Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC  20554

In the Matter of

Establishing a 5G Fund for Rural America

GN Docket No. 20-32

COMMENTS OF VERIZON

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Verizon supports the Commission’s proposal to create the 5G Fund for Rural America ("5G Fund") as another important step in addressing our nation’s digital divide. With the 5G Fund, the Commission can help ensure that high-speed 5G services are deployed in a timely manner throughout rural America, including those remote and sparsely-populated areas in which there would otherwise be no business case for deployment. To realize the full potential of the 5G Fund and target support where it is most needed, the Commission should (1) hold Phase I of the auction in 2022, after it has collected better maps; (2) divide the 5G Fund budget evenly between Phase I and Phase II to leverage lessons learned as the 5G ecosystem develops; (3) and ensure consistency between mapping parameters and test procedures. We address each of these points below.

I.  INTRODUCTION AND SUMMARY

Hundreds of billions of dollars of carrier investment, supplemented by a smaller amount of universal service support, have enabled the deployment of mobile broadband services to almost all Americans, even in rural areas. According to the latest Commission data, over
99 percent of rural Americans have access to 4G LTE mobile broadband\(^2\) and over 94 percent of rural Americans have access to at least three mobile broadband networks.\(^3\)

The same competitive forces that drove the widespread deployment of 4G LTE will also drive the deployment of high-speed 5G services in much of the nation, including rural areas. However, there are some remote areas where there will not be a business case for the deployment of high-speed 5G services, just as there was no business case in some areas for the deployment of 4G LTE. Where the terrain is challenging and there is little population or vehicle traffic, the cost of constructing a tower and deploying fiber backhaul facilities can be too high to recover from the small number of potential customers.

Verizon agrees that it makes sense to pivot from the Mobility Fund Phase II (“MF-II”) to the 5G Fund, given that carriers will be widely deploying high-speed 5G services in the years ahead. By creating the 5G Fund now, the Commission will be able to ensure that 5G is deployed in a timely manner even in areas where there would otherwise be no business case for deployment. But designing the 5G Fund rules now will be challenging: Because the deployment of high-speed 5G services is in its early stages, the Commission will have to make predictive judgments about offered 5G speeds and the areas that will require support.

In light of that challenge, the Commission should not spend almost all of the proposed $9 billion budget in the Phase I auction, as is proposed in the *NPRM*.\(^4\) Rather, it should reserve at

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\(^1\) The Verizon companies participating in this filing are the regulated, wholly owned subsidiaries of Verizon Communications Inc.

\(^2\) *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, 2020 Broadband Deployment Report, GN Docket No. 19-295, FCC 20-50, at Figure 2a (April 24, 2020).

\(^3\) *Communications Marketplace Report*, Report, 33 FCC Rcd 12,558, ¶ 45 at Figure A-32 (2018) (“*Communications Marketplace Report*”).
least half of the fund budget for Phase II, so that the Commission will have more resources to apply any lessons learned from the Phase I auction and to incorporate new information from the first years of commercial 5G deployments, such as actual offered speeds, usage, and deployment patterns.

The proposed descending-clock reverse auction framework is generally reasonable. To identify eligible areas, the Commission should adopt “Option B,” i.e., determine the eligible areas using the 5/1 Mbps 4G LTE coverage map that is required by the Broadband DATA Act. The Commission should also (1) set a higher speed target than the 35/3 Mbps benchmark proposed in the NPRM; (2) relax the proposed 75 percent minimum area deployment target in the most challenging areas; and (3) rely almost exclusively on propagation modeling to assess recipients’ compliance with the deployment milestones.

II. THE COMMISSION SHOULD DIVIDE THE BUDGET EVENLY

Rather than commit $8 billion – almost the entire proposed $9 billion budget -- to the Phase I auction, the Commission should commit no more than half of the budget to Phase I. Dividing the budget more evenly between Phase I and Phase II makes sense for at least three reasons.

First, committing almost the entire budget to Phase I is risky. The Phase I auction will be the Commission’s first large-scale mobile broadband universal service auction, and will use an auction framework that differs in key respects from the Connect America Fund (CAF) auction

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framework. For example, the proposed “adjustment factor”-based approach to determining support amounts differs from the approach used for the 2018 CAF auction. Rather than risk such a large percentage of the program budget on a new mechanism, the Commission should first test the auction mechanism on a smaller scale, just as the Commission tested the CAF auction mechanism on a smaller scale in 2018 before adopting it for the much larger Rural Digital Opportunity Fund (RDOF).

Second, the Commission will have better information about 5G capabilities and deployment patterns by the time the Phase II auction starts. For the Phase I auction, the Commission will be setting the service obligations and defining the eligible areas based on predictive judgments about 5G deployment. Because more commercial deployment will have occurred by the time the Phase II auction starts, the Commission will be able to adjust the program rules based on additional information about the capabilities of commercially-deployed 5G services and the factors that are driving 5G deployment. The Commission will also be able to take into account lessons learned from the Phase I auction. Based on that new information, the Commission could refine the auction rules for Phase II by, for example, adjusting the speed and usage requirements or modifying the deployment requirements or “adjustment factor” to encourage deployment in areas left unserved by Phase I.

Third, the Commission will be able to spend contribution dollars more efficiently. “Among the goals and purposes of the Universal Service program is…to award support in a fiscally responsible manner, thereby minimizing the universal service contribution burden on consumers and businesses.”6 The Phase I auction will be more competitive with a $4.5 billion

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budget than with an $8 billion budget. Moreover, a smaller Phase I auction would give the Commission the option to reevaluate, based on the Phase I auction results, whether the full $9 billion – twice the size of the budget adopted for MF-II – is in fact necessary to achieve the goals of the 5G Fund.

III. THE COMMISSION SHOULD USE OPTION B FOR THE PHASE I AUCTION

To define the eligible areas for the Phase I auction, the Commission should adopt Option B, i.e., define areas as eligible for Phase I auction only if they currently lack unsubsidized 5/1 Mbps 4G LTE coverage according to the new coverage maps required by the Broadband DATA Act. The Commission should not adopt “Option A,” which would define the eligible areas using a specified definition of “rurality,” regardless of whether an area is already served by mobile broadband or not.

The lack of unsubsidized 5/1 Mbps 4G LTE is a reliable indicator that 5G deployment in an area would likely require universal service support. If there is no 5/1 Mbps LTE coverage in an area today, then there are likely no existing towers and backhaul facilities in close proximity that could be used to provide high-speed 5G services. And the lack of a business case for the deployment of 5/1 Mbps 4G LTE shows that there is unlikely to be a business case for the deployment of high-speed 5G.


7 See NPRM, ¶ 44 (“[W]e seek comment on whether budgeting $8 billion for Phase I of the 5G Fund may reduce the efficiency of the auction and whether a smaller budget for Phase I of the 5G Fund would be more appropriate.”).

8 Id., ¶¶ 37-38.

9 Id., ¶¶ 24-29.
By contrast, the evidence shows that a population density-based rurality metric alone is a poor predictor of mobile broadband deployment. Current 4G LTE deployment patterns, and Commission staff’s own analysis in support of the proposed adjustment factors, show that mobile broadband deployment depends not only on population density, but also on a combination of many other factors, including remoteness, vehicle traffic volumes, and terrain.\(^\text{10}\)

Certainly, the specific rurality test proposed in the \emph{NPRM} is overbroad. Under that proposal, which would define as eligible any census tract associated with the U.S. Department of Agriculture’s Rural-Urban Commuting Area Codes (RUCA) 5-10, as much as 67 percent of the nation’s land area (excluding Alaska, Puerto Rico, and the US Virgin Islands) would be eligible for the Phase I auction.\(^\text{11}\) A comparison of the RUCA map to maps of 4G LTE deployment shows that much of the proposed eligible area is already served by multiple providers of 4G LTE.\(^\text{12}\) Providing universal service support to areas where carriers have already deployed towers and backhaul facilities on a widespread basis would be at odds with the Commission’s goal of ensuring that mobility funding is “cost-effective and targeted to areas that require public funding

\(^{10}\) Office of Economics and Analytics and Wireline Competition Bureau Seek Comment on Adjustment Factor Values for the 5G Fund, Public Notice, GN Docket No. 20-32, DA 20-594, ¶ 7, (June 5, 2020) (“The costs of constructing, operating, and upgrading tower sites, or leasing tower sites, will vary depending on factors such as the location’s remoteness, distance to the nearest road, access to backhaul, variance in terrain elevation, land cover, and the cost of local construction and installation labor. The potential coverage area of a site, and hence the number of sites needed, in turn will depend on the specific site location, antenna height above average terrain, terrain variation, foliage and the density of local structures, the spectrum band, and the number of subscribers served.”).  

\(^{11}\) NPRM, ¶ 25.  

to receive the benefits of mobility.’” Should the Commission decide to determine eligibility on the basis of RUCA maps, it should limit eligibility to an area no larger than RUCA code 10, or at most codes 9 and 10, but excluding code 10.1.

The NPRM recognizes that Option B would result in a “more targeted list of eligible areas,” but contends that Option B might delay the start of the Phase I auction by two years, from 2021 to 2023. It is more likely, however, that Option B would only delay the start of the Phase I auction by about one year. Given that the Broadband DATA Act sets a September 2020 deadline for the Commission to adopt implementing rules, the Commission should be able to collect carriers’ map data and produce the national 4G LTE coverage map in 2021, leaving more than enough time to hold the Phase I auction by mid-2022. The benefits of accurately targeting support where it is needed far outweigh any harm from a one-year delay.

Finally, as the Commission tentatively concludes in the NPRM, T-Mobile should not be permitted to use 5G Fund support to fulfill its transaction-specific rural commitments. That restriction is consistent with Commission precedent, beginning with the 2011 USF/ICC Transformation Order. Given the complexity of translating population-based merger

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13 USF/ICC Transformation Order, ¶ 298.
15 NPRM, ¶¶ 4, 37.
16 Id., ¶ 130.
17 USF/ICC Transformation Order, ¶ 146 (requiring carriers to certify that Connect America Fund support “will not be used to satisfy any merger commitment or similar regulatory obligation.”). See also Rural Digital Opportunity Fund; Connect America Fund, Order, 35 FCC Rcd 686, ¶ 45 n.135 (2020) (“A provider’s deployment of broadband service in satisfaction of its Rural Digital Opportunity Fund obligation shall be independent from any other deployment obligations made as part of any other regulatory obligation or to satisfy a provider’s separate
commitments to specific areas, especially for wireless services, the most straightforward way to restrict a carrier from using 5G Fund support to fulfill transaction-specific commitments is to preclude the carrier from participating in the Phase I auction. Because T-Mobile has committed to deploying 5G service covering 85 percent of the population in rural areas within three years after closing, the Commission will know better by the time the Phase II auction starts where T-Mobile is deploying to meet its merger commitments.

IV. THE COMMISSION SHOULD MODIFY THE PHASE I FRAMEWORK

Although the proposed Phase I auction framework is generally reasonable, the Commission should modify the specific speed and deployment requirements proposed in the NPRM.

The speed target should be higher than 35/3 Mbps. Driven in part by the Commission’s decision to make more mid-band spectrum available for mobile broadband, carriers will be deploying 5G networks that support speeds of 100 Mbps or faster, even in rural areas. The NPRM, however, proposes to set the speed target for the 5G Fund at just 35 Mbps downstream and 3 Mbps upstream, which is the standard that the Commission adopted for Puerto Rico and the US Virgin Islands in last year’s PR-USVI Fund Report and Order. According to the

committed made to the Commission or a state or local regulatory body as part of any other proceeding.

18 NPRM, ¶ 15.

19 The NPRM seeks comment on whether the 35/3 Mbps speed should be defined as an average, median, or some other percentile. The NPRM also proposes to set a cell edge speed requirement of 7/1 Mbps, with a 90 percent cell edge probability and assuming 50 percent cell loading. NPRM, ¶¶ 97-98.

NPRM, the Commission believes that the 35/3 Mbps target “would be achievable for carriers that only have access to low-band spectrum, as may be the case in rural areas.”\(^{21}\)

Given that carriers will be deploying 100 Mbps or faster 5G services, even in rural areas, the Commission should set the speed target for the 5G Fund well above 35/3 Mbps. The Commission’s goal should be to provide consumers in areas supported by the 5G Fund with access to the same applications and capabilities as users elsewhere in rural America during the entire ten-year term of the 5G Fund. The proposed 35/3 Mbps speed target, which is within the range of current 4G LTE speeds,\(^{22}\) will have fallen far behind 5G network capabilities by the end of the support term.

The Commission should relax the deployment obligation in the most challenging census tracts. In many census tracts, the proposed requirement to cover at least 75 percent of eligible square kilometers within six years of the Phase I auction is reasonable. As the Commission explained in the MF-II Order, there could be many parts of a census tract where mobile broadband deployment is important, including “business locations, recreation areas, work sites, and agricultural spaces.”\(^{23}\) Moreover, the “adjustment factor” would generally provide additional support to offset the higher costs of deploying in more rugged parts of a census tract.

In some census tracts, however, the 75 percent area deployment requirement could dissuade carriers from bidding. The 75 percent threshold might require carriers to cover large

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\(^{21}\) NPRM, ¶ 97. The Commission required 35 Mbps download speed for Puerto Rico and the US Virgin Islands because “the minimum performance requirements of 5G technology, using a typical 10 MHz channel bandwidth, including other system efficiencies such as Multiple Input Multiple Output (MIMO) should permit service providers to meet this speed requirement.” PR-USVI Fund Report and Order, ¶ 124.

\(^{22}\) Communications Marketplace Report, at 4 (Figure A-19) (showing year-end 2018 mean speed of 34.1 Mbps and median speed of 25.3 Mbps).

\(^{23}\) MF-II Order, ¶ 42.
areas of mountainous terrain with virtually no demand, and the adjustment factor would not fully offset the additional costs.\textsuperscript{24} To encourage carriers to bid on such challenging census tracts, the Commission should adopt an alternative deployment requirement for challenging census tracts that focuses on road miles and population. The Commission should, in particular, consider carriers in challenging census tracts to have met their deployment obligation if they cover at least 35 percent of the eligible area, provided that they meet road mile and population targets based on those adopted for Mobility Fund Phase I, i.e., 75 percent of the road miles and 75 percent of the population in eligible areas.\textsuperscript{25} The public interest is better served by a rule that encourages carriers to cover roads and populated areas in a challenging census tract, even if other parts of the census tract are left unserved, than by an overly stringent rule that dissuades carriers from bidding on the tract at all.

V. COMPLIANCE SHOULD BE ASSESSED USING PROPAGATION MODELING

It is the details of the compliance regime, rather than the nominal speed requirement (such as 35/3 Mbps), that will actually determine the network that funded carriers must build. To decide whether to bid, how much to bid, and how to design its network, a carrier must know exactly how the Commission will decide whether the carrier has met its deployment obligations. Accordingly, the Commission must adopt the compliance requirements well before the short-form application deadline, and must fully specify in detail all of the compliance requirements.

\textsuperscript{24} \textit{NPRM\textsuperscript{,}} \textsuperscript{¶} 66 (“We do not intend to have an adjustment factor capture the full differences between the costs and benefits of providing service to different types of geographic areas. We propose to cap the adjustment factor if needed to ensure the funding allocation determined by the auction is both equitable and efficient.”).
A. Compliance with Milestones Should Be Determined by Propagation Modeling

The NPRM proposes to assess compliance with the interim and final deployment obligations using “a combination of predictive propagation modeling and comprehensive on-the-ground measurement testing.” However, it is not clear from the NPRM what that means – whether, for example, the Commission intends to determine compliance using speed test results in drivable areas and mapping results in non-drivable areas, or intends somehow to evaluate compliance in the same area using a combination of test results and mapping results.

Rather than evaluate compliance using both propagation modeling and speed testing, the Commission should rely almost exclusively on modeling. As the Commission acknowledges in the NPRM, drive testing is especially challenging in the kinds of areas that will receive 5G Fund support. Rural areas receiving 5G Fund support “would likely be the most costly areas for a carrier to drive test, and such tests still may not reach large areas that have coverage but are less accessible for drive tests.” The significant cost of drive testing would be reflected in higher bids, which would reduce the area covered by the program.

It is, moreover, extremely difficult to use speed testing to “verify” coverage defined by a specific speed threshold and an assumed loading factor. Because loading in real networks varies widely within short periods of time, and carriers cannot control for loading when they conduct their speed tests, carriers may measure below-threshold speeds simply because the loading at the time of testing exceeds the loading assumption.

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26 NPRM, ¶ 111.
27 See id.
28 Id.
The Commission suggests that drive testing should be part of the compliance regime because the results of propagation modeling “may not accurately reflect coverage and the on-the-ground consumer experience.” But that concern, which is based on Commission staff’s findings in the MF-II Investigation Staff Report, is overstated. The differences between the speeds measured by staff and the MF-II maps reflect a mismatch between the testing procedures and the MF-II mapping specifications, not faulty mapping procedures. Whereas the MF-II rules directed carriers to map an “outdoor level of coverage,” Commission staff conducted speed tests from inside a moving vehicle. And the speed tests reflected actual cell loading at

29 Id.
30 Mobility Fund Phase II Coverage Maps Investigation, Staff Report, GN Docket No. 19-367, (December 4, 2019) (“MF-II Investigation Staff Report”).
31 Letter from Cathleen A. Massey, T-Mobile, to Marlene H. Dortch, FCC, Mobility Fund II Coverage Maps Investigation, GN Docket No. 19-367, DOC-361165, at 2 fn.6 (February 17, 2020) (“T-Mobile Letter”) (“when the FCC collected speed test data to evaluate T-Mobile’s maps, it failed to follow commonly-accepted coverage testing procedures as well as its own MF-II instructions”); Letter from David A. LaFuria, United States Cellular, to Marlene H. Dortch, FCC, Mobility Fund II Coverage Maps Investigation, GN Docket No. 19-367, Attachment at 2, 7-8 (June 18, 2020) (“Testing was in-vehicle ignoring MF-II requirement that tests be conducted outdoors.”).
33 MF-II Investigation Staff Report, ¶ 58. A vehicle adds at least 6 dB of vehicle penetration loss. See T-Mobile Letter at 2. See also “Final Report - In-car Mobile Signal Attenuation Measurements,” LS Telecom for Ofcom, at 33 (Nov. 8, 2017) https://www.ofcom.org.uk/__data/assets/pdf_file/0019/108127/in-car-mobile-signal-attenuation-report.pdf (reporting a median attenuation value of 8.9 dB). And testing at highway speeds adds significant Doppler shift and spread to the both the downlink and uplink signals, resulting in a reduction in throughput compared to the same signal conditions but for a stationary user. NPRM, ¶ 118 (“low speed or stationary throughput measurements are typically higher than high mobility throughput measurements”).
the time of each test, which may have exceeded the cell loading assumption required by the MF-II mapping rules.\footnote{For the MF-II maps, the Commission directed carriers to depict coverage assuming that the network was 30 percent loaded. In actual networks, the cell loading varies widely. Because the Commission selected a relatively low cell loading factor for MF-II, the actual cell loading at the time of a speed test may have exceeded the 30 percent mapping assumption. For example, Verizon reported to the Commission that cell loading on the Oklahoma test route often exceeded 30 percent. Letter from Alan Buzacott, Verizon, to Marlene H. Dortch, FCC, \textit{Universal Service Reform – Mobility Fund}, WC Docket No. 10-208, at 4 (July 27, 2018).}

The Commission can address the perceived shortcomings of a model-based approach by adopting robust and standardized mapping inputs and by more clearly defining key mapping parameters, as is discussed in more detail below. It would also be reasonable for the Commission to require carriers to submit supplemental information such as the link budget and a detailed description of the carrier’s model,\footnote{\textit{NPRM}, ¶ 115.} which would allow Commission staff to assess the reasonableness of the carrier’s modeling procedures. To enhance certainty for both the Commission and carriers, the Commission could require carriers to submit detailed information about their modeling procedures for Commission staff review at the start of the support term, rather than after the first deployment milestone at the end of the third support year.

To the extent the Commission requires fund recipients to conduct speed tests, the purpose should be to give the Commission additional confidence that the funded carrier’s modeling procedures are generally reliable, not to verify coverage at every point on the map. In particular, the Commission should not adopt its proposal to require at least three speed tests in every square kilometer grid cell.\footnote{\textit{See id.}, ¶ 113.} That approach would require thousands of tests to cover a large area, but would still not yield a statistically valid sample, given the inherent variability of wireless signals.
The Commission should instead limit the cost of the testing requirement by (1) requiring speed testing only in areas that can be readily tested, i.e., areas with roads; and (2) requiring fund recipients to test only a representative sample of locations in the funded area. Most importantly, the Commission must avoid a mismatch between mapping parameters and testing parameters, as explained below.

B. The Commission Must Specify All Mapping and Testing Parameters

Propagation Modeling Requirements. For any propagation modeling requirement, the Commission should specify (1) the minimum cell edge download speed, upload speed, and cell-edge probability; (2) the minimum resolution of the map and of terrain and clutter data;\(^\text{37}\) and (3) the cell loading factor. The Commission should also clearly specify whether the map should depict outdoor coverage or in-vehicle coverage, and whether the map should depict coverage for a stationary user or at highway speeds.

For consistency with the Broadband DATA Act requirements, the Commission should set the cell edge probability at 90 percent and the loading factor at 50 percent. Both of those values are more robust than those adopted by the Commission in the MF-II proceeding, and thus should make it less likely that actual user experience falls short of that predicted by the model.\(^\text{38}\)

\(^\text{37}\) Resolution parameters may vary by spectrum bands. The 100 meter bin size adopted in the MF-II proceeding, for example, is unworkable for mmWave spectrum bands.

\(^\text{38}\) Discrepancies between modeled and actual user experience run in both directions – sometimes a model will predict coverage or performance characteristics that exceed user experiences, and sometimes the user experience will exceed predicted performance. Adoption of more robust parameters reduces the likelihood of the former. In the MF-II Challenge Process Order, the Commission adopted modeling parameters that reflected its “priority of directing our limited universal service funds on areas most in need of support.” MF-II Challenge Process Order, ¶ 36.
The Commission should also define all key terms. For example, the Commission must specify whether “cell loading” means serving-cell loading or other-cell loading. Similarly, if the Commission requires carriers to model outdoor coverage, it should clearly define the term “outdoor.” The definition of “outdoor” used in the NPRM (“not inside a building”) is not the standard industry definition of “outdoor.” The NPRM’s definition of “outdoor” could be interpreted to require carriers to submit a map of in-vehicle coverage, which would be materially smaller than a map of true outdoor coverage under the industry-standard definition.

**Speed Testing Requirements.** If the Commission adopts a requirement that carriers submit speed test results, it must specify how carriers must conduct their speed tests, i.e., it must specify whether testing should occur at stationary locations or from a moving vehicle, and should specify whether the test device should be inside or outside the vehicle. Speed measured from inside a vehicle will be lower than speed measured outdoors, and speed measured from a moving vehicle will be lower than speed measured by a stationary user. Carriers must know, well before the Phase I auction starts, what type of measurements the Commission will use to assess compliance.


40 NPRM ¶ 118 n.176.


42 In the *CAF* proceeding, the Wireline Competition Bureau, Wireless Telecommunications Bureau, and Office of Engineering and Technology adopted the CAF performance measurement requirements three months after the deadline for filing short-form applications for the 2018 CAF auction and only three weeks before the start of the auction. *Connect America Fund*, Order, 33
The Commission must also specify when and where carriers must conduct the speed tests and the number of tests that carriers must conduct at a given location or in a given area. If the Commission decides to measure compliance based on the “mean,” “median,” or some percentile of the collected measurements, the Commission must define the metric it will use and specify how it will calculate that metric from the speed test data. And the Commission must specify the threshold value that the metric must achieve in order to be considered compliant.

Finally, the definitions and specifications must be consistent across the compliance regime, if the Commission decides to adopt both modeling and testing requirements. If the Commission requires that propagation maps depict “outdoor” coverage, then the same definition of “outdoor” should be reflected in the speed testing requirements. If the Commission requires carriers to depict coverage assuming a 50 percent loading factor, then the rules for evaluating speed test results must recognize that actual loading may vary widely and that the measured speed may fall below the target speed if actual loading at the time of a speed test exceeds the 50 percent loading assumption.

FCC Rcd 6509 (2018); Connect America Fund, Order on Reconsideration, 34 FCC Rcd 10,109 (2019). Given the even greater complexity of wireless propagation modeling or speed testing, the Commission must adopt all of the 5G Fund compliance requirements well before the short-form applications are due.
VI. CONCLUSION

The Commission should design the 5G Fund to target support where it is needed and to make efficient use of the limited budget.

Respectfully submitted,

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