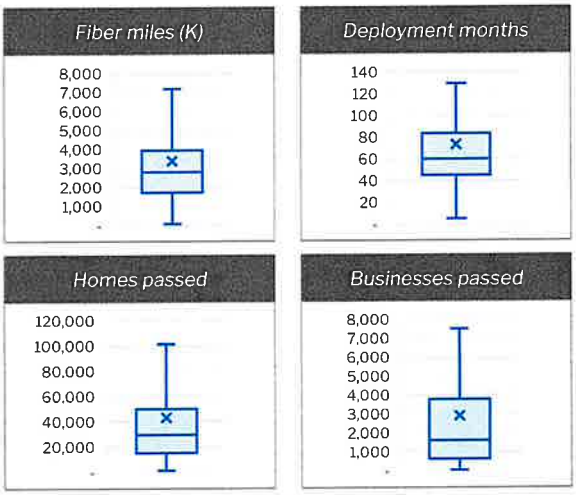
Deployment statistics

Deployment statistics

The characteristics of cooperative deployments vary widely:

- Median **deployment timeline** of 5 years
- On average, respondents were three years into the five-year total build; however, even after the main build is completed, edge outs continue
- The **median total project was**:
  - 2,800 fiber miles
  - 29,600 homes passed
  - 1,500 businesses passed



Key trends

Project density varies significantly

- Median fiber miles relatively similar by tenure
- The high-density group had two to three times the locations per mile as the low-density group

Tenure	Fiber miles	Locations	Loc./Mi[2]
<2 years	2.3K	22K	14.1
2-5 years	3.4K	36K	11.4
5+ years	3.0K	36K	9.8

Density	Fiber miles	Locations	Loc./Mi[2]
Low	1.5K	16K	6.9
Mid	2.4K	35K	10.5
High	2.7K	74K	18.4

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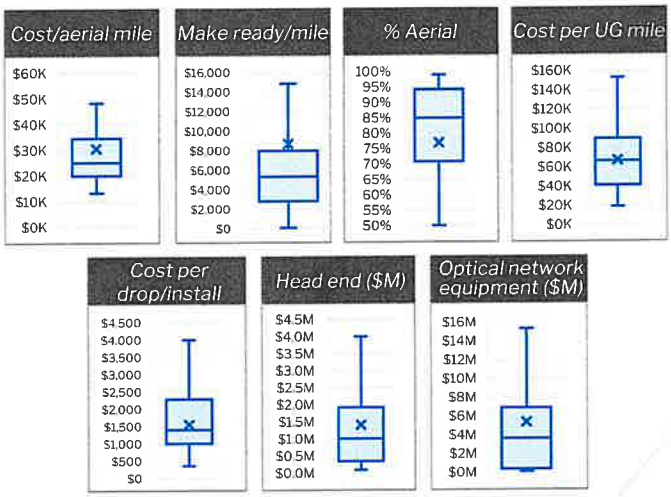
(1) Data represents the total project, not construction to date
(2) Represents median locations per mile for individual members, not based on median miles and locations for each cohort

Deployment costs

Deployment costs vary; however, metrics converge around averages that can be used for planning:

- Median **cost per aerial mile** of $25,000; variation caused by the amount of make ready, placement, and strand counts
- Median **make ready cost per mile** of $5,300; variation caused by plant age, pole condition, and terrain challenges
- Median **cost per underground mile** of $66,000 driven by terrain and strand counts
- Median **cost per drop, including installation** of $1,400; variation due to drop length and drop type
- Median **head end** cost was $1M; variation caused by network size, redundancy, and services offered such as video



Key trends

Costs are going up

- Cost per aerial mile are highest in more recent deployments
- This is due to **price pressures on materials and labor**

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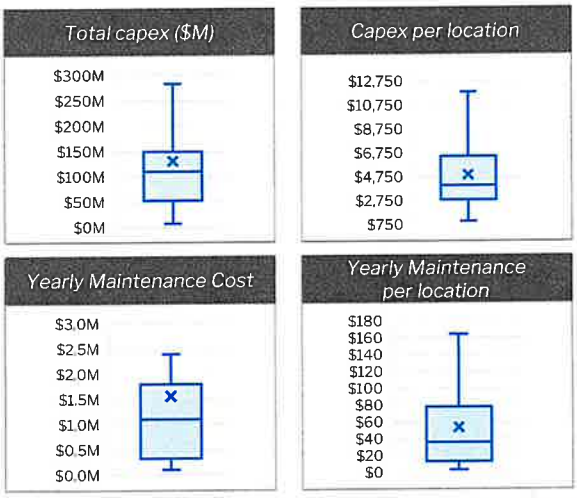
Total project costs

- Median **total capex** of $110M, with a large range of project sizes
- Median **capex per location** was $4,100, variances caused by percent aerial, density, and technology
- This report now includes yearly network **maintenance cost**, including both labor and equipment fees. Median maintenance cost was $1.1M per year
- Median annual maintenance cost per location was $36 but varied significantly. The variation may be due to differences in each project; However, differing definitions of this cost also could be a factor



Key trends

Cost per passing correlates with density and tenure

- Lower density projects ~2.5x cost per passing than higher density
- Recent projects almost 2x cost per passing that of 5+ year projects

Tenure	Capex	Per Passing (1)
<2 years	$72M	$6.9K
2-5 years	$122M	$4.2K
5+ years	$91M	$3.6K

Density	Capex	Per Passing
Low	$60M	$5.4K
Mid	$121M	$3.8K
High	$169M	$2.1K

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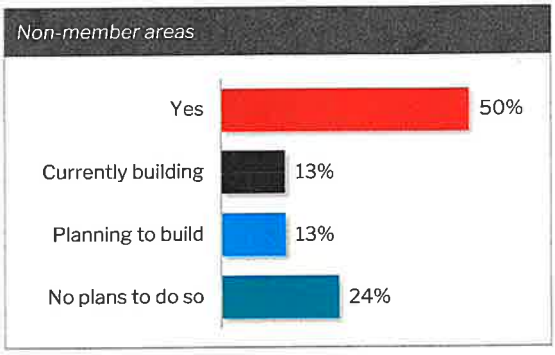
(1) Represents median locations per mile for individual members, not based on median miles and locations for each cohort

Non-member areas

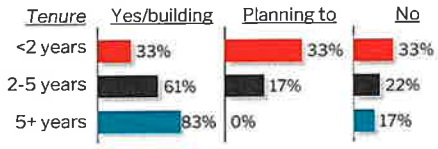
- Cooperative broadband projects usually begin by focusing on their members' connectivity
- After assessing the level of demand in their areas, many projects expand to non-member communities
- Expanding service areas extends broadband to more unserved households and provides better scale and economics to the overall network
- **63% of respondents** have built or are building "non-member" areas
- Only 24% said that they have no plans for these areas



Key trends

Regardless of tenure, most members plan to serve non-members

- Most projects serving customers for more than two years have built service to non-members
- Many new projects include future plans to expand to non-members



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Subscribers and revenue

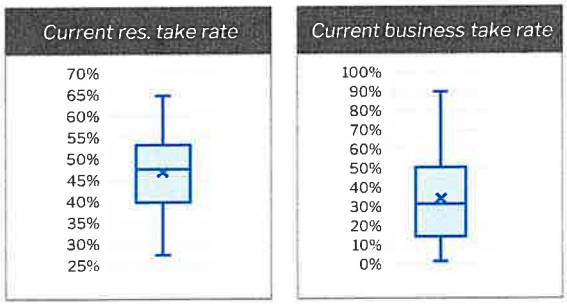
Take rates

Members have achieved attractive take rates

- Median **residential take rate** of 48%
- Median **business take rate** of 32%

Primary factors influencing take rate are:

- Degree of competition in an area
- The service plans being offered (speed, services, etc.)
- Quality of customer support and network service
- Member relationships and loyalty
- Price



Key trends

Take rates for mature networks & low-densities exceed 50%

- Members **quickly ramp their take rates**, with projects reaching nearly 50% in 2-5 years
- Low-density areas have higher take rates, presumably due to **less competition**

Residential take rate – To date and total project (1)

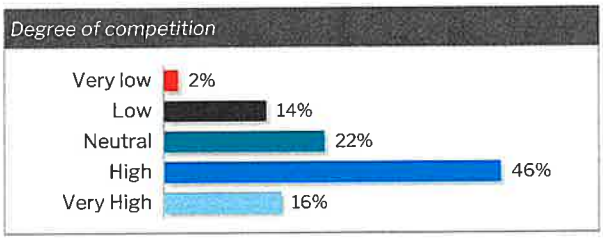
Tenure	To date	Ttl project	Density	To date	Ttl project
<2 years	37%	46%	Low	50%	60%
2-5 years	47%	47%	Mid	47%	49%
5+ years	52%	50%	High	52%	44%

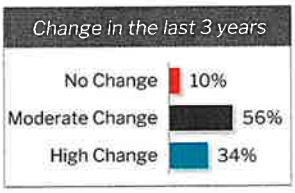
(1) "To date" represents the current take rate of current locations passed; "Total Project" represents the total anticipated take rate from the total locations passed once the project is complete

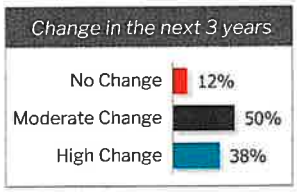
Competition

Members are seeing increased competition

- **62% of respondents** see high competition
- **90% have seen increased competition** in the last 3 years
- **88% expect increased competition** in the next 3 years



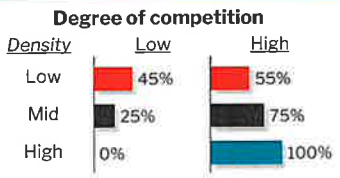




Key trends

More competition in higher densities, but is present in most projects

- 100% of high-density projects see high competition
- 45% of low-density projects still see high competition



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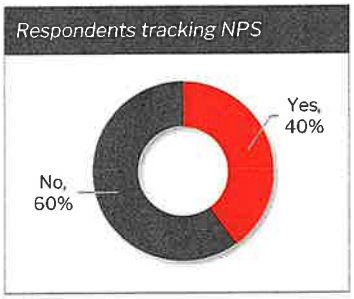
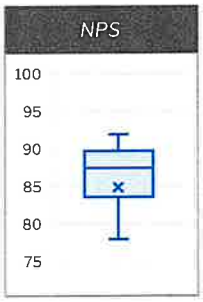
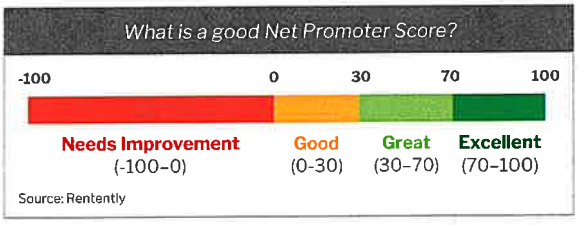
Net Promoter Score (NPS)

Respondents reported extraordinary NPS, reflecting very loyal customers

- **NPS (Net Promoter Score)** measures loyalty, typically measured as promoters (9-10 in 0-10 scale) less detractors (0-6)
- **40%** of respondents track NPS
- Respondents' median **NPS of 88** far exceeds the median Internet Service Provider NPS of -3 in the overall United States market [1]
- This is primarily due to our members' connection to their community, the cooperative model, and focus on quality of service and support





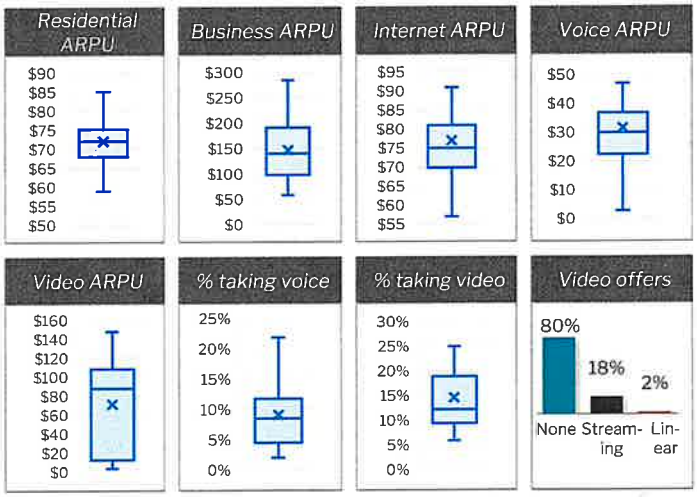


(1) https://www.retently.com/blog/good-net-promoter-score/

ARPU

Median average revenue per user per month (ARPU):

- **Residential**: $72; Co-ops offering more services (such as voice and video) have higher ARPU due to more offerings
- **Business**: $141
- **Internet**: $75
- **Voice**: $30 with 9% of customers taking this service
- **Video**: $87 with 12% of customers taking this service
  - Only 20% of respondents offered video, 90% of those who do, offered streaming



Key trends

In this report, we found no strong correlations between ARPU and services offered by tenure and density

- In our 2022 report, we saw older projects with greater ARPU due to higher video ARPU composition; This was not a factor in this report as more members abandon linear video
- In 2022, we saw correlations between ARPU and density, with lower densities having greater ARPU due to less competition; This also was not a factor in this report, possibly due to increased competition for most respondents

Price plans

Most members offering high-speed, symmetrical rate plans

- A benefit of fiber is the ability to efficiently offer symmetrical speeds
- Almost all respondents reported offering symmetrical speeds

Customers choose plans based on their needs and ability to spend

- Most consumers choosing low and mid tiers
- Consumers choose high tiers if their use cases (high video and gaming use) justify the spend

Avg residential plans	Speed (Mbps)	Monthly price	Customer mix
Tier 1	100	$59	53%
Tier 2	475	$80	28%
Tier 3	1,000	$100	17%
Tier 4	2,000	$125	2%
Income qualified tier	100	$35	1%

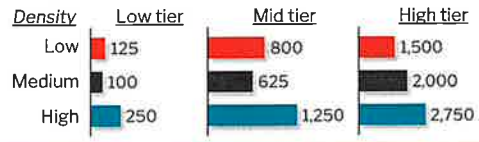
Avg business plans	Speed (Mbps)	Monthly price	Customer mix
Tier 1	100	$80	67%
Tier 2	500	150	21%
Tier 3	1,000	$275	12%
Tier 4	4,000	$555	1%

Key trends

Members offer robust speeds regardless of density

- However, average speed offered generally increases as density increases, likely driven by degree of competition

Average residential download speed offered by density



Graphs represent the median speed and price per tier; Low and high tiers as reported by members, "Medium Tiers" represents the average of tiers between low and high

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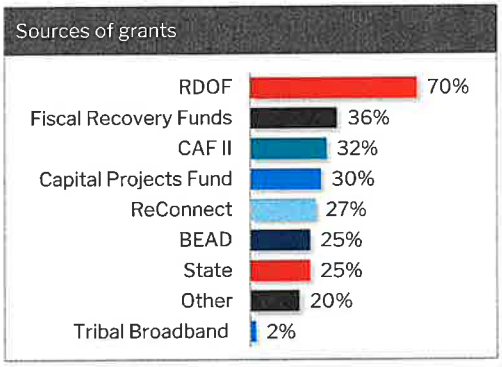
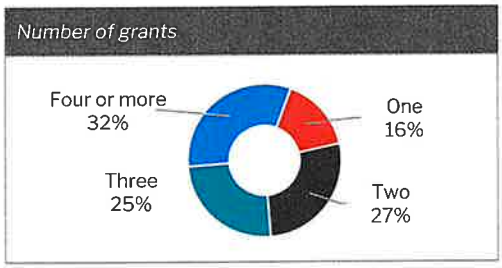
Business considerations

Grants

Members take advantage of several grant programs

- **100%** of respondents received at least one grant, 84% received two or more
- **FCC** programs: 70% received funds from the **Rural Digital Opportunity Fund (RDOF)** and 30% from the **Connect America Fund (CAF) II**
- **Federal and state** programs
  - **Broadband Equity, Access, and Deployment (BEAD):** $42.5 billion federal grant program allocated to the states to manage
  - States have also managed grants funded by the **American Rescue Plan (ARPA)** and from their own general revenue
- **RUS** administers the **ReConnect loan and grant program**; there have been several rounds of this program
- **NTIA** manages several programs, including BEAD, **Tribal Connectivity, Connecting Minority Communities, and Middle Mile grant programs**

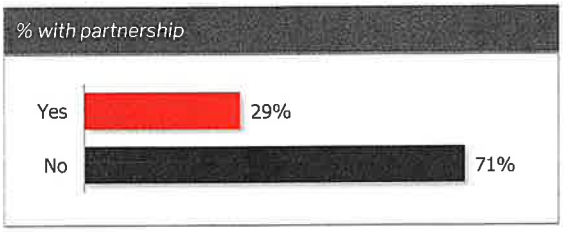


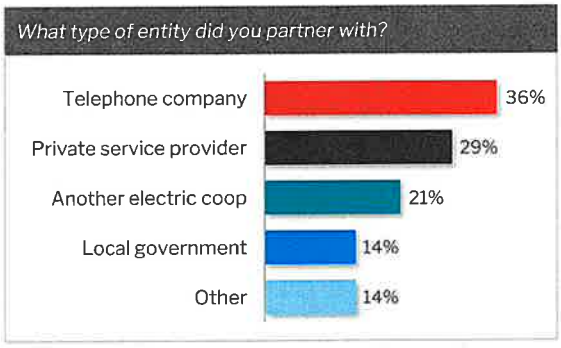


Partnerships

Members report entering partnerships with various entities

- The most common partners among respondents are service providers, both telephone companies and private service providers
  - In these partnerships, the electric cooperative is typically responsible for building and maintaining the network, while the telephone company provides service
- Some also cite partnering with other electric co-ops, IOUs and municipals



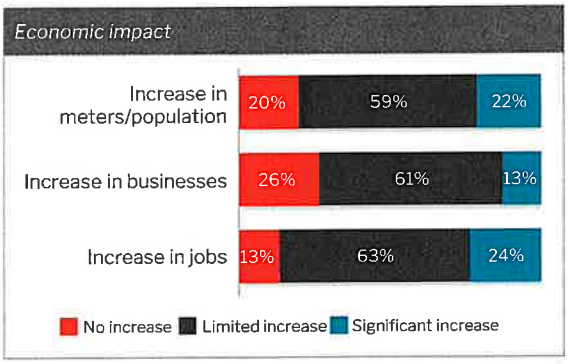


Economic impact

Broadband has positive effects on local economies

Most respondents have not conducted a formal economic study, but share evidence of positive economic impacts such as:

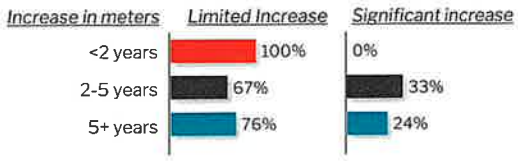
- Increase in electric meters and population
- Increase in new businesses and jobs
- **89% of members** report seeing a positive impact from at least one of these categories



Key trends

Economic gains take time to materialize

- 85% of respondents in operation for more than two years saw an increase in meters/population compared to 54% of newer projects



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Operations

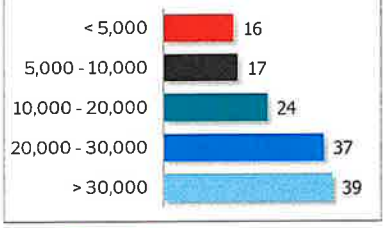
Broadband organization composition

Just as the size of deployments vary, staff composition varies depending on the size of the organization and staffing models

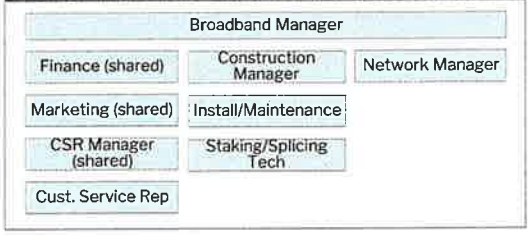
- There is a correlation between subscriber and staff counts
- Co-ops build dedicated teams and use shared resources from electric operations
- Members also often choose to outsource functions such as help desk, installation, and NOC monitoring

Functional staffing results	25th percentile	Median	75th percentile
Broadband Manager	1.0	1.0	1.0
Admin Assistant	0.0	0.0	1.0
Outside Plant Manager	1.0	1.0	1.0
Construction Manager	1.0	1.0	1.0
Administration	0.0	1.0	2.0
Marketing	1.0	1.0	2.0
Mapping / Staking Tech	1.0	1.0	1.9
IT / Network Engineering	1.0	2.0	3.0
Warehouse	0.5	1.0	1.0
Purchasing	0.2	1.0	1.0
Finance/ Accounting	1.0	1.0	2.0
Customer Service Reps	3.0	4.0	6.0
Maintenance Techs	1.0	2.0	4.0
Installation Techs	1.0	3.0	5.3
Total	**12.7**	**20.0**	**32.1**

Internal staff size by subscriber count



Typical Org Chart



Function	In-source	Out-Source	Both
Marketing	85%	2%	13%
IT / network engineering	64%	4%	32%
Purchasing	83%	4%	13%
Customer service	77%	4%	19%
Help desk	11%	28%	62%
Network (NOC) monitoring	45%	28%	28%
Installation	21%	28%	51%
Regulatory & compliance	35%	11%	54%
Grant writing	38%	13%	49%

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What do you wish you had known?

Many respondents commented on the sheer number of issues to deal with, representative comments:

- "Too much to write. Get a good consultant."; "It would take a book to capture it all"; "Everything"; "So much, might want to call!"
- "How truly different broadband is from electricity in terms of demand, market approaches, and customer expectations, especially considering we are building the fiber network out from scratch, as opposed to operating an existing, complete electric network"

The importance of a thorough, realistic feasibility study and the impact of cost increases and supply chain issues

- "A proper business case analysis. Original plan was way off on many aspects, some positive, some negative"; "Feasibility study was understated"; Cost was higher than expected"; "interest rates skyrocketed"; "Make ready, construction, and other capex costs"; "supply chain problem"

The importance of a long-term approach

- "Think and prepare for the long term from the get-go"; "How fast bandwidth demand grows"; "Build the network more strategically with anticipated growth opportunities"; "I wish we had strung up more strand counts"

Opportunities and challenges of competition and territory expansion

- "Increase in broadband competition"; The struggles of building out of territory for take rates

Importance of talent, staffing, and training

- "Get the right people in the role. Can't be managed successfully with employees having multiple responsibilities on electric and fiber"; "It is going to be the co-op's system when the contractors leave, make sure to own the processes even in the early days of the project"; "How many people are needed to maintain the network and what is the call volume after completion and initial installation for CSR numbers"

Obligations, complexity and work with regulatory compliance:

- "The amount of work required for grant compliance"; "Cost increases with grants"; "Better defined rules for grants"; "Complexity of grant applications"; "Amount of compliance compared to the electric business"; "The burden is placed on the provider by the federal government"

Acknowledgments

A deep expression of gratitude to the 78 participating electric cooperatives. We asked you to share a lot of detailed information about your broadband technology, business, operations, and results. Your willingness to do so made this report possible. Thank you for your commitment to helping other cooperatives enhance their broadband strategies.

NRTC and NRECA were pleased to collaborate on this effort. Cooperative principles guide everything we do, and this was a wonderful opportunity for us to embody the spirit of Cooperative Principle 6. More importantly, it's what our shared members deserve–their national organizations working together for them.

NRTC and NRECA look forward to continuing the broadband conversation with our electric cooperative members, helping to evaluate technologies and technology investments that hold promise for you, your members, and the communities you serve.

About NRTC: NRTC is a technology cooperative, owned by the ~1,500 electric and telephone members that we serve. We help our members evaluate, build, and manage broadband, smart grid, and mobile networks.

About NRECA: NRECA is the national trade association representing nearly 900 local electric cooperatives. From growing suburbs to remote farming communities, electric co-ops serve as engines of economic development for 42 million Americans across 56% of the nation's landscape.

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America's Electric Cooperatives

Statistics summary

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Metric	Median	Tenure			Density			Average
		< 2 Years	2-5 Years	5+ Years	Low	Mid	Hi	
Fiber Miles	**2,089**	1,364	1,900	2,700	1,514	2,391	2,704	**2,600**
Homes Passed	**18,804**	12,034	18,607	22,012	10,240	25,415	47,116	**29,060**
Businesses Passed	**1,276**	412	1,428	2,201	552	1,410	2,851	**2,354**
Locations	**20,080**	12,446	20,035	24,213	10,792	26,825	49,967	**31,413**
Locations per Mile (calc)	**9.6**	9.1	10.5	9.0	7.1	11.2	18.5	**12.1**
Locations per Milee	**9.3**	8.5	10.9	9.0	6.7	9.6	18.6	**11.7**
% Aerial	**86%**	90%	90%	85%	90%	80%	87%	**77%**
Cost per Aerial Mile	**$25,000**	$34,231	$25,000	$21,082	$22,188	$26,400	$23,390	**$30,518**
Make Ready per Mile	**$5,345**	$6,000	$5,212	$5,000	$5,000	$6,250	$5,173	**$8,710**
Cost per UG Mile	**$66,500**	$63,360	$72,500	$60,000	$59,927	$66,680	$69,000	**$67,233**
Cost per Drop	**$1,400**	$1,325	$1,200	$1,500	$1,500	$1,325	$1,200	**$1,542**
Head End ($M)	**$1.0**	$0.5	$0.5	$1.0	$1.1	$0.4	$0.8	**$1.4**
Network Equip ($M)	**$3.6**	$0.2	$3.2	$5.0	$2.2	$3.0	$6.1	**$5.3**
Total Capex ($M)	**$110**	$72	$122	$91	$60	$121	$169	**$131**
Capex per Mile	**$39,080**	$65,456	$39,379	$34,467	$38,780	$42,424	$42,263	**$47,412**
Capex per Location	**$4,060**	$6,919	$4,223	$3,579	$5,447	$3,818	$2,115	**$4,966**
Res Take Rate (Current)	**47%**	37%	47%	52%	50%	47%	42%	**47%**
Res Take Rate (Planned)	**48%**	46%	47%	50%	60%	49%	44%	**52%**
Res ARPU	**$72**	$78	$72	$69	$72	$69	$72	**$72**

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