From: Hallquist, Christine [christine.hallquist@vermont.gov]
Sent: 9/9/2024, 10:51 AM
To: bead@ntia.gov
Subject: Comments regarding the NTIA policy on alternative Technologies.

The NTIA has developed a decision hierarchy that is effective for the state of Vermont. The priority is to provide access to reliable broadband as defined by the NTIA. Vermont is committed to providing access to fiber for every address possible, within reason. There will be addresses, such as those that are off-grid or those that are extremely expensive, where an alternative technology is needed. Hybrid Fiber Coax is a logical solution where possible. DSL is only effective in sub-kilometer distance if it is in conduit (see performance curve below. This will be helpful for long drops.

Vermont will be very careful in selecting fixed wireless as an alternative technology. Vermont is concerned about the speeds and latencies that terrestrial fixed wireless technologies can reliably provide during periods of dense foliage. Therefore, the VCBB believes it is paramount that speed tests are conducted when leaves are on the trees, or that speed tests taken when leaves are not on the trees show results that are sufficiently fast to justify that speeds of 100/20 Mbps or greater would be expected at a time of peak foliage coverage. Should entities wish to dispute the modification of these addresses as underserved, they will be required to submit tests conducted during a period of foliage in 2023 no more than 180 days prior to the start of the challenge process, or to justify that speed tests are 40% better in fall and winter months when leaves are not on trees, to demonstrate that speeds of 100/20 Mbps or greater would be available during times of peak foliage coverage.

Based on ITU and IEEE publications, non-line-of-sight (non-LOS) propagation at frequencies between 600 MHz to 3.65 GHz experience between 20% to 40% more attenuation through trees. 1. International Telecommunication Union Radiocommunications Sector. Recommendation ITU-R P.833-10, "Attenuation in vegetation," September 2021. Available at https://www.itu.int/dms_pubrec/itu-r/rec/p/R-REC-P.833-10-202109-I!!PDF-E.pdf. 2. An Accurate Empirical Path Loss Model for Heterogeneous Fixed Wireless Networks Below 5.8 GHz Frequencies, Published Sept 2020 in IEEE Access. Available at https://ieeexplore.ieee.org/abstract/document/9193927

Oversubscription in fixed wireless networks is particularly challenging due to the inherent variability of wireless connections. Signal attenuation from obstacles such as trees and buildings can weaken the signal, meaning that some customers require more transmission power and repeated data packets. Additionally, multipath interference, where signals bounce off obstacles, results in the tower sending data multiple times, further consuming the bandwidth. In shared frequency bands, noise and interference from other devices or even other wireless systems can disrupt service. Also, the physical clustering of users in weak coverage zones can strain beamforming capabilities, leading to uneven service distribution. Managing traffic in fixed wireless scenarios is complex due to the dynamic nature of wireless conditions. Users in weak coverage areas often communicate more with the tower, sending frequent feedback such as signal quality reports, handshaking, and error corrections. This feedback overhead, while essential for maintaining connectivity, consumes valuable tower resources and bandwidth.

Interference, especially in shared bands, not only affects individual users but can also disrupt the overall traffic flow, causing network congestion. Algorithms designed to ensure fair bandwidth distribution across users can get taxed when trying to balance between strong and weak connections. Overcompensating for weak-signal users can diminish performance for those with strong signals, making it challenging to guarantee consistent service levels. The unpredictable nature of wireless connections, compounded by environmental and interference factors, necessitates sophisticated traffic management strategies and a disclosure of oversubscription and traffic management methods used by the fixed wireless provider.

Vermont agrees that Unlicensed Fixed Wireless is a lower priority solution, due to narrower and unpredictable signal to noise ratios.

Finally, Low Earth Orbiting satellites are an important alternative to remain in consideration as there will be addresses in Vermont that will not be reachable with any other solution.
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With warm regards,

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