



September 2019

# 5G: What Does One More G Mean to You?

**By Jeff Johnston**

*Lead Economist*

## Inside...

<i>Introduction</i> .....	1
<i>What is 5G?</i> .....	2
<i>Implications for Wireless Operators</i> .....	2
<i>5G for Consumers</i> .....	3
<i>Rural Implications</i> .....	4
<i>Headwinds</i> .....	4
<i>Conclusion</i> .....	5
<i>References</i> .....	5

## Key Points:

- Hype is reaching fever pitch for 5G (fifth-generation cellular wireless service), which has been touted as a quantum leap for wireless internet speed. However, operators’ go-to-market strategies are unclear.
- The millimeter wave spectrum being used in many 5G networks support fiber-like data speeds, but technical and operational issues limit its scale.
- Early on, it will be enterprises that get the most out of 5G, as 5G will enable a whole new set of IoT (internet of things) applications that will drive efficiencies for organizations.
- 5G New Radio (NR), which is the standards and network equipment behind 5G, will reduce the cost to deliver data. Cost appears to be one of wireless operators’ primary motives to deploy 5G.
- 5G networks will eventually have a meaningful impact on consumers, but that won’t happen for about three years. For rural America, it will be at least another five years.

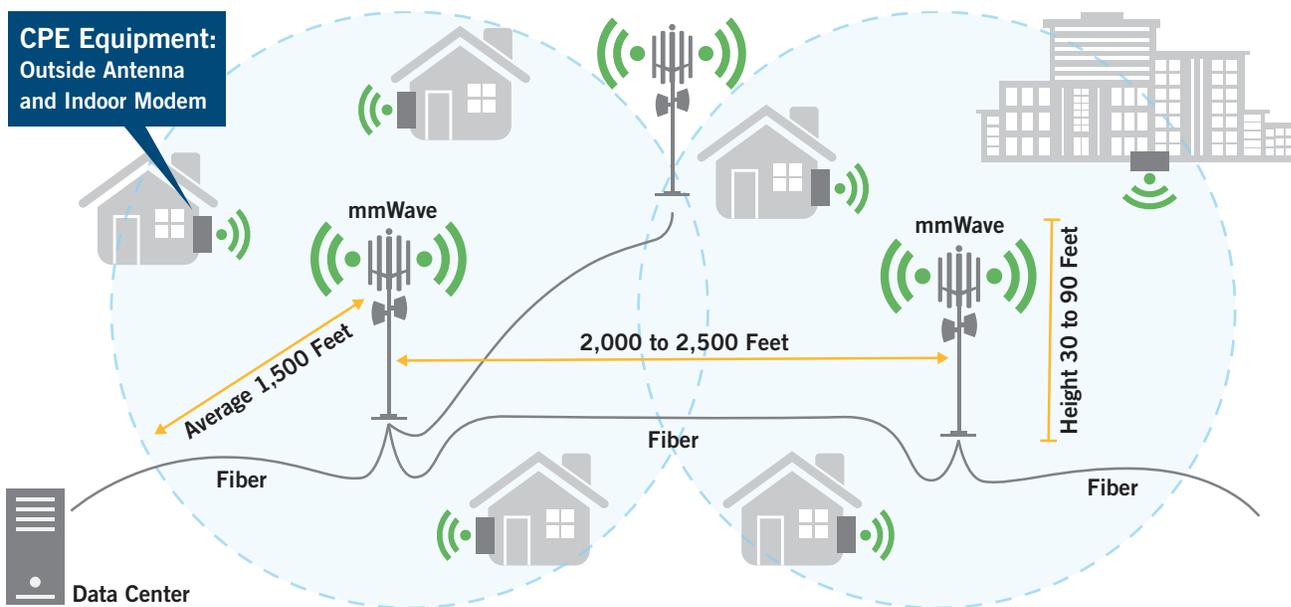
## Introduction

As the wireless industry works toward deploying 5G, we’ve looked at the underlying drivers behind these deployments and how they will impact wireless operators and their customers. Our key takeaway is that 5G is an exciting evolution in wireless, but the technology’s hype is reaching fever pitch and the value proposition over the near-term remains murky, outside of some enterprise applications.

At this point, 5G deployments in the U.S. seem geared toward 1) marketing spin – operators need something new to talk about, and 2) cost management – the efficiencies in 5G NR technology reduce the cost to deliver data, which is becoming increasingly important for operators. A clear path to meaningful topline revenue growth is hard to find, leaving operators with the hope that “if we build it, they will come.”

So, what does one more G really mean to consumers, operators, and rural America? Here is our take.

## EXHIBIT 1: 5G Fixed Wireless with mmWave Spectrum



### What is 5G?

5G NR is the latest wireless standard as defined by 3GPP, the global wireless standards-setting body. It finalized the first 5G standards in late 2017 and the industry continues to work on subsequent releases of the standards that will deliver new network and device functionality. All four U.S. national operators (AT&T Mobility, Verizon Wireless, T-Mobile U.S., and Sprint Corp.) have launched non-stand-alone 5G service in a handful of markets primarily using millimeter wave spectrum. Coverage maps for high-speed 5G data are small, but when in range of a millimeter wave site, reported speeds have been in the 1 gigabit range. However, ultra-low latency and features such as network slicing (more on that later) need stand-alone 5G, which is scheduled for commercial deployment in late 2020.

On the 5G fixed-wireless front, Verizon has launched in a handful of markets, but has since downplayed its plan for the technology. According to Verizon, it built its initial 5G fixed-wireless networks with non-standard 5G equipment and is waiting for standards-based equipment before launching new markets.

5G fixed-wireless access points are located 2,000-2,500 feet from a service area and they broadcast a signal to a receiving unit that is mounted on the outside of a house/building (*Exhibit 1*). These receiving units are tethered to a modem inside the building which acts as the internet access point.

### Implications for Wireless Operators

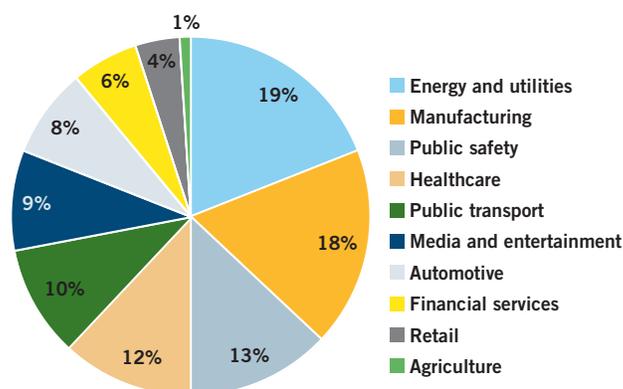
The race is on to secure 5G network bragging rights. Wireless operators' revenue has been shrinking, and they hope 5G will reverse this trend. Low latency applications like autonomous driving vehicles, augmented reality, and virtual reality will rely heavily on 5G. In addition, operators will see revenue opportunities (*Exhibit 2*) from the new core technologies that are launching in conjunction with 5G, such as network slicing.

Network slicing is a type of virtualized networking architecture that allows far better network flexibility by partitioning network resources into virtual elements. In essence, network slicing enables operators to more effectively and dynamically support multiple

### EXHIBIT 2: 5G Enterprise Opportunity for ICT Players, 2025

IoT (internet of things) use cases that have varying degrees of computing needs. For example, a self-driving car requires much more computing resources compared to a utility meter module that transmits a text message-sized update once a day. Network slicing enables these use cases by utilizing network resources more efficiently.

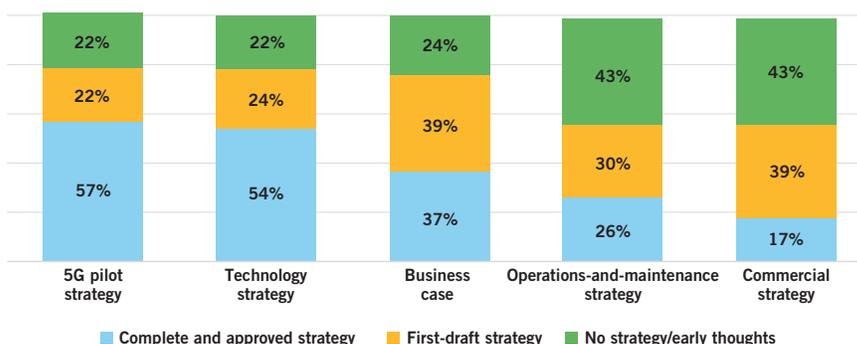
*Ericsson estimates that 5G-enabled industry digitalization revenues for ICT (information and communications technology) players will be \$1.3 trillion in 2026*



Source: Ericsson

Despite the marketing hype and aggressive network build schedules, uncertainty surrounds operators' commercial strategy (Exhibit 3). Beyond some of the aforementioned emerging applications, the mobile 5G value proposition is unclear. The reality is, the vast majority of mobile apps (Facebook, Twitter, Instagram, WhatsApp, Messenger, etc.) won't look any different on a 5G phone than they currently look on a 4G phone. Throw in the fact that 5G phones are more expensive than 4G phones, and one can see how the adoption of mobile 5G could take time.

### EXHIBIT 3: Current Status of Wireless Operators' 5G Strategy Development (Percent)



Source: McKinsey & Company

Note: Figures may not add up to 100 percent because of rounding

Even with the uncertainty for top-line revenue growth, 5G does offer efficiencies that will reduce network costs (Exhibit 4). In addition to the inherent spectral efficiencies with 5G NR equipment, the transition to 5G means the industry will see a greater level of RF consolidation in data centers, as well as more network virtualization, investments in fiber, and use of unlicensed spectrum. All of these factors will help reduce network operating expenses in the near-term, and appear to be some of the primary drivers behind the capital investments in 5G.

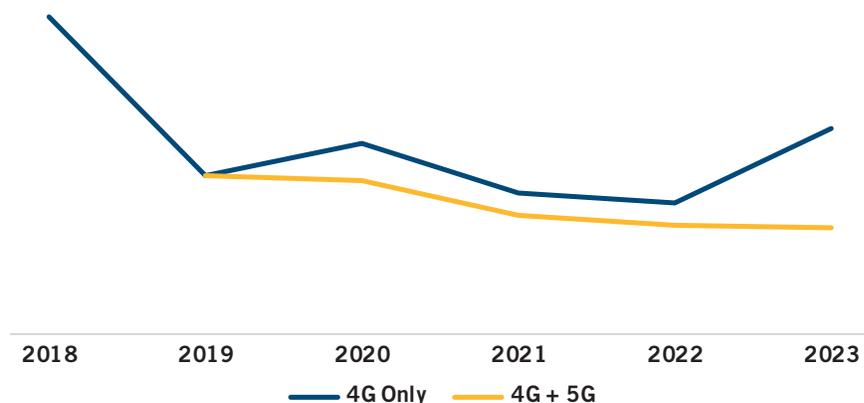
### 5G for Consumers

To the extent that 5G fixed wireless becomes a legitimate alternative to fixed broadband, consumers would benefit

from having more options, which should reduce pricing. Note that Verizon had previously stated that it plans to use its 5G fixed-wireless service to take 20%-30% share of the broadband market. T-Mobile and Sprint have pledged to cover 52% of U.S. ZIP codes with fixed wireless if they're allowed to merge.

In theory, this all sounds great, but the reality is the type of spectrum being used in these initial network builds present significant challenges that cannot be easily overcome. And unless the fixed-wireless service is significantly cheaper than the incumbent's – which it probably won't be – we think consumers should temper their expectations for new broadband choices.

## EXHIBIT 4: Wireless Operators' Network Cost (Capex and Opex) Per Gigabit



Source: Ericsson

**Augmented reality (AR)** adds digital elements to a live view often by using the camera on a smartphone. Examples include Snapchat lenses and the game Pokemon Go.

**Virtual reality (VR)** implies a complete immersion experience that shuts out the physical world. Devices include HTC Vive and Oculus Rift.

On the mobile 5G front, consumers will benefit from a faster data connection, which will help usher in a new era of applications such as next-generation mobile augmented reality, virtual reality, and self-driving cars. It will also allow consumers to download videos more quickly and stream video at a higher resolution with less buffering.

However, to use 5G, a consumer will need to buy an expensive 5G phone. It's important to understand the limitations of first-generation 5G devices now available. First-generation 5G phones are prone to overheating in the summer months and revert back to 4G as a result, plus they do not support new ultra-low latency applications. To use those applications, consumers will have to upgrade to next-generation, stand-alone 5G devices (once they become available).

Over time 5G smartphone pricing will fall, the technical issues will be addressed, and the 5G adoption rate will rise. However, given the muted mobile 5G value proposition, we believe the 5G adoption rate will ramp up slowly.

### Rural Implications

Over the next several years, we don't expect 5G to have much of an impact on rural communities. The reason is that in order to realize 1 gigabit speeds,

wireless networks need to utilize high-band millimeter wave spectrum. The spectrum offers a significant amount of capacity and supports antenna technologies that enable fiber-like speeds. However, the signal range is limited to 2,000-2,500 feet and it struggles to penetrate foliage, buildings, etc. Therefore, it's good for urban and some suburban markets, but there's limited value in millimeter wave spectrum for sparsely-populated rural markets.

To be clear, 5G will be deployed on mid and low spectrum bands, which will expedite 5G coverage. However, we expect that for rural America, 5G will start with low-band spectrum, which will limit the upside in speed to about 30% faster than 4G networks. Over time as mid-band spectrum is deployed in rural markets with stand-alone 5G, speeds will increase and prompt adoption of applications such as autonomous driving tractors, precision agriculture, telehealth, etc. We estimate that it will take at least five years before rural America will realize the full benefits of stand-alone 5G.

### Headwinds

Due to the poor propagation characteristics of millimeter wave spectrum, network access points need to be located closer to where devices are being used. These access points, called small cells, are typically located on utility poles, light poles, etc. Given the large number of local

governments with which operators need to negotiate pole attachment rights – and the fact that each city has unique processes, requirements, fees, etc. – delays in obtaining these rights have impacted small-cell deployments. For example, Crown Castle, a major supplier of fiber and small-cell solutions, cited obtaining pole attachment rights as the primary reason why it will not meet its small-cell deployment goals.

As a result of these delays, last year the FCC issued a report and order for local governments that established a shot clock for approving small-cell applications and pricing guidelines. Not surprisingly, a number of local governments have taken issue with the FCC's report and order and are challenging it in court. Time will tell how all this gets sorted out, but given the administration's interest in ensuring America's leadership position in 5G, we believe these roadblocks will start to come down over the next 12 months.

## Conclusion

Despite the uncertainty surrounding how wireless operators will monetize their 5G capital investments, the big four U.S. operators are committed to deploying the technology in short order. Beyond 5G's network efficiencies, operators need to invest in 5G to “keep up with the Joneses.” Operators have often used network

quality as a source of differentiation, so being the first to deploy 5G or the first to have nationwide coverage is a big deal.

The enterprise market appears to be the one with the most revenue upside potential as 5G will deliver operational efficiencies above and beyond what is being realized today. And for rural America, we don't see 5G benefitting these communities anytime soon as the spectrum being used to deliver fiber-like speeds is not conducive for rural use. Lastly, to the extent 5G fixed-wireless networks are built, consumers could benefit from choice and lower prices, but don't hold your breath. ■

## References

“What's the Difference Between AR, VR, and MR?” *The Franklin Institute*, accessed August 2019, <https://www.fi.edu/difference-between-ar-vr-and-mr>.

Mike Dano, “Nokia, Ericsson, Cisco Pull US Operators Toward Standalone 5G,” *Light Reading*, Aug. 12, 2019, <https://www.lightreading.com/mobile/5g/nokia-ericsson-cisco-pull-us-operators-toward-standalone-5g-/d/d-id/753414?>

“What is Network Slicing?” *SDxCentral*, accessed August 2019, <https://www.sdxcentral.com/5g/definitions/what-is-network-slicing/>.

**CoBank's Knowledge Exchange Division welcomes readers' comments and suggestions.  
Please send them to KEDRESEARCH@cobank.com.**

**Disclaimer:** The information provided in this report is not intended to be investment, tax, or legal advice and should not be relied upon by recipients for such purposes. The information contained in this report has been compiled from what CoBank regards as reliable sources. However, CoBank does not make any representation or warranty regarding the content, and disclaims any responsibility for the information, materials, third-party opinions, and data included in this report. In no event will CoBank be liable for any decision made or actions taken by any person or persons relying on the information contained in this report.