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Digital Beat

FCC's Rural Digital Opportunity Fund Auction Was Supposed to Significantly Reduce America's Rural Broadband Gap

Communities Will Have to Contend with Broadband Uncertainty for Many Years to Come



Rivkin-Fish

The Federal Communications Commission (FCC) recently completed its Rural Digital Opportunity Fund (RDOF) auction. The goal of the auction was to bring to rural areas across the United States the same affordable and reliable broadband service enjoyed in many urban and suburban areas. A review of the results of the auction shows it is unlikely the FCC attained its

goal—and for America's rural communities, the ongoing uncertainty is likely to persist for some time.

As I describe in detail below, CTC Technology & Energy analysis of the RDOF results points to a few key takeaways for local communities:

- If SpaceX's Starlink low earth orbit satellite network won in your area, RDOF failed to incentivize any new investment in terrestrial broadband deployment—and the FCC's funding will go to an untested technology that likely would have become available to your community anyway.
- Intense competition in the RDOF reverse auction led some gigabit providers to accept such low levels of support that they may not be able to secure financing to build their networks—raising doubts about the ability of some awardees to deliver on their commitments.
- Because RDOF winners are only obligated to complete 40 percent of their build-out by the end of the third year of funding,

it may be years before a community can determine whether an awardee will deliver as promised.

- If an auction winner does not deliver on its commitments, it is unclear when those awarded areas will be eligible for additional federal funding.

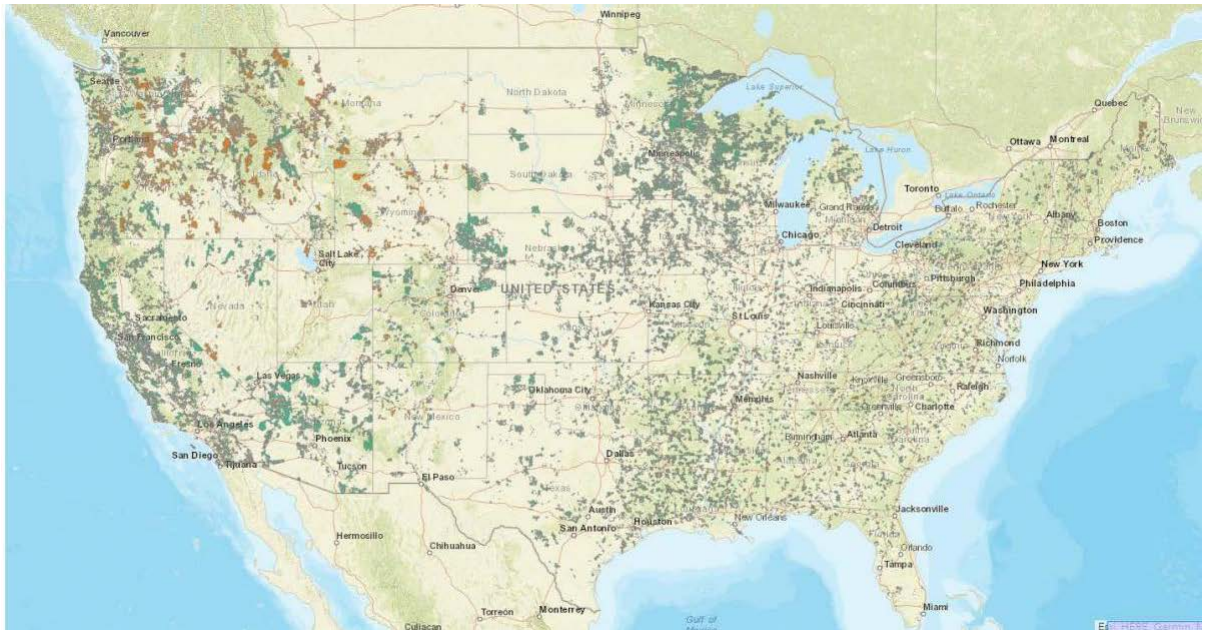
The Impact on Your Local Community and Prospects for Getting Real Broadband Anytime Soon

The auction outcome has introduced an enormous measure of uncertainty for many communities. A grant strategy for quickly getting broadband to your community might now have disappeared, because federal and some state broadband grant programs will not fund a project that overlaps with a previously awarded area. Many unserved communities might find themselves in limbo, because we may not know for years which areas will see broadband service from the auction winner.

At worst, the auction outcome could result in enormous opportunity costs, with a significant share of U.S. residents precluded from getting fast, future-proof broadband solutions. At best, it could mean that many of those same citizens find themselves with a viable alternative to their current limited options—including, in many areas, short-term fixed-wireless solutions that offer inconsistent coverage and speeds, or no solution at all.

If you are in one of the communities where RDOF support was awarded in the gigabit tier, and if the awardee is not a local fiber-to-the-premises (FTTP) provider, you have homework to do to get clarity from your new provider on its financial health, design approach, and build-out plans. If the awardee is SpaceX's Starlink low earth orbit satellite network, RDOF will not result in any new terrestrial broadband deployment in your community. Your ability to access financing for new network build-outs will largely depend on whether future broadband grants will exclude satellite solutions from eligibility. In any case, be prepared for the possibility that more creative or more expensive solutions will be needed if you plan to provide your rural constituents with reliable, high-speed broadband in the near future.

Figure 1: RDOF Winners by Tier and Latency
 (<https://www.ctcnet.us/analytics/r dof-winners/>)



You can explore the RDOF results on CTC Technology & Energy's [RDOF mapping application](#). We will update it as the FCC publishes reassignments to individual providers among the consortium bidders. [If you are interested in exploring the results of the Citizens Broadband Radio Service (CBRS) auction, CTC Technology & Energy has a [CBRS tool](#) as well.]

A Reverse Auction Is a Complicated Thing

In the RDOF auction, broadband service providers bid for “eligible census blocks”—areas in which providers had reported that they currently offer no service. For a given bidding area, the FCC had calculated and assigned a “reserve price.” That price was intended to reflect the amount of financial support required to level the playing field so that rural providers could charge equivalent rates and expect similar returns on investment as do providers in urban areas. This was a “reverse auction” in which participants bid on a progressively decreasing percentage of the reserve prices associated with the eligible census areas.

With each new round of the auction, the amount of implied support decreases as a percentage of the reserve price. The decrease depended on the round's clock percentage and a bidder's weight for the technology offered in that area. The weight is essentially a "penalty" deduction with the lowest weight (i.e., zero) assigned to gigabit-speed, low-latency services and the highest weight (90) assigned to minimum-speed (25/3), high-latency services. The higher the deductions, the lower the amount of support a bidder will receive. For a given broadband provider, when the auction clock dropped below the level of the provider's weight deduction, the provider could no longer bid, since that level would imply no support. Therefore, the higher a bidder's weight deduction, the sooner the bidder might be out of the running.

The FCC Changed the All-Important Weight Criteria Mid-Stream

On June 11, 2020, the FCC released [Public Notice 20-77](#), in which the FCC responded to comments on an earlier proposed set of rules. In the context of discussing whether new technologies could claim gigabit service or low-latency service or both, the FCC wrote:

“ Some technologies lack demonstrated capabilities to perform at certain speed and latency combinations—and we generally do not find it prudent to authorize bidding for performance tier/latency/technology combinations that lack a proven track record of deployment at the speeds and latencies we expect will actually occur. The record demonstrates significant concern regarding applicants that propose to use technologies that have not been widely deployed to offer services at high speeds or low latency, or have not been deployed at all on a commercial basis to retail consumers. [Auction 904](#) is not the appropriate venue to test unproven technologies using universal service support.

The FCC also categorically excluded a variety of technologies—including low earth orbit satellite—from bidding in the gigabit service tier:

“

“ Thus, we will not allow an applicant that intends to use any form of satellite technology, whether geostationary, high earth orbit, medium earth orbit, or low earth orbit, to select the Gigabit performance tier. Moreover, we will not allow an applicant that intends to use geostationary, high earth orbit or medium earth orbit satellite technology to select low latency.

The FCC statements were widely interpreted to mean that SpaceX could not qualify for a low-latency rating or the gigabit performance tier because it intended to use satellite technology for which it lacked an operational track record. However, the FCC left a door open for SpaceX to prove its case:

“ An applicant proposing to use low earth orbit satellite technology will have the opportunity to demonstrate in its short-form application to Commission staff that it is reasonably capable of offering service meeting the low latency requirements. For the Above Baseline, Baseline, and Minimum performance tiers and for high latency, we retain our prior approach of reviewing all technologies on a case-by-case basis.

Because the RDOF short form was due only a month after the July public notice, SpaceX would have had an uphill battle persuading the FCC that it could meet the requirements. But the FCC left a window open for the next phase of RDOF, if SpaceX by then had a subscriber base and could provide real-world results:

“ The Commission will have an opportunity to consider whether subsequent changes in the marketplace or other new information warrant modifying these decisions in Phase II.

FCC's Decision Allowed SpaceX to Have a Huge Impact on the Outcome of the Auction

And then a funny thing happened on the way to the auction: SpaceX persuaded the FCC to accept a low-latency rating despite its lack of an operational network with “paying subscribers” and a track record. SpaceX based its low-latency rating on beta test results of its

emerging network.

The impact was immense. SpaceX's weight in the auction went from an expected 60 to 20.

If SpaceX had had a weight of 60, here is an example of how the auction might well have worked. With the auction clock at 70 percent, a gigabit fiber-optic provider with weight of zero who won a given area would receive 70 percent of the maximal support. Meanwhile, SpaceX, with a weight of 60 percent, would receive only 10 percent: the 70 percent auction clock deduction minus the 60 percent weight deduction. (It is worth noting that SpaceX can succeed with 10 percent support, or even less, because—unlike most other bidders—SpaceX plans to build its network regardless of RDOF support. In effect, any RDOF funds will be “free money.”) The real advantage for other bidders would have occurred if the auction closed at 60 percent. SpaceX could not have bid on an implied support level of zero, so, effectively, it would have been forced to bow out.

But SpaceX had a weight of 20, which is a very different matter. At the clearing round, when there is a sole bidder with the lowest weight, the corresponding area is assigned to that bidder and does not “carry forward.” On the other hand, when multiple bidders are tied for the lowest weight when the auction clears for a given area, that area carries forward.

So when the areas in question carry forward, the total value of available support is reduced because of the decreased auction clock percentage, while the relative competitive advantage of SpaceX's low weight of 20 is increased. As an example, let us say SpaceX was bidding against fixed-wireless and coaxial cable providers, which, unlike SpaceX, have additional, significant capital costs to extend their infrastructure. SpaceX could win all areas by bidding until its competitors could no longer justify the decreasing amount of support. The competitors would be required to reach all locations in those areas, entailing significant capital costs.

SpaceX's participation altered the market in other ways as well. Normally, we would have anticipated cable providers to do well. But unless they decided to deploy gigabit service—using fiber—they

would be outcompeted by SpaceX. They would no longer win against a low earth orbit satellite provider through the advantage of their lower weight. They would be forced to slog it out in a carry-forward auction in which SpaceX would have an overwhelming advantage: It would have had no additional capital costs for extending service. The cable companies seem to have been well aware of this potential dynamic and opted to bid on fiber rather than coaxial cable to gain that critical advantage. When feasible, gigabit was the way to go, and if you are going to go gigabit anyway, fiber-optic technology usually makes the most sense.

So who were the losers due to this change?

- The **geostationary high orbit satellite providers HughesNet and Viasat**, had no chance of competing against SpaceX. Those satellite providers have a large advantage in that their networks are already built. They do not have to build expensive infrastructure to extend service. This situation created a distorting effect in the auction that preceded RDOF—the Connect America Fund (CAF II) auction. The FCC altered some of the rules and weights to ensure there would not be a “race to the bottom.” The high orbit satellite providers would still be able to pick up areas that nobody else would bid on. But now, SpaceX would be able to claim a higher speed tier *and* a lower latency. The weight differential was suddenly very large, but SpaceX did not have to add more satellites or ground stations than the ones it had already planned to build. In the end, HughesNet won areas only in Rhode Island.
- **Fixed wireless providers** using currently implemented technologies were also at a huge disadvantage. A technology that has lower capital costs and faster deployment than most other providers would be a welcome solution for some remote areas where high-speed wireline solutions are not feasible. If SpaceX had been assigned a high-latency rating, fixed-wireless operators would have won at the clearing round in areas where they were competing with SpaceX because their low-latency rating would have given them a lower weight.
- But even **some fiber-optic providers** had to jump off before the clearing round because their anticipated capital costs could

not justify the support levels with which they might have been stuck. Fiber-optic providers, especially small local and regional ones, face high initial capital costs but low operating costs. Over a long period of time—say, 14 years—fiber is superior. It certainly delivers much higher speeds and is relatively “future proof” against any bandwidth requirements. But, for a small operator, financing over such a long period of time is risky and difficult. The result is that some small fiber-optic providers would bow out early on in the face of aggressive bidding driving down the clearing clock—which again would be to SpaceX's benefit because their competitors would bow out before winning by default in the clearing round based on lower weight.

How Fixed-Wireless Disappeared

The FCC made it clear in its July 2020 Public Order that it would allow fixed-wireless providers to claim gigabit speeds on a case-by-case basis. The context in the order still placed the burden on auction applicants to prove their cases, and the FCC certainly strongly suggested that the lack of a track record for an operational residential service of a given technology would require the FCC to apply a great deal of scrutiny to such claims.

We had seen at least some fixed-wireless providers and cable companies intending to use CBRS or C-band spectrum to deliver broadband service. Many fixed-wireless providers and large cable providers who claimed gigabit tier had also recently won CBRS-spectrum licenses and are participating in the C-band auction currently underway.

A gigabit designation for fixed-wireless solutions would have an enormous impact because it would allow such bidders to bid very deeply into the auction at weight zero and to win many areas outright, without having to deploy expensive fiber infrastructure in rural areas. It does not seem that the FCC allowed auction participants to claim a gigabit tier to be assigned to fixed wireless in isolation. But several providers such as Starry, Resound, and NextLink were allowed to claim gigabit fixed wireless in addition to fiber-optic gigabit. Without a network architecture, it is difficult to tell the extent to which they plan to deploy fixed wireless, whether gigabit speeds will be achievable, and where in the network it would be deployed. If used strategically

and sparingly in what otherwise is a fiber-optic design, it could deliver gigabit performance while plugging potentially expensive gaps.

The FCC does not make it easy to discern the technology bidders would claim when bidding in particular tiers, but it does make available some information applicants for the auction had to disclose about their technology prior to the auction. Although it is tedious work, it is largely possible to “reverse engineer” what the technology for a particular tier would be for each bidder by reading its short form submission to the FCC. From that information, interesting patterns emerge. Some fixed-wireless companies signed up not just in the three lower tiers of speed below gigabit but also for fiber-optic deployments in the gigabit tier. Conversely, cable companies signed up for gigabit with fiber-optic technology but also with fixed wireless in the lower-speed tiers.

However, in the results, you can hardly see the fixed-wireless offerings in the lower-speed tiers. Few fixed-wireless solutions made it past the clearing round. Their higher weight made them lose instantly against SpaceX or gigabit competitors. And those who, like SpaceX, were able to claim above-baseline speeds had to give up shortly after. Some fixed-wireless providers remained to the bitter end, perhaps to prevent a competitor from making inroads into an area where they had towers and assets and had been planning to upgrade their equipment.

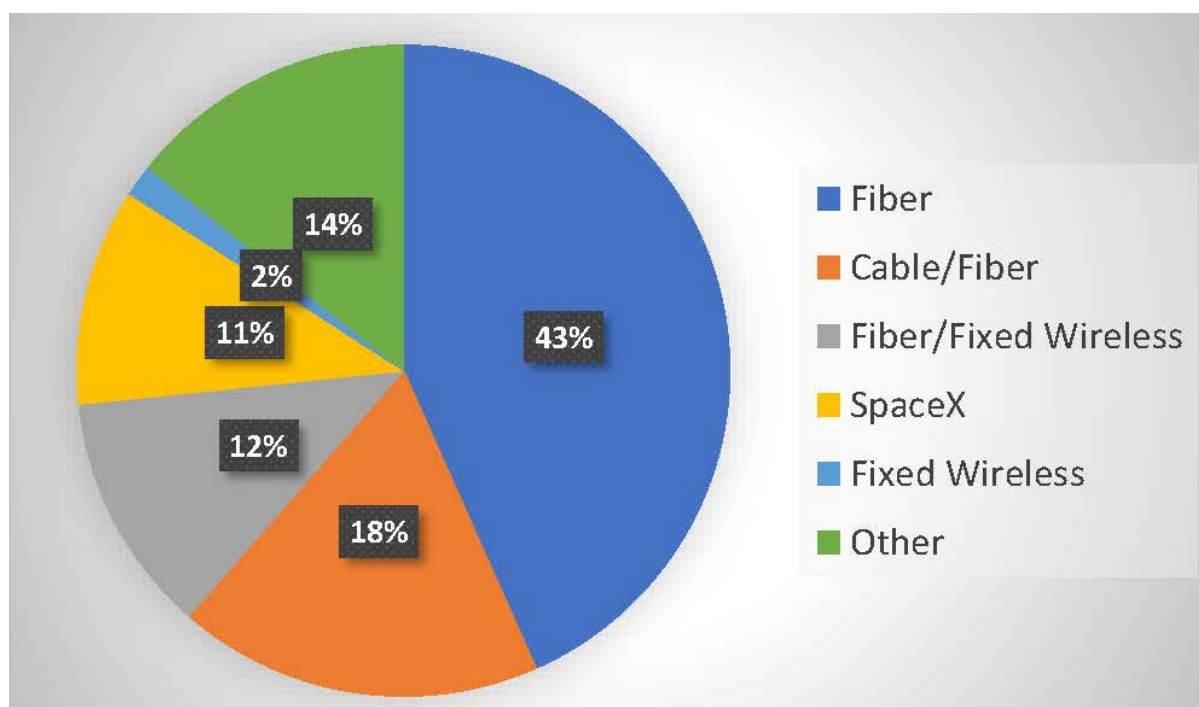
Where SpaceX Did Not Prevail, Gigabit Emerged Victorious

The dynamics of the auction gave gigabit a big advantage (by design, of course). But SpaceX's aggressive bidding compounded the effect. With so many areas bid on at low weights, it took until round 13 for the budget to clear—when the bidding clock was at 60 percent. By then, most lower-tier providers had to bail, but so did some fiber-optic providers. Those providers who could not make a relatively low support level work -- or who were not confident in getting a letter of credit from a bank to cover the anticipated capital expenses for the areas (given a substantial reduction in FCC support) -- also had to stop bidding. There might have been local coaxial cable providers who intended to bid in the same tier as SpaceX and who were

outgunned at this point. To confirm, we would need to further map the short-form data in the rounds immediately before and after the clearing round. An initial analysis shows that many coaxial cable providers eligible to participate in the auction either decided not to participate, lost out in earlier rounds, or decided to bid in the fiber-optic gigabit tier if they had signed up for that as an option in the short form.

The result is a heavy tilt toward gigabit, primarily in the form of pure FTTP, FTTP with some gigabit fixed-wireless mixed in, or FTTP/coaxial cable in the gigabit tier. After that comes SpaceX as the single provider committed to servicing the most locations (and, of course, it makes up 100 percent of the low-orbit satellite category).

Figure 2: RDOF Winners by Provider Type



It Is Not Clear the Winning Bidders Can Make the Finances Work

As I pointed out before, the auction cleared much later than anticipated due to bidding by gigabit providers and SpaceX on just about all available areas. With low weights and therefore larger levels of support, it took a while to get the total costs under the available budget. But in the clearing round, less than half of the total available

locations were automatically assigned. (Assignment in the clearing round went to sole bidders or bidders with weights lower than any other bidder.) Because of heavy competition, more than half of the available locations were still in play. In many cases, there were still three or more bidders competing for a census area.

Competition was furious, with gigabit providers driving each other to the bottom. In round 18, with the support clock at 10 percent, more than a quarter of locations were still in play. In the final round, with the clock at 0 percent, remaining providers were bidding in the single digits, sometimes as low as 1 percent. The auction went well beyond calculations of returns on investment (balancing anticipated RDOF support revenue and earnings potential against capital cost projections). The logic for many remaining participants was an existential need to block a competitor from access. In rural areas, the take-rate—the percentage of locations that will sign up for a provider's service—is everything. An urban market, with its density and much lower construction cost per potential subscriber, can sustain multiple providers in healthy competition. Rural areas with two capital-intensive fiber-optic providers could mean neither obtains a take-rate that makes their network profitable to operate.

Presumably, large national providers can take such losses on the chin, but we should worry about smaller local or regional providers who may have been driven down to unsustainable support levels with little prospect of digging themselves out in the future. Of particular concern might be electric utilities that have prepared for years for the auction and potentially invested in infrastructure or made promises to their constituents that forced their hand in the auction. A separate analysis of the types of providers that remained, and at what support levels they were assigned, would be needed to get a better sense of the potential risks.

Can SpaceX and Gigabit Deliver?

RDOF auction winners are obligated to make service available to *all* FCC-determined locations in an assigned census block. Winners have an obligation to complete 40 percent of their build-out by the end of year 3, with an additional 20 percent commitment for each subsequent year, so that the network is built out by the end of year 6.

The status of the build-out is measured at the state level, however, and the clock does not start until all the paperwork has been processed and the FCC has approved the winner to start receiving subsidies. That process could easily take half a year. Winners also have an obligation to deliver on promised performance, but here again performance tests are not mandated until several years into the project, and then only for a sample of addresses that have been activated. The result is that, for a specific community, it could easily take four to six years before the local community will know if a provider is delivering.

SpaceX committed to deliver 100/20 Mbps, but the network requires both a large number of low-orbiting satellite and an extensive and costly terrestrial base station network. Pilot testers on the emerging network—which is not yet commercially open for business anywhere—report test results in the target area. Those results are certainly promising. But there is a lot we do not know. The network is very expensive to deploy, and we know very little about its economics. In addition, SpaceX will face competition from other low earth orbit satellite providers that are currently deploying, creating uncertainties about the ability of either SpaceX or its competitors to generate sufficient revenue to justify the initial and ongoing investments required. If Space X is not able to generate sufficient revenue, or if its satellites or other infrastructure fail at faster rates than anticipated, the result might be a downscaling of investments, leading to connectivity and capacity issues.

For gigabit-fiber providers the question is different. RDOF was designed to provide long-term stability in a financially risky environment by guaranteeing a sufficient level of ongoing support over a 10-year period. But some of the winners might not even pass the next milestone of producing a letter of credit from an approved bank. And if they can but struggle to meet their obligations under the low levels of support they won in the auction, it is not clear what the repercussions would be for potential customers if a fiber-optic network is only partially completed. It is also not clear when those areas would be eligible again for federal grant funding.

In other words, there is a great deal of uncertainty about whether the major winners of the RDOF auction can actually deliver. It could be

years before we see the evidence one way or the other. In addition, low earth orbit satellite requires expensive ongoing investments. SpaceX, in particular, is not a “build-it-once-and-be-done” proposition. For FTTP, the capital-intensive costs could quickly put a provider in the red, requiring a local bailout or sale of assets. We might very well be back where we started in a few years with the very same unserved communities.

If SpaceX is contemplated as an interim solution and the gigabit winners can deliver a sustainable fiber-optic infrastructure wholly or partially, then there is a lot to cheer about, even with the less-than-ideal decisions the FCC made. However, there is a real danger that many rural subscribers and communities can look forward to many years of frustration trying to get broadband comparable in speed, latency, reliability, and price to the broadband their urban counterparts enjoy.

Ziggy Rivkin-Fish is an analyst who specializes in project management and process planning. He has advised local governments, large consortia, and other public sector clients regarding the governance issues raised by inter- and intra-jurisdictional communications projects and networks.

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