



There's Nothing Small About Small Cell Deployments

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The 8-Step Program for Efficacy —

Ready or not, 5G continues to pick up speed. According to the GSMA, commercial 5G networks are expected to be live in at least 18 major countries by the end of this year.¹ Although we are still a very long way from ubiquitous 5G devices, mobile network operators are already preparing their networks for the next evolution by increasing capacity, improving coverage and enhancing performance. And they are using massive deployments of small cells to do so.

It's estimated that in order to handle the explosion in mobile data demand, hundreds of thousands of small cells will be installed over the next few years. In fact, the CTIA anticipates that small cell deployments will account for 80% of future wireless infrastructure deployments, reaching 800,000 in the US alone by 2026.² Achieving a target that large would be no small feat, because, despite the name, there's nothing small about planning and implementing small cell deployments.

A Big Undertaking

Small cells offer many advantages over macro cells, making them the right choice for network densification and 5G preparation. Not only do they offer a lower total cost of ownership than macros, but because they are small and have low transmit power, they can be placed close to where people gather to greatly improve coverage and/or capacity. Closer proximity to people and their devices also means that they are able to deliver a higher

quality air interface, leading to faster, more reliable data connections, higher throughput and the low latency demanded by high bandwidth services such as video. Small cells also work in conjunction with macro cells to provide users with a seamless mobility experience as they move between coverage areas.

The vision of small cells installed on utility poles, streetlights, and the sides of buildings, throughout a dense coverage area might appear like a quick and easy fix to solve the challenges of delivering 5G. However, transforming that vision into reality is far from simple.

Perhaps you've read articles claiming that installation of a small cell can be accomplished in just a couple of hours — but this statistic is misleading. While it's true that covering an area with small cells can be faster than erecting a tower to deploy macro cell sites, a considerable amount of planning and preparation is needed for each small cell site before you can show up and plug in a radio access node. A good rule of thumb is to expect the actual installation to account for about 20% of the work, and planning and site preparation for the other 80%.

Fortunately, small cell deployment projects can run smoothly with proper management. The more effort you put in up front, the more successful you will be in the end, keeping operational costs low while you increase overall network capacity and coverage.

Give Me 8 Steps

There are a number of moving parts involved in any small cell deployment, so a great deal of project oversight is required to keep track of all the different steps. The process will vary for different types of small cells, but many of the steps will be similar. Following is an example of 8 steps involved in just one outdoor small cell site deployment but note that many of these different steps often occur simultaneously. (See Figure 1.)

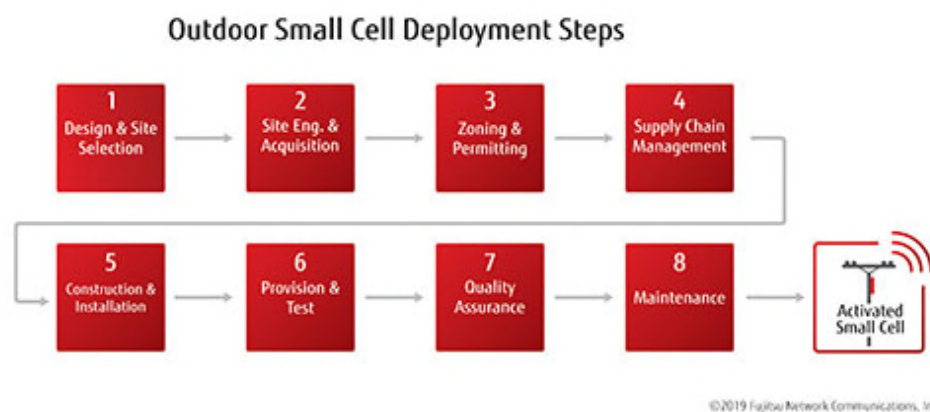


Figure 1. Outdoor small cell deployment steps.

Step 1: Design and Site Selection

RF Design engineers develop long-term network plans based on established coverage, capacity, and

performance objectives; however, their plans are constrained by real-world considerations, including the radio placement locations available to them.

Network designers may conduct a search to identify the best candidate sites for deployment (pole, rooftop, etc.) Site information is returned in the form of a site candidate information packet (SCIP), typically identifying at least 3 qualified site locations in a given area of interest, including detailed information about each location such as available access to power and fiber. This and other information is used by radio access network (RAN) planners to develop their small cell design. This is necessarily an iterative process, as sites may have to be dropped for various technical, logistical, or administrative reasons at a later time, and adjustments to the network design must then be made.

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Step 2: Site Engineering and Acquisition

Once a site has been identified for inclusion, engineers determine the equipment installation details, as well as the power and fiber runs. Typical activities include pole loading assessments, development of construction drawings, and completion of pole attachment applications or lease amendments.

Step 3: Zoning and Permitting

Addressing municipal permitting for the site can be particularly challenging, as each case can vary by local jurisdiction. In addition to a building permit, you may need to secure zoning clearance and a right-of-way access permit, both of which can take a good deal of time and paperwork. Some municipalities might require technicians to meet city officials to walk the site, and to discuss the plan of action before granting permits.

Step 4: Supply Chain Management

Requisitioning and securing materials and equipment is a process that follows several steps. It's important to confirm and double-check the pick list at the warehouse to avoid multiple trips. Once the site equipment is picked up, technicians may need to assemble and/or paint the equipment prior to deployment.

Step 5: Construction and Installation

Of course, it's critical at this stage that the site has been prepped to ensure access to fiber and power, reducing the possibility of wasted time and effort when a team tries to install a small cell at a site where the power is not working. Before site construction can begin, a traffic control plan might be needed to clear right-of-way restrictions with the regional Department of Transportation. This plan may require barricades and traffic cones to be set up before construction can proceed, often taking place during evening hours when traffic is lighter. A seasoned project manager will think outside the box to maximize efficiency and minimize disruption, such as accessing a site located near a busy intersection through an adjacent parking lot instead of blocking traffic in the street.

Step 6: Provision and Test

Once the site equipment is installed, field engineers will complete the deployment task by provisioning the small cell, integrating it into the network, and testing it to ensure it is working properly. Testing requires fiber validation at the site. To ensure proper quality of experience (QoE), drive testing of the area should be conducted.

Step 7: Quality Assurance

Frequent inspections of the active work sites are required to detect and correct defects quickly to ensure installations are done per industry best practices, standards, and safety guidelines.

Step 8: Maintenance

After the small cell site is tuned up, ongoing maintenance and troubleshooting will be required to ensure service delivery is uninterrupted.

This is just 1 site, so to estimate the full scope of a small cell buildout, the number of steps in each site deployment will have to be multiplied by the total number of sites being installed. While a small project may have as few as 10 sites, larger deployments can involve hundreds of sites, particularly as service providers get closer to launching commercial 5G services. Some network operators choose to handle the entire process themselves; others opt for working with a system integrator like Fujitsu to handle the end-to-end deployment process quickly and efficiently. As an example of a typical project scope, a recent small cell buildout conducted in Arizona involved 106 sites — a project that took about 6 months to complete.

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Best Practices

Even the best laid plans can go awry, so it's important to adopt fail-safe measures throughout your planning process. For example, before a technician heads out to the field, they should check and recheck that everything is "good to go" for site construction.

- Are the necessary consumable requisitions approved?
- Is the site preparation completed, including access to working fiber?
- Are the materials at the warehouse and ready for pickup?
- Have all the materials been checked and loaded; have shortages been noted?

This simple, but not always obvious, best practice can help you avoid errors and delays, keeping the deployment on-time. Delays cost money and may derail your business case and impact profit margins. Proper preparation allows more time on-site to address unforeseen issues, thereby keeping the schedule on track.

5G will reach critical mass in 2020, driving demand for ever greater speed and capacity, so the time for planning is now. As network operators prepare for this exploding demand, densification via large-scale, small cell deployments will enable them to improve their network's capacity, coverage and quality of service at relatively low cost as compared to macro cells. The secret to achieving this successfully is to focus on the small details while keeping an eye on the big picture.

Endnotes

1. GSMA Intelligence, February 25, 2019, "The Mobile Economy 2019". <https://www.gsmainelligence.com/research/2019/02/the-mobile-economy-2019/731/>
2. CTIA, "To Meet America's Wireless Demands, Our Networks Are Evolving". <https://www.ctia.org/positions/infrastructure>

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