



June 2020

As CBRS Auction Shapes Broadband Landscape, Should Rural Operators Make a Bid?

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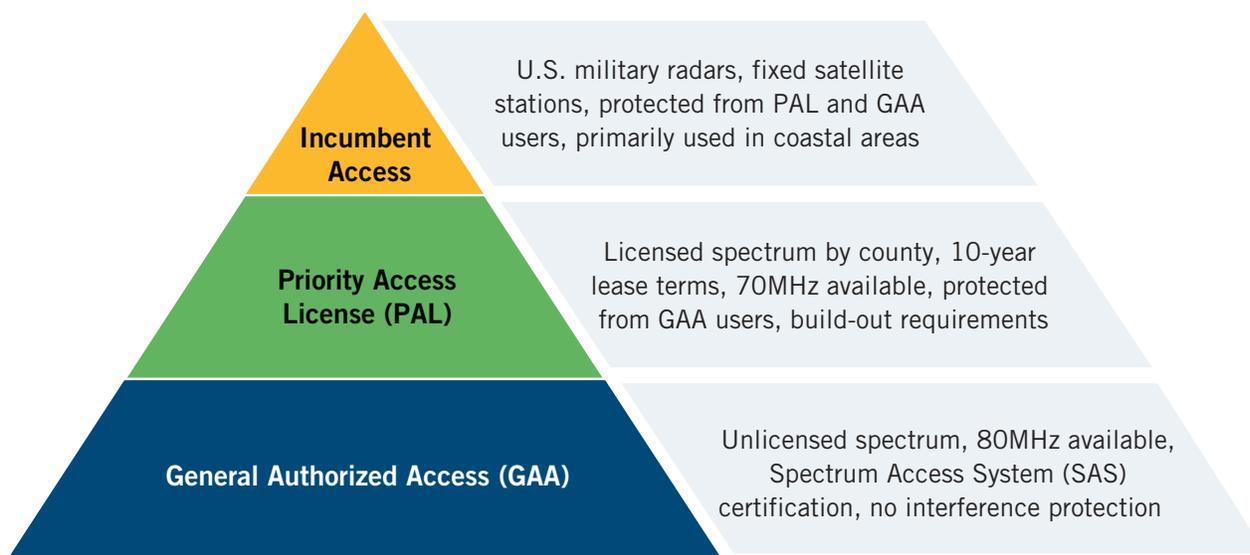
Key Points:

- The upcoming Citizens Broadband Radio Service (CBRS) auction will enable new market entrants and smaller and rural operators to build carrier-grade networks at very attractive costs. This could lead to a more fragmented industry with hundreds of new networks.
- The CBRS band includes licensed and unlicensed spectrum and the decision to acquire spectrum is a complicated one for rural operators.
- The auction is expected to be very competitive in urban and suburban markets, but county-level licenses may offer cost-effective opportunities for smaller operators to acquire spectrum in rural markets.
- Using either licensed or unlicensed portions of the CBRS band includes paying fees to and relying on a Spectrum Access System (SAS) administrator. Operators should consider long-term implications when negotiating these agreements.
- Given that market entry barriers are expected to come down, incumbent broadband operators could see increased competition from new business models.

Introduction

On July 23, 2020, the Federal Communications Commission (FCC) will start its highly anticipated CBRS auction for the licensed portion of the spectrum band. The shared nature of the CBRS band is expected to be a catalyst for new market entrants with new wireless business models. We expect bidding interest to be high. The FCC is offering spectrum licenses at the county level versus its traditional approach of using partial economic areas (PEA), which are much larger. As a result, smaller regional and rural operators will be able to participate in the auction. For these companies, the decision to buy spectrum or use the unlicensed portion of the band is a big one. In this report we look at how the CBRS band could change the broadband industry and what factors rural operators should consider when developing their spectrum strategy.

EXHIBIT 1: Citizens Broadband Radio Service (CBRS) Access Rules



Source: CoBank

CBRS

In 2015, the FCC established the shared use of the CBRS band which includes a whopping 150MHz of spectrum. This represents a significant increase in the amount of mid-band spectrum currently available. The band is bifurcated into licensed and unlicensed spectrum with 80MHz earmarked for unlicensed use and the remaining 70MHz for licensed use (*Exhibit 1*). Prior to 2015, the CBRS band was exclusively used by the U.S. Navy and other Department of Defense members. To ensure that new users of the band do not interfere with the incumbents, the FCC established third-party SAS administrators. These administrators include Google, Comscope, Federated Wireless, Amdocs, and Sony. SAS administrators effectively act as traffic cops dynamically moving users to radio channels to ensure government agencies are not interfered with.

It's important to recognize that all tier-one wireless and cable operators will acquire licensed CBRS spectrum. This will spur equipment and technology companies to create a robust supportive ecosystem that could be larger than anything the industry has seen. This means small operators or new market entrants may be able to build carrier-grade wireless networks at a significant discount compared to a pre-shared spectrum environment.

And with CBRS spectrum, data speeds will easily exceed the FCC's minimum broadband requirement of 25Mbps/3Mbps, and be comparable to the average fixed broadband download speed of 132.6 Mbps.

Spectrum Strategy for Rural Operators

The CBRS auction presents rural operators with an opportunity to acquire mid-band spectrum at affordable prices. Past spectrum auctions were not rural friendly, given the large geographic areas that the limited number of licenses covered. For example, the CBRS auction includes 22,631 Priority Access Licenses (PAL) in 3,233 service areas (counties) whereas in Auction 97: Advanced Wireless Service (AWS) only 1,614 licenses were available. Fewer licenses covering large geographic areas generally results in higher costs.

The question for rural operators is whether to buy a PAL/s or use the unlicensed portion of the band.

Arguments Against Buying

Buying spectrum ties up capital, which is an important consideration for some rural operators. Exclusively using unlicensed spectrum, which comes with no up-front acquisition costs, is arguably the right approach in rural America where radio frequency interference

EXHIBIT 2: CBRS Valuation Examples for Rural Markets

MARKET DEMOGRAPHICS AND BROADBAND AVAILABILITY							SPECTRUM VALUATION	
County	State	Population	Percent of Population Coverage				Estimated PAL Cost per 10Mhz Block	
			Speed in Mbps				Low End	High End
			4/1	10/1	25/3	100/10	\$0.023	\$0.100
Harney County	Oregon	7,422	100%	100%	100%	1%	\$1,670	\$7,422
Humboldt	Nevada	16,528	100%	100%	100%	0%	\$3,719	\$16,528
Shannon County	Missouri	8,441	100%	100%	100%	0%	\$1,899	\$8,441
Coconino County	Arizona	134,421	100%	100%	100%	64%	\$30,245	\$134,421

Source: FCC Broadband Maps; U.S Census; CoBank Estimates

Note: Spectrum costs do not include SAS fees

concerns will be less of an issue. For example, the U.S. Navy, which is one of the main incumbent users in the CBRS band, doesn't typically operate in rural areas of the country.

Arguments for Buying

Owning a PAL gives the operator priority access to the CBRS band over unlicensed users, which results in better network performance. And with better network performance, the operator could charge a higher fee for its service and should see less customer churn. Also, licensed-based networks could generate wholesale roaming revenue. All tier-one wireless carriers are expected to acquire some CBRS spectrum, thus all of their handsets will support the band. In areas where these carriers don't have coverage, a third-party CBRS network can supplement coverage.

Spectrum Valuations

CBRS spectrum valuations will vary based on competitive bids and the number of residents in a county. Valuing spectrum is notoriously hard to do, but most of the estimates range from \$.02 per MHz-POP in rural markets and up to \$.30 per MHz-POP in urban markets. We think the CBRS auction will be competitive. The spectrum is central to U.S. operators' 5G networks thanks to the network capacity it offers and its attractive propagation characteristics versus millimeter wave spectrum (which

is the other band often referred to in 5G networks). In particular, we see Verizon being one of the most active bidders given its thin holdings of mid-band spectrum.

However, bidding activity in high-cost counties may be less competitive making the cost to acquire a 10Mhz channel attractive (*Exhibit 2*). We think that operators can build a high-quality network by acquiring a small amount of licensed spectrum. Having the ability to toggle between licensed and unlicensed channels allows operators to maintain high throughput speeds. For example, when data traffic levels are high, operators can use their licensed spectrum as an overflow channel and when data traffic is light, they can use the lower-cost unlicensed channel.

SAS Administrators

SAS fees apply to both licensed and unlicensed users and will likely be charged on a per-user, per-month basis. Five SAS providers are currently authorized, and outside of Google's announced \$2.25 per user per household (for fixed wireless), pricing is unknown. Contracting for SAS services is generally done in two ways: directly with the SAS providers or by bundling the services into an infrastructure equipment contract. The latter could be a better option if the equipment is priced aggressively, which it should be given the large number of CBRS equipment manufacturers expected to be in the market.

EXHIBIT 3: CBRS Network Cost Analysis For a 200 Home Homeowners Association

Up Front Costs	
RF Equipment (3 Towers)	\$45,000
RF Equipment (\$200 per Home)	\$40,000
Poles (3 Poles)	\$30,000
Labor	\$60,000
Total Up Front Costs	\$175,000
Monthly Costs	
Loan Payment (7 Year Loan for Up Front Costs)	\$3,000
Managed Services	\$2,000
Power and Backhaul	\$2,500
Monthly SAS Fee	\$500
Total Monthly Costs	\$8,000
Monthly Broadband Cost per Home With Loan	\$40
Monthly Broadband Cost per Home Without Loan	\$25
Average Broadband Cost per Home in The US	\$66.20

Source: The Brookings Institution; CoBank estimates

However, operators need to recognize that SAS fees from an equipment manufacturer will likely be marked up. Therefore, it's prudent to conduct a detailed analysis of the two alternatives.

Operators need to be mindful of the risks associated with entering a long-term SAS agreement, as the administrator could have negotiating leverage when the original contract expires. This is because after an operator activates several thousand CBRS subscribers, they will likely become a meaningful source of revenue. To ensure these revenues keep flowing, the operator needs to partner with an SAS administrator. This kind of dependency could give SAS administrators the upper hand in future negotiations. Therefore, it is important to be wary of deals that are cheap up front but eventually exploit an operator's potential vulnerability. Operators should look for creative deal structures that manage these future cost risks. For example, a SAS administrator could aggregate licensed CBRS networks and sell

wholesale access to national wireless operators, cable operators, enterprises etc. The proceeds could then be shared with the network owners, which would help offset SAS fees.

New Business Models

The CBRS band and associated shared spectrum methodology is expected to usher in new business models with new market players. For example, entities that have registered interest in participating in the FCC auction include not only national telecom operators, but also notable newcomers such as Chevron, Occidental Petroleum, fiber supplier Corning, John Deere, and numerous universities.

For rural America, John Deere stands out for its investments in agricultural technologies. Deere's interest in buying spectrum may signal its intent to become a network operator where

it bundles high-speed data connectivity with farming equipment. After all, the company's investments in precision agriculture, etc. won't be fully realized until access to high speed data networks broadens in rural America.

Other potential business models could be more disruptive to incumbent broadband providers.

For example, network engineering firms are pushing the concept of broadband network ownership for homeowner associations and small cities that lack a competitive broadband market. In theory, a homeowner association with 200 houses could build a CBRS fixed wireless broadband network and have a third party manage it, potentially cutting their members' broadband bills in half (*Exhibit 3*). The rationale is that a homeowners' association already owns and manages community pools, common grounds, gates etc., so why not own the broadband network? For rural America, this business model could also apply to farmer cooperatives that

operate in unserved and underserved markets, and that are not affiliated with a local rural telecom operator.

Of course none of this will happen overnight. There are thousands of homeowners' associations and the like across the country, and convincing them to deploy their own networks is akin to herding cats. And while it's easy to dismiss this threat, we think there are parallels that can be drawn between what Google did to the broadband industry in 2010 and what CBRS could do to it today.

In 2010 Google announced plans to deploy Google Fiber, a fiber-to-the-home service that offered speeds 100 times faster than average speeds at the time. After six years and six markets later, Google announced it was "pausing" future deployments.

Looking strictly through the lens of a broadband service provider, Google Fiber was a failure – it didn't gain material share and wasn't able to scale the business to profitability. But what Google Fiber did do was force cable operators to invest billions upgrading their networks to "fend off" competitive threats from Google and its war chest of money. These network investments were strategically important to Google and its YouTube business. In order for YouTube to grow into its potential, Google management knew that home broadband speeds needed to be much faster. Google Fiber accomplished just that. Looking back, one could argue that the main reason for YouTube's success is Google Fiber.

Google bought YouTube in 2006 for \$1.65 billion. According to Wall Street research firm Needham, YouTube could be worth \$300 billion if it were a standalone company. The Google Fiber project was well worth it!

Could we see Google, Amazon or Facebook threaten to build low-cost, fixed wireless CBRS networks with the goal of reducing broadband fees for consumers? After all, cheaper internet access only helps these companies. More people subscribing to faster data connections would allow them to access a greater number of applications offered by the internet giants. Or perhaps there are other strategies that include new entrants building CBRS networks to enable them to expand into adjacent markets at the expense of the broadband industry's margins.

Conclusion

The CBRS auction introduces new options for rural operators to build carrier-grade fixed wireless networks with attractive economics. The shared nature of the CBRS band gives operators the option of buying licensed spectrum or using unlicensed spectrum. For remote parts of the country, it probably makes sense for operators to use unlicensed spectrum as interference from incumbent users will be low. All CBRS users will need to contract with a SAS administrator and carefully consider how these contracts are structured to reduce the administrator's leverage when renegotiating the contract. And finally, the CBRS band is expected to usher in new market entrants and new business models that could disrupt the broadband industry. ■

Sources Used

<https://frankrayal.com/2020/01/31/cbrs-spectrum-valuation/>

<https://www.fcc.gov/auction/97/factsheet>

<https://markets.businessinsider.com/news/stocks/youtube-value-as-separate-company-is-300-billion-analyst-says-2019-10-1028641059>

<https://hbr.org/2018/09/why-google-fiber-is-high-speed-internets-most-successful-failure>

<https://www.thrillist.com/news/nation/how-much-internet-costs-in-every-country>

<https://www.speedtest.net/global-index>

<https://www.lightreading.com/5g/verizon-atandt-charter-cox-dish-among-cbrs-auction-bidders/d/d-id/761573?>

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