5G Wireless as Rural Solution: Not any time soon.

Minnesota legislators are now hearing that a market-based broadband solution is near. 5G wireless to the rescue! Learning that public dollars would not be necessary for rural broadband development would be soothing music to elected officials' ears as other groups line up for funds– roads, schools, health care, tax cuts; the list is endless.

After all, many counties and regional entities are growing desperate for broadband and are actively studying the options for spurring broadband delivery to meet at least minimum FCC broadband standards. Alternatives range from subsidizing incumbents to partnering with new or existing broadband cooperatives. While the State of Minnesota is seen as the major finance partner, even townships are writing checks for broadband!

So the question "Is 5G coming to rural America anytime soon?" is critical for policy leaders and elected officials. They wonder, "If we wait, will our future pass us by?" Conversely, they question "Will our investment in fiber be a waste of money as wireless becomes the preferred and available technology?"

After doing a lot of reading and talking with technologists, it is clear that 5G wireless is coming to the marketplace, but it is not coming to rural America anytime soon. 5G wireless does offer promise, but only to high density population centers such as campuses, large office buildings and apartment buildings. 5G's chief feature is very high bandwidth– 1 Gigabit or more! Once established, 5G promises to have the ability to connect many devices with very quick responses, especially applicable for self-driving vehicles or many smart devices in a factory, on urban streets and so on. 5G would also be great for large file sharing applications like HD movies.

So why not 5G in rural areas? That answer is easy and indisputable. Deployment of 5G wireless services will require significant fiber deployment, more than either the current 4G wireless cellular network or the new CAF2 Fiber to the Node (FTTN) installations by large incumbent providers.

Rural 5G wireless services would require installing radios every 1,000 – 3,000 feet on towers and poles. These small cells would require direct fiber connections and all of them would require electricity to power the radios. The radios would connect to wireless devices in customers' homes and to other devices on the network and, of course, back to the network backbone.

For comparison, today's fiber-fed 4G towers might be four to fifteen miles apart depending on terrain and the number of customers. We know that 4G services have yet to reach many rural customers at their homes since these services are often focused down state and federal highway corridors in tandem with existing fiber routes leaving those in the bulk of the rural countryside without modern service.

In today's CAF2 environment, providers are making significant investments to deploy FTTN, shortening copper loops to approximately 7,500 feet. These shorter

loop lengths will allow some customers to exceed the 25 Mb download and 3Mb upload FCC broadband standard while others at the end of the line will more likely receive 10 Mb/1 Mb. While this may be a significant improvement from current services, it lags far below the Minnesota broadband goal of 100 Mb/20 Mb by 2026. Optimists view these CAF2 improvements as an interim step to future FTTH deployment; others view these improvements as the last incumbent investment for a generation.

There are many questions yet unanswered on 5G wireless technical standards and final standards may be years in the making. There are just as many questions on the different business models that will drive deployment in urban, suburban and rural markets. These deployment strategies will likely vary by location and provider mix.

For example, ATT and Verizon are dominant wireless carriers seeking to use more wireless in their old wired local exchange areas. They could relatively easily transition their landline customer base to the new 5G networks adding to their existing wireless customer base. In Minnesota, these wireless companies use a combination of their own networks and leased facilities from a variety of providers to reach large customers, but primarily to reach cell towers.

In Minnesota, incumbent providers CenturyLink and Frontier are just one year into a five-year process to deploy their CAF2 FTTN networks. Once completed in 2020-21, likely to coincide with 5G technology and devices entry into the marketplace, will they be willing to open these deep fiber networks to competitive 5G wireless providers? Or will they offer their own 5G wireless services on enhanced CAF2 networks? Or, will these companies decline to sell access to their networks to wireless providers to preserve their own customer base. In that scenario one has to wonder if there would ever be a business case for wireless carriers like ATT and Verizon to install duplicate fiber networks to reach rural customers?

So 5G is coming, definitely and soon, but only to metro areas, just as new technologies always seem to hit metro markets first. But will and when will 5G reach rural? For those rural residents and businesses still waiting for 4G wireless services, the answer is clearly not any time soon. Fiber networks, to the home or to the node with very short loop lengths, will be a requirement to support future 5G wireless services. First fiber, then 5G. Not the other way around.

My advice: keep pursuing local fiber deployment so that all innovative broadband services – wired and wireless - can be offered in your community.

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Steven Senne of Finley Engineering reviewed this article for technical accuracy.