Utilities Technology Council

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Joint Use Study

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Executive Summary

Electric utility poles are an economic super highway. Not only do utility poles bring electricity to nearly every home and business in the country, they also enable broader adoption of voice, wireless, data, and broadband services. With the advent of the next generation of wireless services called "5G" seemingly around the corner, utility owned distribution poles are a key piece to getting this new technology deployed.

For 5G wireless technology to work, it requires massive amounts of so-called small-cellular devices densely deployed. This means that the wireless carriers are pushing for utilities and other infrastructure owners to accelerate the deployment of these devices on all kinds of infrastructure.

Small cells are key to the increased connectivity that 5G promises. Put very simply, a small cell is radio equipment that is used to extend the network of a macro site. Small cells are most often mounted on poles but can also be strand mounted on the communications cable running between two poles. This technology allows a wireless carrier to extend their network at a lower cost. As carriers request service at more utility poles, utilities are preparing for the coming flood of pole attachment requests and understand strategies to best deal with the volume of requests.

This report examines joint use – attaching small cell equipment to utility distribution poles – from four perspectives:

- Regulatory considerations
- How utilities manage third parties that mount equipment on their poles
- Metering the power consumption of attached small cell equipment
- How utilities manage the assets that they own

UTC's UtiliSite Division administered a survey late in 2019 to UTC core-member utilities to understand what those utilities are doing in each of these four areas. The majority of our responses were from large investor-owned or public power utilities. UTC has observed that large utilities are already receiving a high volume of pole attachment requests, and thus their responses as presented in this report represent the best thinking thus far on how to effectively manage attachment requests from third parties. The charts presented in this report were created from the responses to our survey.

The study identifies many useful trends among utilities as they deal with joint use. Importantly, , utilities approach collocation and pole attachments with safety and electric reliability as the most important bedrocks. Therefore, utilities are extremely cautious about granting access to the supply space on a pole – the area where the energized conductors are. Other electric infrastructure such as streetlights pose separate challenges, as utilities often manage streetlights belonging to

municipalities or other third parties. Pole-loading calculations are critical before any attachments can be authorized. Our members have multiple approaches to collecting revenue for the power that they supply to attached equipment. Finally, asset management software with specialized modules to manage attachments can provide immense benefit to utilities.

The goal of this report is to help readers understand the pole-attachment issues that utilities encounter and how utilities manage those issues. The report concludes with key lessons learned that were cited by our respondents. Joint use is a complex topic, taking in important technical, business, and regulatory considerations, as shown throughout the report. Sharing our members' findings and experiences can help any utility better navigate the waters of small cells and 5G rollouts as they arrive in the near future.

About UTC

The Utilities Technology Council (UTC) is a global association focused on the intersection of telecommunications and utility infrastructure. UTC gives voice to the men and women in the utility workforce who create and maintain critical communications systems that help keep the lights and the water flowing. We represent the hands-on crews and engineers in the field and control rooms responding to storms, deploying new technologies, and securing energy and water infrastructure from all kinds of threats. UTC sits at the nexus between the energy and telecommunications industries, which are rapidly converging and becoming more interdependent.

About the UtiliSite Division

UTC's UtiliSite Division provides UTC members with information sharing and expert content focused on opportunities for utility wireless collocation, joint use and fiber leasing. This includes the key areas of pole attachments and small cell communications that are covered in this report. The UtiliSite Division meetings monthly to discuss current developments in these three areas, and to discuss current experiences and technologies that affect these areas. Participation in the UtiliSite Division is open to all UTC members.

Demographics: Who responded to the survey?

The UTC Joint Use Survey was administered anonymously late in 2019 to all UTC member utilities in North America. We received 33 responses from member utilities, of which 32 identified as U.S. utilities and one Canadian utility.

Just under 60% of the responding utilities identified themselves as investor-owned utilities (IOUs), while the remainder were public power utilities and electric cooperatives. UTC did not observe significant variance of responses between IOUs, public power utilities and cooperatives, so the analyses throughout this report will be presented for all utilities at once.

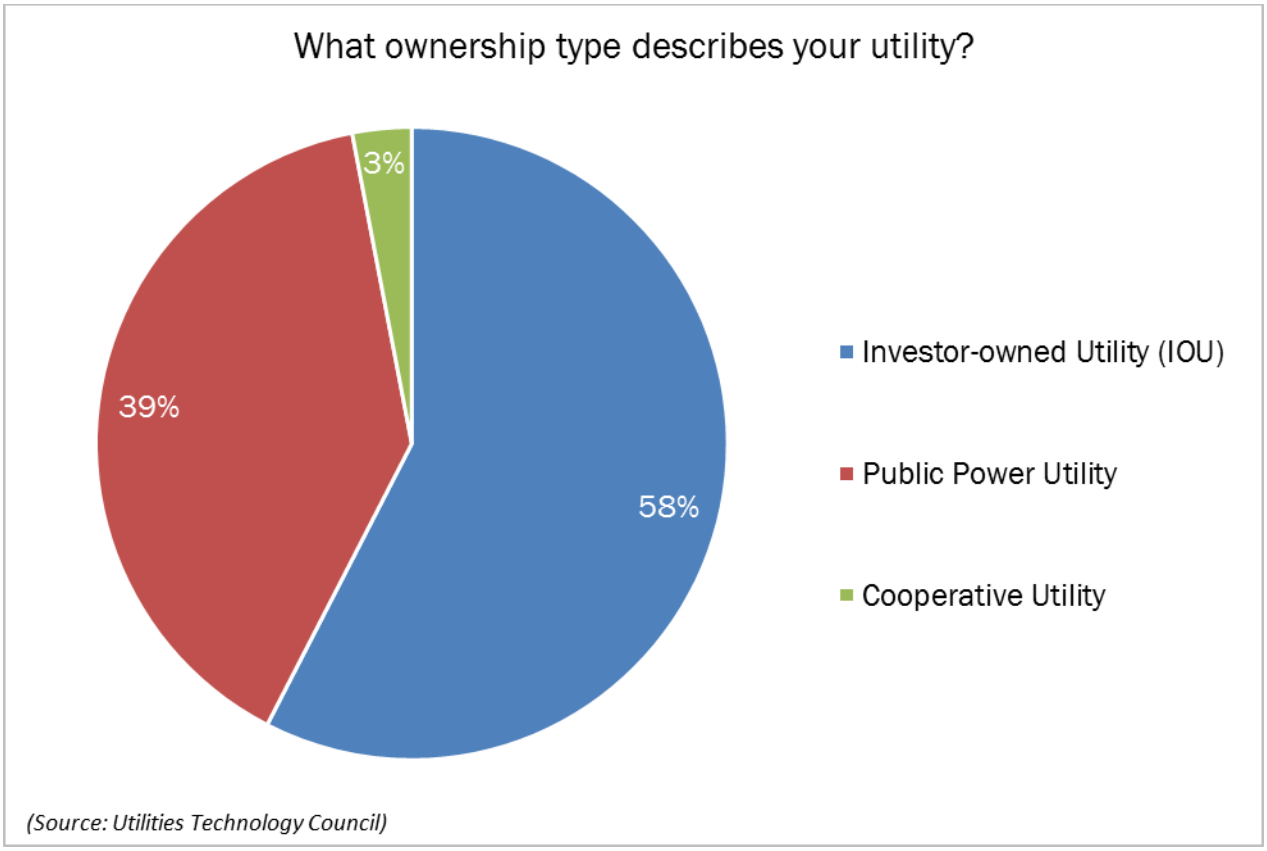

Chart 1 Ownership type of responding utilities

Likewise, we asked each utility to identify the regions of the U.S. in which it does business. And again the responses did not identify noticeable variances in approach to joint use from one region to another, so region of business is not considered in any of this report's analyses.

As with most UTC surveys, this one was administered anonymously to ensure that no single utility's information can be identified or extracted from our analyses.

Regulatory Considerations

Standards Used for Attachment Requirements

This section examines how utilities comply with regulatory requirements to manage their joint use programs. The regulatory requirements address many issues, including:

- Small cell equipment attachments
- Communication space clearances
- Standalone customer-owned small cell poles
- Customer equipment attached to wood, concrete or fiberglass distribution utility poles.

Small cell equipment attachment standard requirements are used to provide a more efficient and complete design. Utilities have several standards to choose from, as described in the following sections. In addition to industry standards, many utilities add their own standards for additional guidance.

International Building Code (IBC)

The International Building Code (IBC) is a model building code developed by the International Code Council (ICC) to address both health and safety concerns for buildings based upon prescriptive and performance related requirements. None of the utilities that responded to our survey uses the IBC as factor in their joint use policies.

National Electric Safety Code (NESC)

NESC is the National Electrical Safety Code, published by The Institute of Electrical and Electronics Engineers (IEEE) and updated every five years. Since the NESC sets guidelines and rules for safeguarding of utility workers and the public, most utilities use those guidelines as a reference for design requirements. 91% of our responding utilities use NESC as a reference standard and 94% of respondents use the NESC table 235 for clearance between power and communications conductors/lines at the pole and in the span.

General Order 95 (GO 95)

General Order 95 (GO 95) is a directive issued by the California Public Utilities Commission (CPUC). This order defines the rules for construction and maintenance of overhead line construction electric supply and communication systems. Only 6% of the responding utilities indicated that they use G0-95, because it only applies in California

Telecommunications Industry Association (TIA)

The Telecommunications Industry Association (TIA) Engineering Standards and Publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay, the proper product for their needs. TIA has two relevant standards for collocation.

The TIA-222 standard provides the requirements for the structural design and fabrication of new and the modification of existing structural antennas, antenna-supporting structures, mounts, structural components, guy assemblies, insulators and foundations. Six percent of responding utilities use TIA-222.

The TIA-322 standard is to provide construction considerations and loading requirements for structures under construction related to antenna supporting structures and antennas. The Standard addresses requirements for specialized equipment such as gin poles, hoists and required temporary supports. Six percent of responding utilities that use TIA-322

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO is the American Association of State Highway and Transportation Officials. AASHTO is a standards setting body which publishes specifications, quality control protocols and guidelines which are used in highway design and construction.

Chart 2 depicts clearly that the mostly widely used standards are the National Electric Safety Code (NESC) and utilities' own in-house standards. Many utilities may refer to more than one standard, depending on the use case, which is why the numbers in this chart substantially exceed 100%.

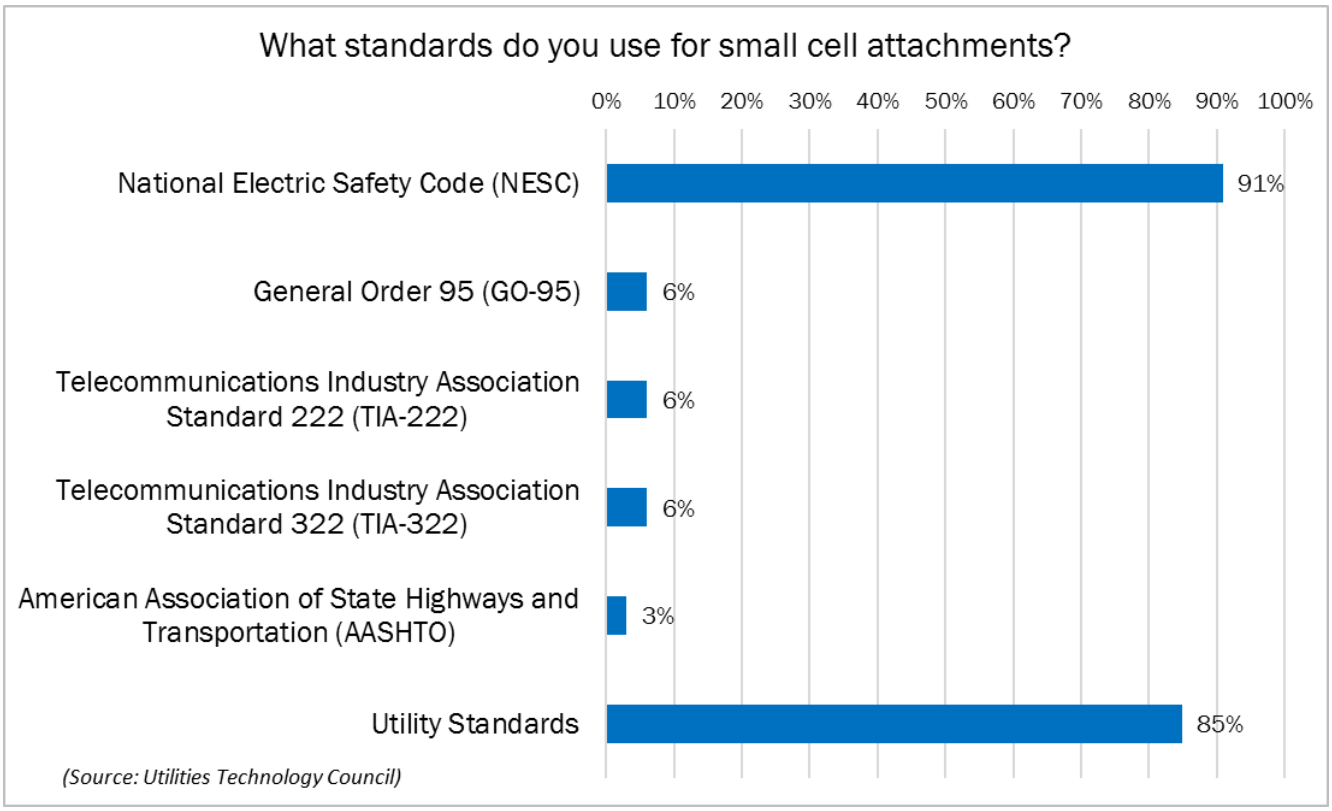

Chart 2 Standards used for small cell attachments

Mounting Equipment on Poles

The increasing rollout of small cell and other wireless equipment means that space on distribution poles and other structures will be become a premium. Structure owners need standards and processes for design, installation, maintenance and modification of customer equipment. This section looks at what utilities are doing today – what types of poles can be used for attachments, and what types of attachments are allowed on those poles. Customers will ask to mount their small cell equipment on acceptable utility owned assets in the right location for their desired coverage.

Pole Types on Which Equipment Is Allowed

The survey asked utilities if they allow attachments to utility-owned streetlights, traffic lights, wood distribution poles, and standalone customer owned poles. Chart 3 shows that most utilities will allow attachments on their wooden poles, although not all utilities do this. Utilities are much less willing to allow attachments to their streetlights, often because the existing streetlight structures do not have the necessary structural strength, space or channels inside the pole for the cabling and additional power needed by small cell equipment. Only one public power utility allows small cell radio mounts on traffic lights, but utilities often do not own traffic lights, so that decision would not be theirs to make.

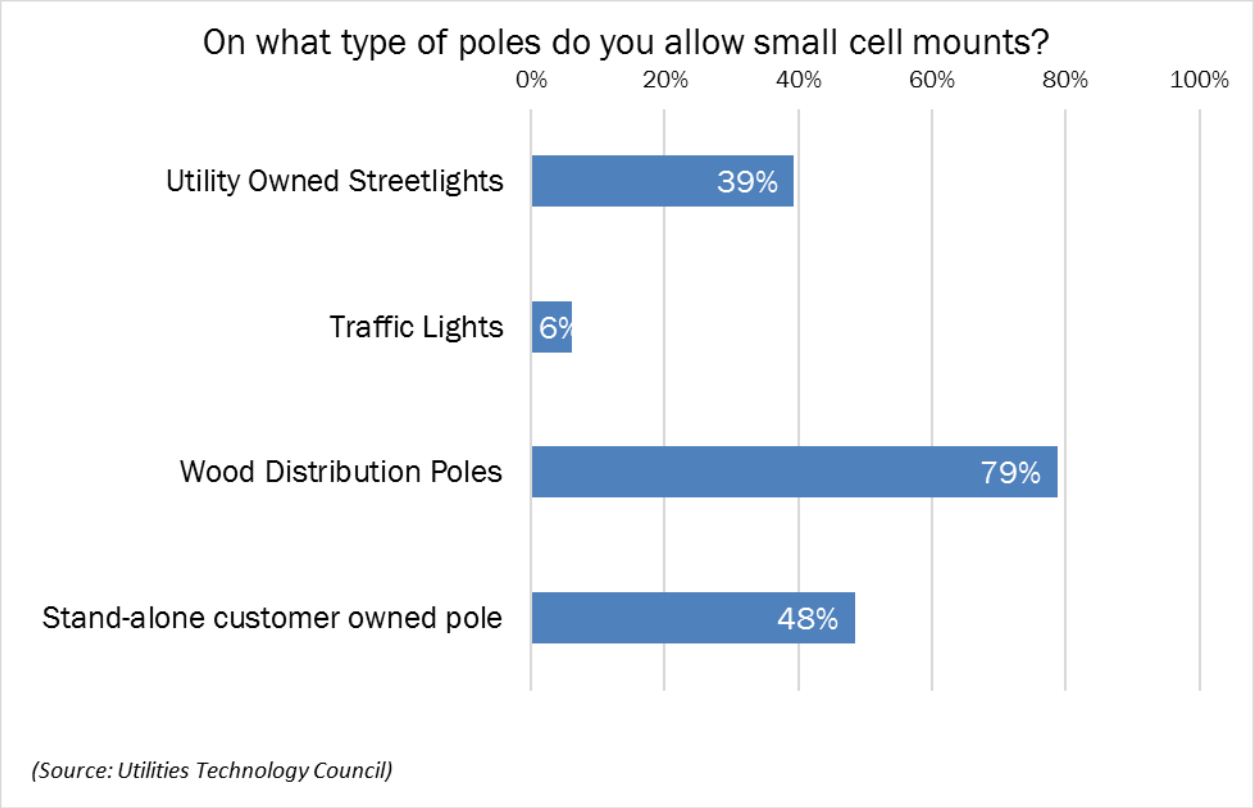

Chart 3 Poles on which attachments are allowed

Mounting Position on the Pole

Antennas can normally be mounted in one of three positions on a pole:

- In the communications space
- In the power space
- On top of the pole, above the power space

As Chart 4 shows below, many utilities will allow antennas either in the communications space or atop the pole. Utilities do not often allow antennas to be mounted in the power space because of safety concerns with non-utility employees or contractors working in the power space or pole top – either for mounting or later for maintenance.

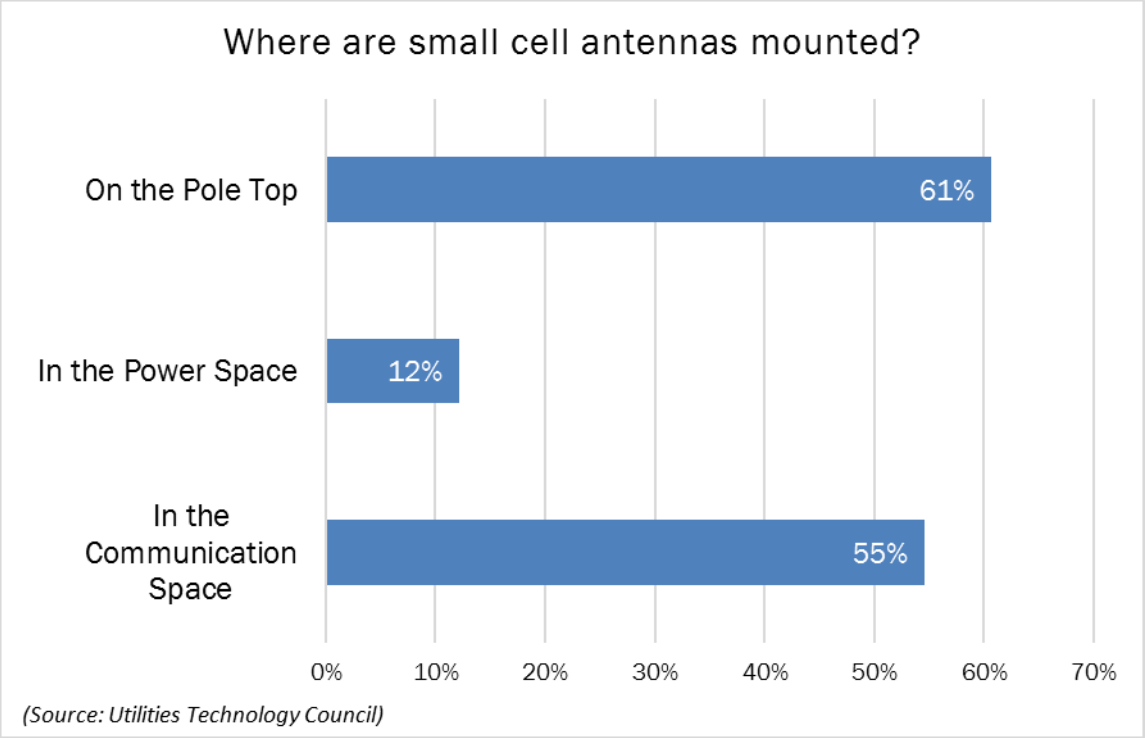

Chart 4 Where are small cell antennas mounted?

Antenna Mounting Height

Customers will request mounting of small cell antennas at different heights, depending on the application for each particular antenna. The survey asked utilities if they allowed antenna mounts in the follow height ranges:

- 25 to 30 feet
- 30 to 40 feet
- 40 to 50 feet
- Above 50 feet

About two-thirds of the responding utilities allowed multiple height options for their customers, which explains why the totals in Chart 5 well exceed 100%.

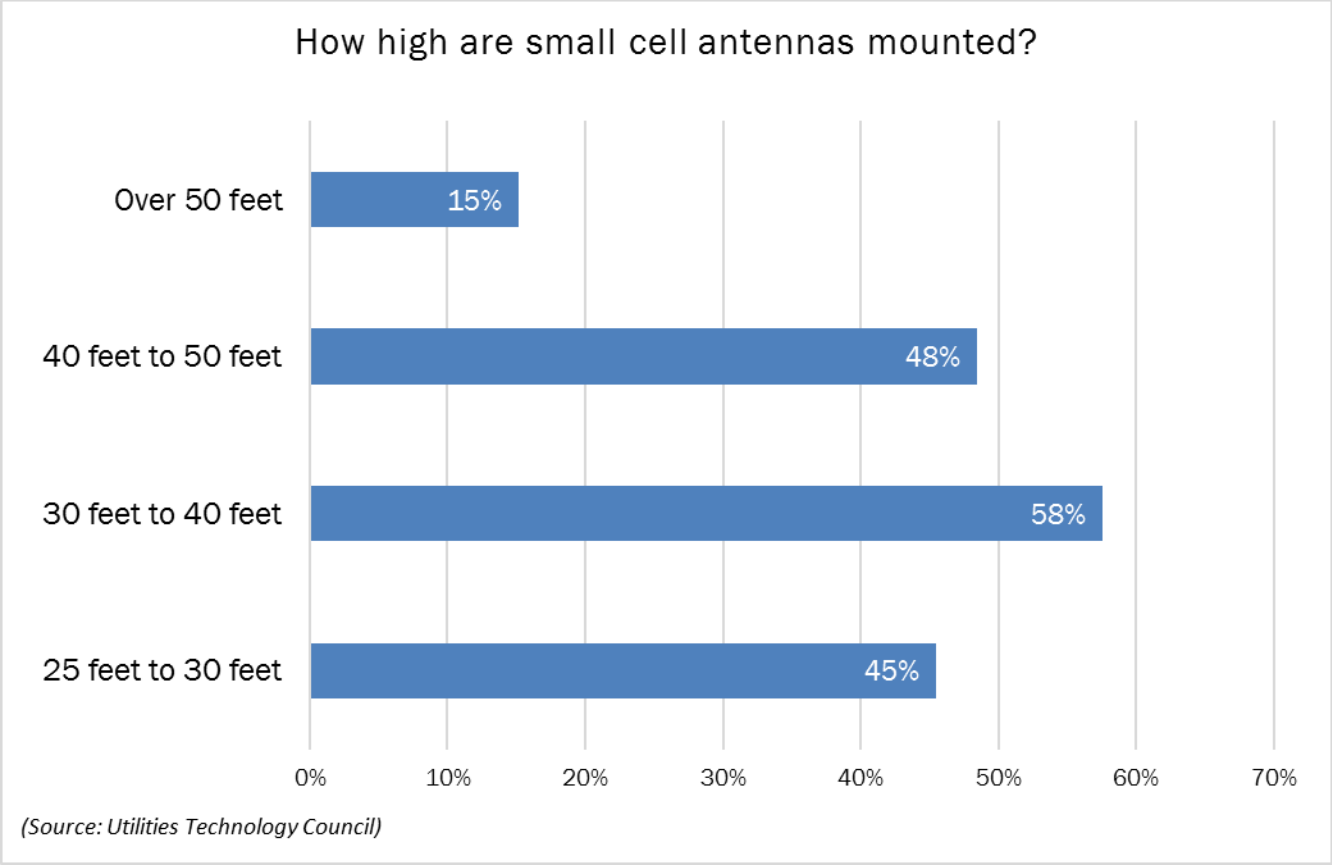

Chart 5 How high are small cell antennas mounted?

67% of utilities allow third parties to mount small cell or associated equipment on their poles in the public right-of-way (ROW). It is important to note that in some cases, city ordinances can place limits on pole heights beyond what a utility may require.

Installing Equipment in the Power Space

When equipment is installed in the power space only power-qualified workers may maintain the equipment. Utilities may require that their own power-qualified crews or their own power-qualified contractors perform these installs, or they may allow approved power-qualified third parties to install the equipment. Additionally, some utilities do not allow installation of third-party wireline or wireless equipment in the power space.

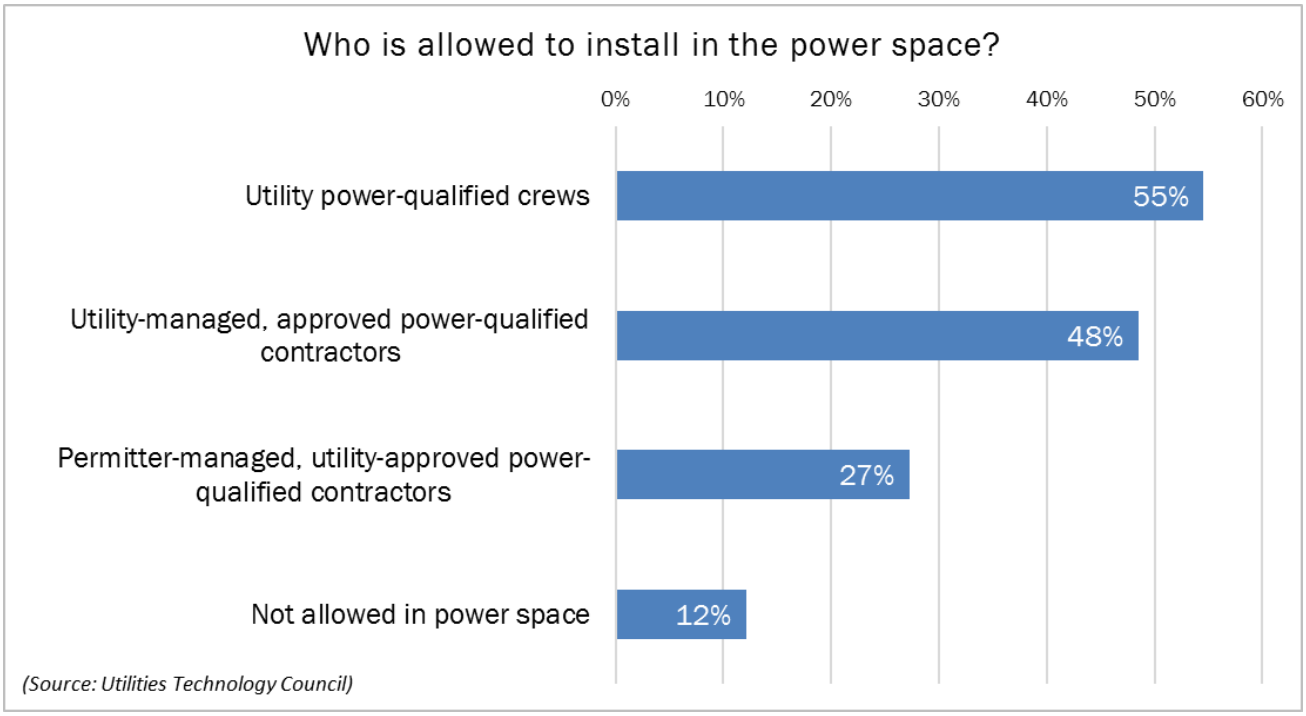

Chart 6 Who is allowed to install in the power space?

Chart 6 shows that utilities are often open to more than one type of installer. Utilities place more importance on knowing that the installers are power-qualified, rather than the particular commercial relationship between the utility and the installers: employees, contractors, or third parties. This aligns with utilities' consistent prioritization of safety above all other concerns.

Utility-specific Rules for Attachments

The U.S. National Electric Safety Code (NESC) specifies numerous requirements that apply to pole attachments and most utilities have additional requirements for use of their assets, guided by the utilities' requirements for safety and reliable delivery of electricity. Chart 7 examines four specific requirements that were identified in the survey:

- Attaching strand mounted equipment on communications wirelines
- Allowing more than one customer on the same pole
- Restricting installations on poles with supply space attachments
- Requiring pole loading calculations for small cell equipment

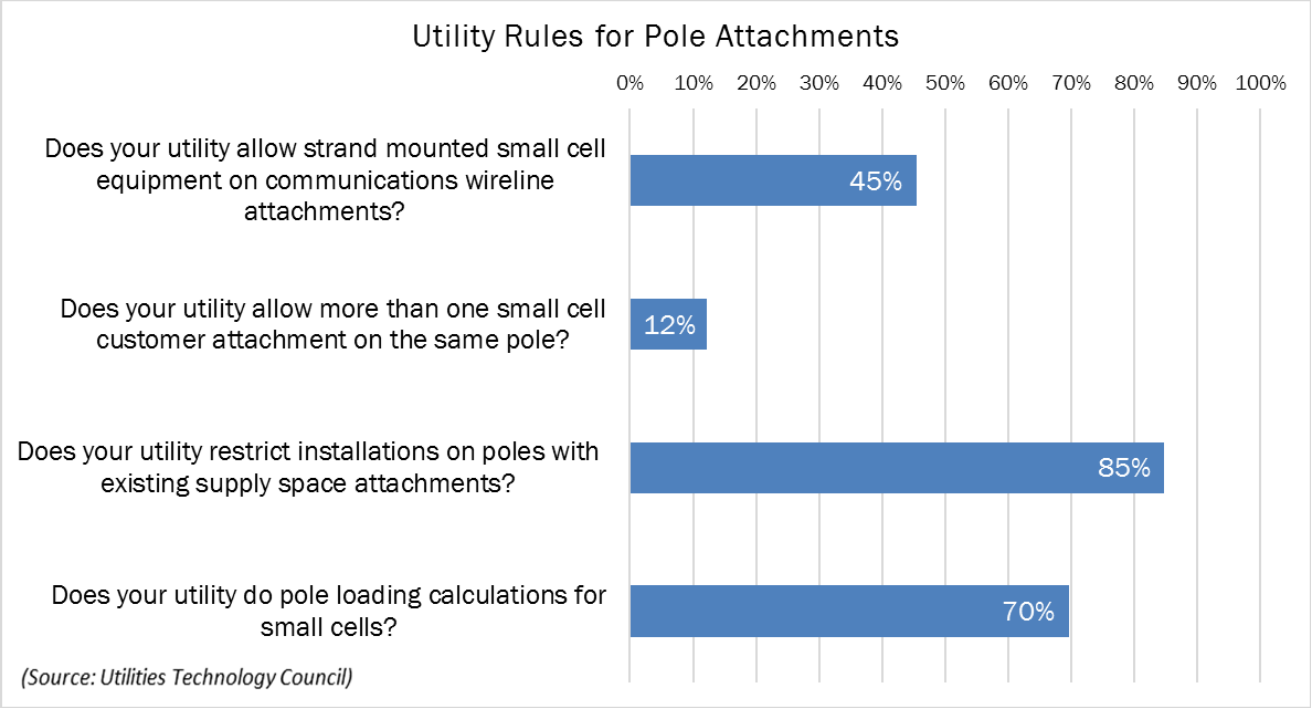

Chart 7 Utility Rules for Pole Attachments

The top line of the chart shows that just under half of the responding utilities would allow strand mounted small cell equipment in the communication space. Strand mounted equipment can be challenging because it must be powered, meaning that the utility will have to supply power to the communications space, which is meant to be unpowered as a safety measure. It is unclear if attachers are aware that placing powered equipment in the communications space will greatly reduce the number of people that are qualified and safe to work in that space. Additionally, some trade unions have expressed concern that their members may encounter a powered environment when they have not been trained to work in such areas. Finally, any strand mount device increases the loading on the pole to which the communications strand is attached, so a study is still necessary to ensure that the strand mount equipment does not overload the poles at either end of the strand. Utilities may require strand mount equipment to be metered, in which case the meter may be on an adjacent service pole, on the ground next to the pole, or somewhat further away.

The second bar of the chart shows that only 12% of utilities will allow multiple customers to attach to the same pole. That is, nearly 90% of utilities will only allow a single small cell customer to attach equipment to any given pole. Utilities limit poles to a single attacher because small cell requires at least an assembly with antenna and radio, a meter and an RF disconnect: potentially three attachment points on the pole. So, to meet all clearance requirements, there is generally only room for one attacher per pole. However, an attacher may choose to support more than one carrier per pole, with no additional attachments required.

Continuing with the chart, 85% of responding utilities do not allow additional attachments to a pole that already has attachments in the supply space. Due to the critical nature of the Electric Distribution System, utilities must limit the use of poles that already have utility equipment on them, such as primary risers, capacitor banks, circuit switching equipment, multiple transformers and poles with multiple circuits, solar panels, and other infrastructure critical to the electric system. Often, it is more efficient to install a transformer on the same pole as the small cell equipment than to bring secondary lines to the pole.

Finally, 70% of utilities perform pole-loading calculations for small cell attachment requests. Although these calculations can slow down the approval process, it is important for utilities to understand whether an additional attachment might put a pole out of compliance by making the total weight of all attachments exceed the pole's specified maximum loading weight. When this occurs, the utility must choose between denying the request or replacing the pole with one that can bear more weight. Pole-loading calculations are essential in protecting the electric grid, safety, and reliability.

Metering Small Cell Equipment

The metering of small cell equipment determines power usage of said equipment, so that utilities can be fairly compensated for the power consumed by that equipment. Additionally, smart meters perform a bellwether function by helping utilities to locate and remedy outages more quickly. This section discusses how utilities meter the power supplied to small cell equipment.

Metering Small Cell Equipment

Chart 8 shows that 58% of utilities require metered electric service to their small cell sites, but the remaining 42% of utilities allow for unmetered services. Having the meter and disconnect mounted on a pole is a climbing safety hazard and some utilities do not allow this practice. Meters can also be problematic on poles due to their size and weight, which can further complicate pole-loading calculations and put the pole out of compliance with its specification.

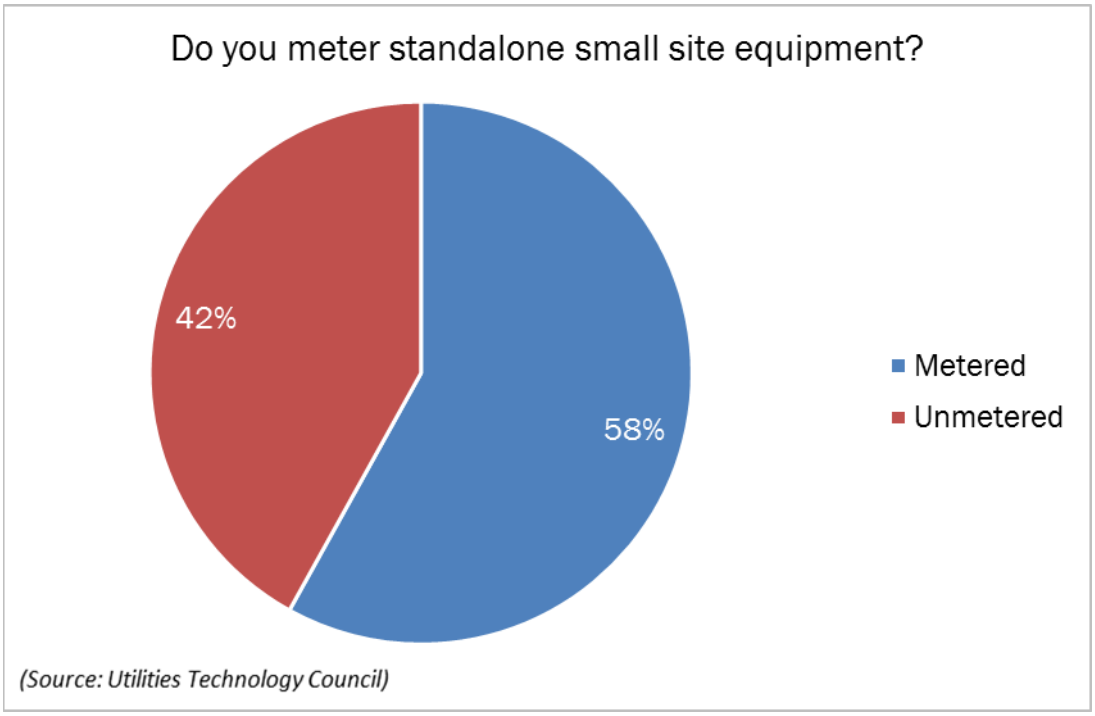

Chart 8 Utilities that meter small cell equipment

Those utilities that do not meter service to small cell equipment indicated other ways that they determine how much to charge small cell customers for the consumed energy, such as:

- Charge based upon the breaker size or amperage.
- Communication tariff established for wireline systems, extended to small cells
- Monthly charge for unmetered attachment based on utility company pre-determined rates

- Charge based on manufacturer's load sheet
- Historic usage of metered sites
- Flat rate-monthly billing
- Charge based on total expected kWh consumption

Types of Metering Used for Small Cell Equipment

Those utilities that do meter their customers' attachments have several options. Chart 9 shows that utilities may allow meters to be mounted directly on poles on a nearby pedestal in the right-of-way, or on a pedestal in a private easement. The most common application is for the meter to be mounted directly on the pole, although as described above this can be problematic. Meter manufacturers have recently demonstrated a smart meter designed specifically for pole-mount applications which have a much smaller form factor and weight.

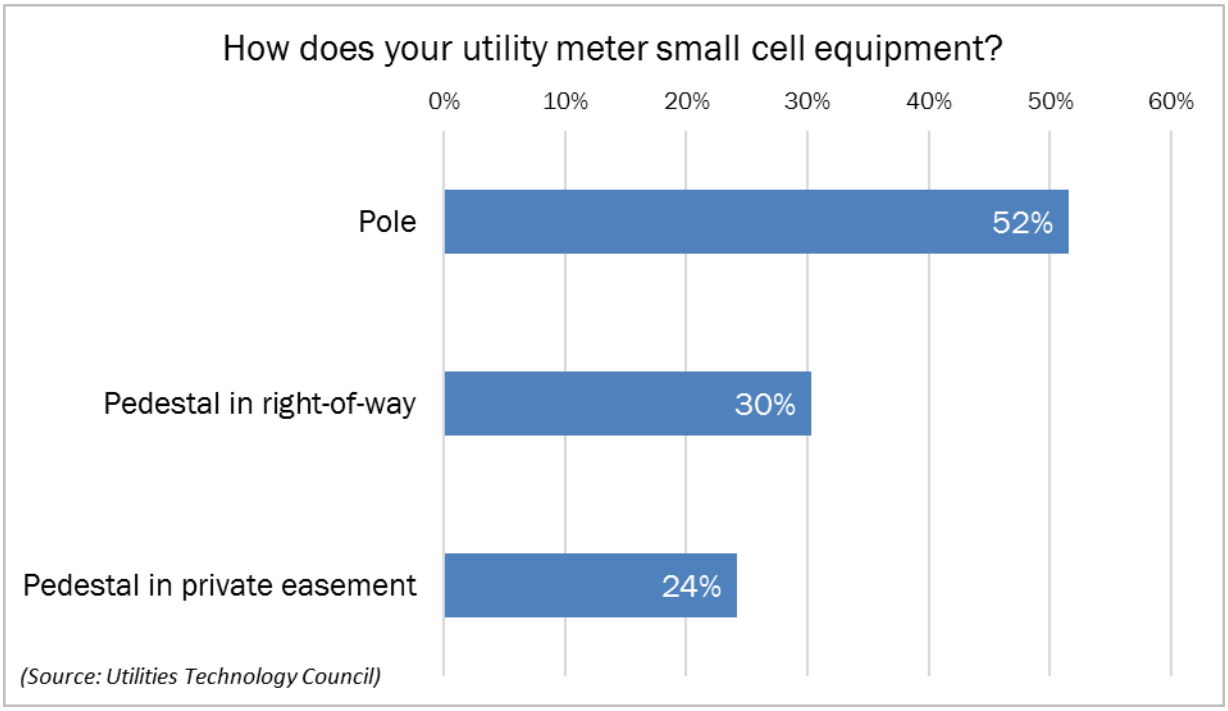

Chart 9 Location of small cell equipment meters

The totals in this chart add up to slightly more than 100% because several respondents take multiple approaches to metering based upon specific use cases.

Metering Small Cell Equipment on Street Lights

Streetlights present a special case for metering small cell equipment because street lights are often mounted on poles that cannot readily accept a meter. Some street light poles cannot even accept

small cell equipment because they lack the loading capacity and internal channels for additional network or power cabling. In those cases, the street light structure itself might have to be replaced before equipment can be mounted. Utilities report significant expense and lead time in procuring those specialized structures.

Chart 10 shows the various approaches that utilities take to metering small cell power on streetlights. Metering is most often accomplished via a separate meter for the small cell, although some utilities do not meter small cells on streetlights. Finally, there are utilities that do not own any streetlights, or that will not allow small cells on streetlight structures.

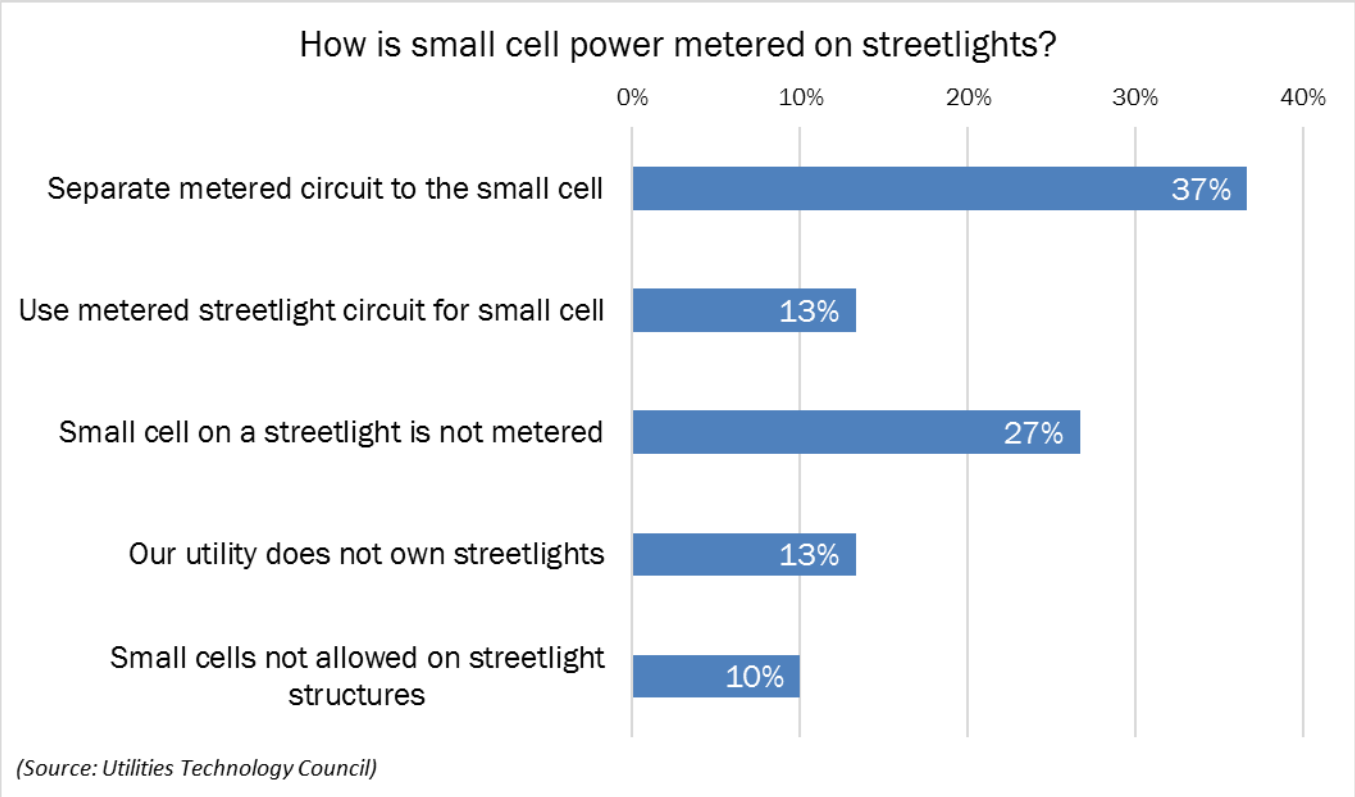

Chart 10 How small cell power is metered on streetlights

Utilities often operate streetlights that they do not own – it is common that a municipality owns the streetlight, while the utility operates and/or maintains the streetlight and its supporting structure. In those cases, the municipality makes decisions on when attachments will be allowed, since it is their structure. However, the utility must implement the municipality's decisions. This can become challenging when a municipality approves a small cell to be mounted on a utility-managed streetlight that cannot accept a small cell without modification or replacement. The utility, the municipality, and the small cell customer must apportion fiscal responsibility for necessary modifications and ongoing maintenance of those modifications among the three parties.

Disconnect Capabilities for Small Cell Equipment

In some designs, an RF disconnect can be used to separate the electric service from the small cell equipment. Chart 11 shows that 89% of our responding utilities do in fact install a disconnect switch for small cell equipment. The RF disconnect is necessary in order to turn off the antennas, to protect workers closer than the safe approach distance.

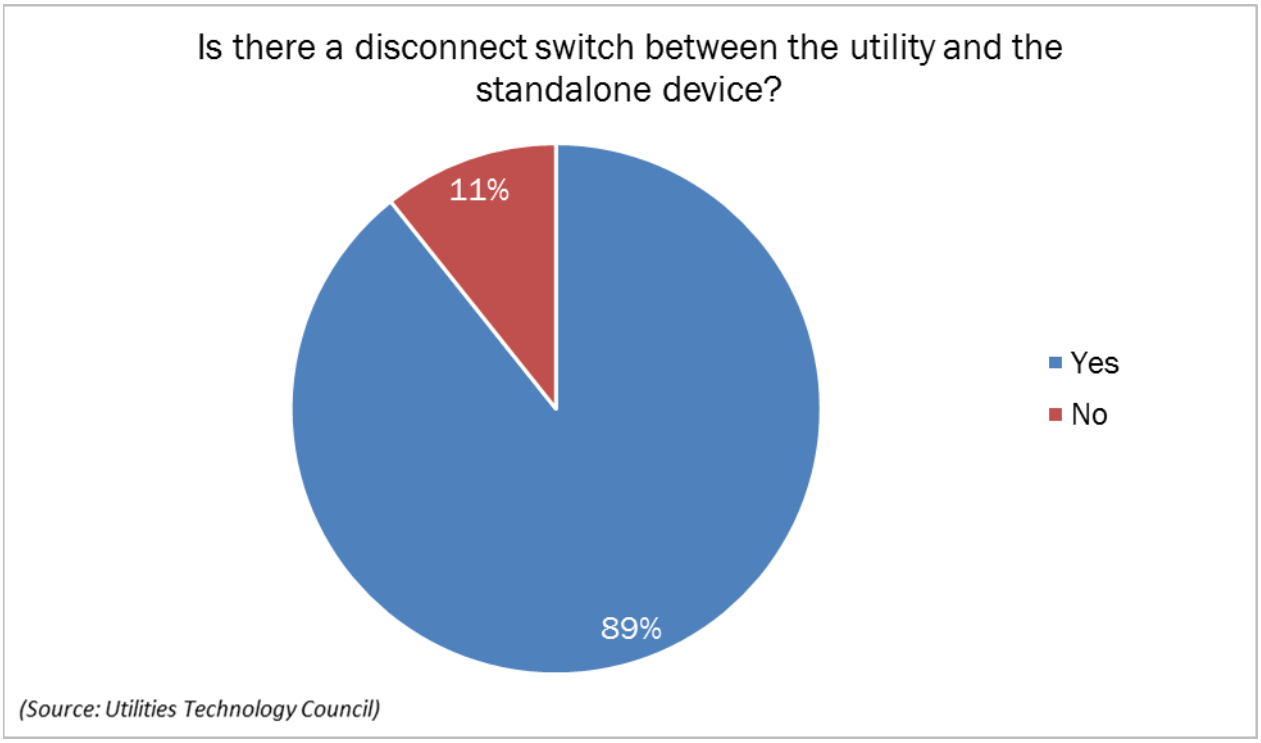

Chart 11 Disconnect switch for small cell mounts

Utility Ownership of Assets

The ownership of distribution and other utility assets includes: primary use of and management of a structure, type of electric service to the customer, type of pole for the design, protocol for outage restoration, and implementing an RF safety program. This section looks at the requirements of a utility as owner of these assets.

All respondents indicated that pole or structure owners dictate the primary use of a structure; rarely if ever will a customer be able to dictate the primary use of a structure.

Power Supply for Small Cells

To power small cells, utilities will most often use whatever power source is readily available. Chart 12 illustrates that utilities overwhelmingly do not have a specific requirement for overhead or underground electric service, rather, they will normally use the existing facilities at the location of the small cell attachment. In selected use cases, overhead or underground power may be specifically required, often due to community requirements. As with other charts, the totals here exceed 100% because many utilities must comply with differing requirements in different areas of their service territories.

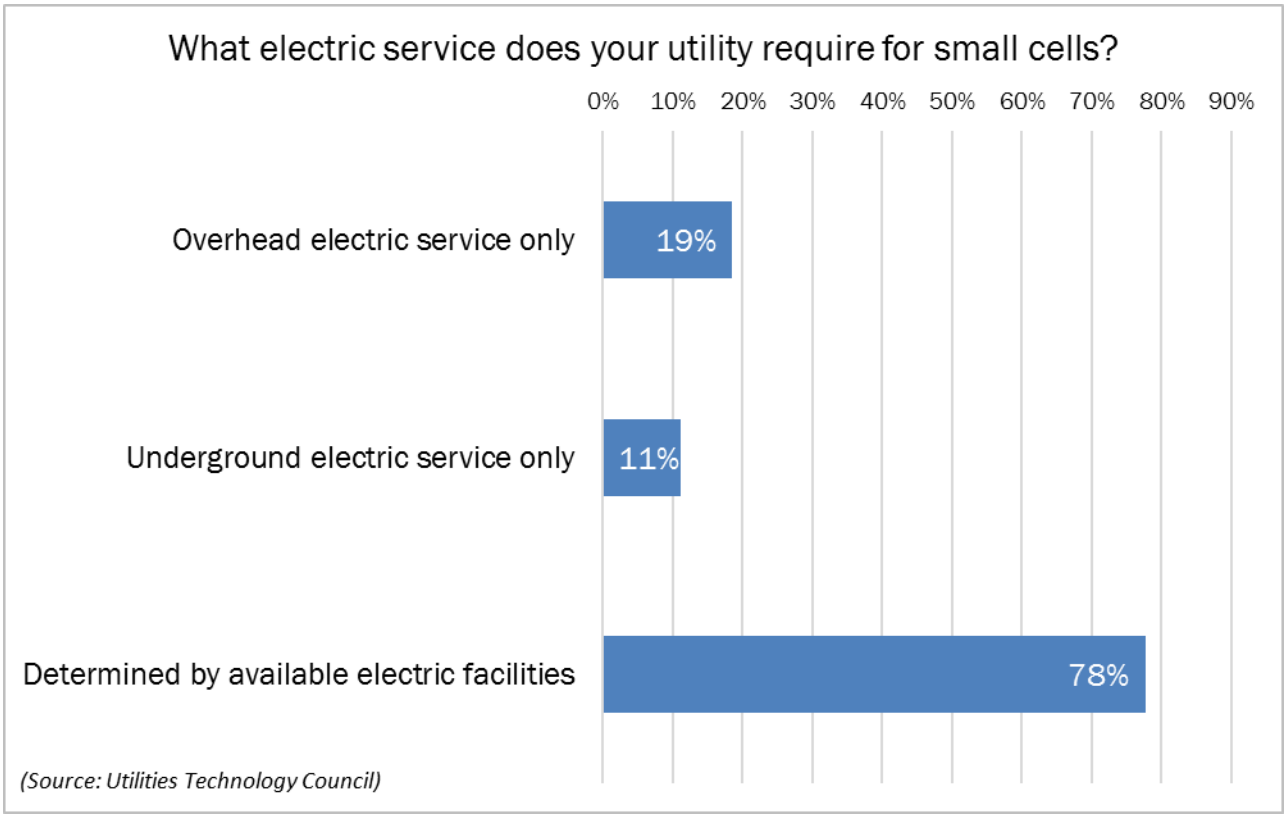

Chart 12 Electric service is required for small cells

Structures where Small Cells May Be Mounted

Chart 13 shows that utilities most commonly use wood distribution poles for mounting small cells. This is due not to the sheer number of wood distribution poles, but to utilities' preference for using these poles. As described earlier, streetlights can pose challenges in mounting small cells that would not be encountered with wood distribution poles. Thus, only half as many utilities (39%) reported allowing small cells on streetlights, as reported allowing small cells on wood distribution poles (78%). Traffic signals are a seldom-used mounting location for small cells because they are often critical infrastructure to a city: if the signal light goes out, the safety of residents can be seriously compromised. The additional loading on the "pole" could also make it more susceptible to failure.

Finally, about half of utilities support customers mounting small cells on customer-owned poles. Clearly utilities have no say as to what is mounted on a pole that they do not own. However, utilities may be cautious in supplying power to a pole that they do not own. If the customer-owned pole is installed in the ROW, it must be approved by the city first, so the utility will supply power once the city has approved the pole. Cities may base their permitting decisions on several factors, including the aesthetics of the proposed pole at the proposed location. If a pole is not in the ROW, but in a private easement where a utility already has facilities, then the utility will require proof that the

attacher has easement rights before providing electric service. If the attacher has easement rights were the utility does not, then the process becomes complicated and my run longer.

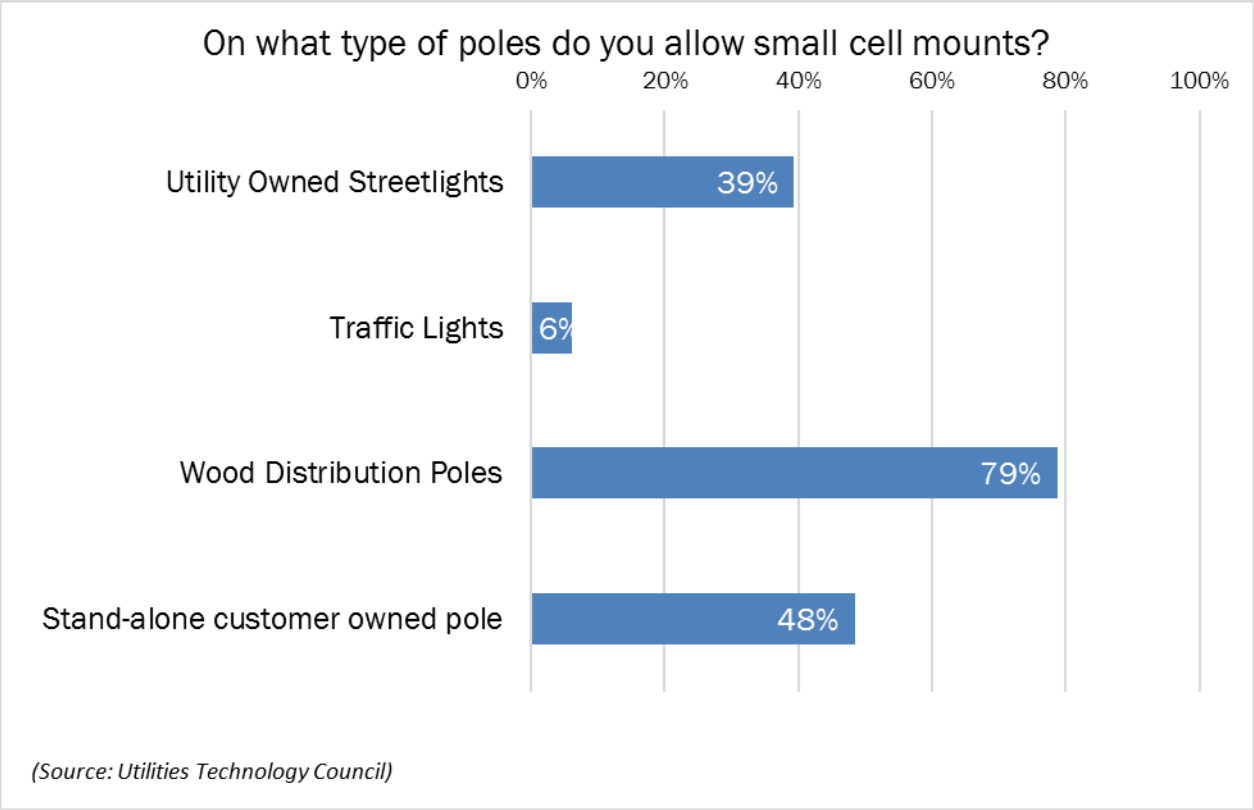

Chart 13 Types of poles where small cell mounts are allowed

The total of the four options shown in Chart 13 is 173% - illustrating the most utilities will allow small cell mounts on multiple types of structures.

Asset Management Software

Asset management software enables utilities to track the location and status of assets such as poles available for small cell mounts. Specifically for poles, the software can indicate what is already mounted on a pole and its current status in terms of total loading allowed as compared to the current loading on the pole. Having this information readily available can streamline the pole-loading calculations. However, utilities must ensure that data in the asset management system remains accurate. The asset management system can also help utilities plan for maintenance and replacement of poles further into the future, which provides insight for asset procurement forecasts.

An asset management system combined with a Geospatial Information System (GIS) can provide a tremendous benefit during accident or storm restoration and disaster recovery, by indicating where

damaged poles are located, the specifications for a replacement pole, and what equipment must be mounted on the replacement pole.

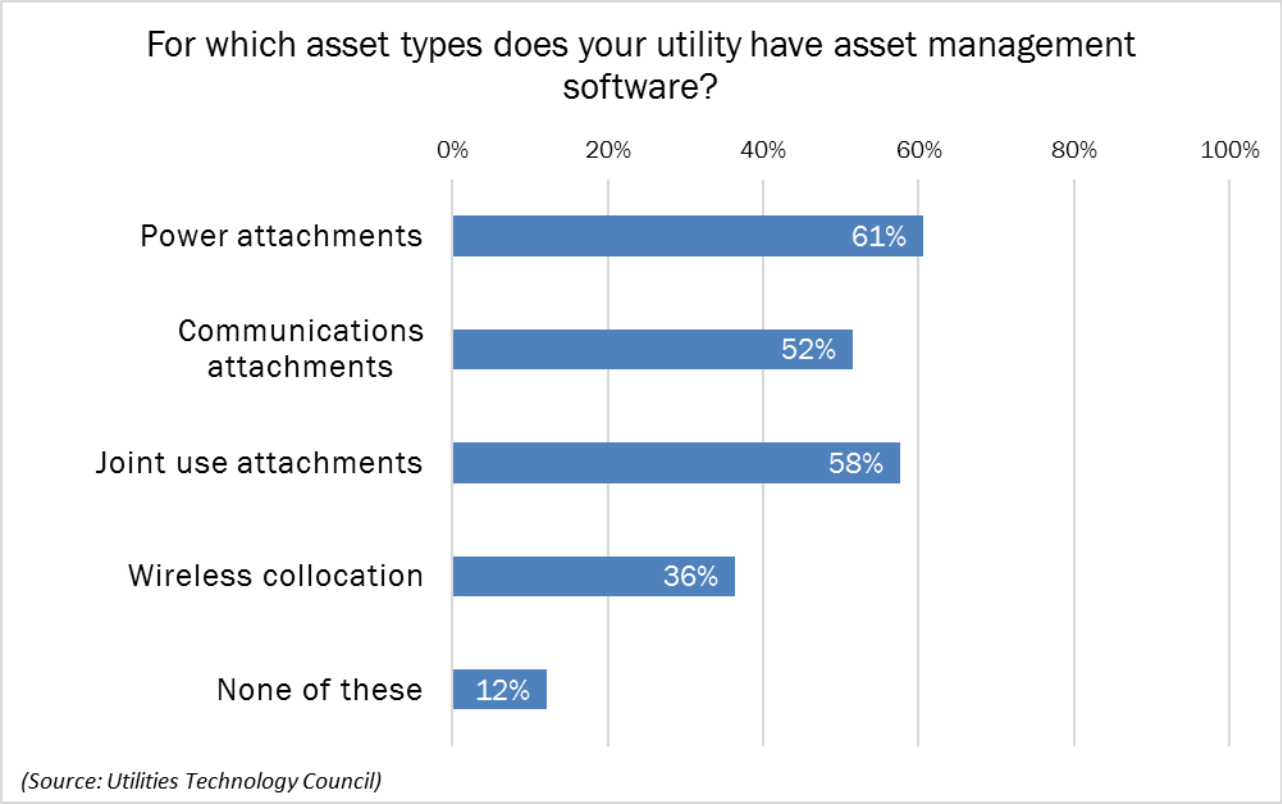

Chart 14 Asset types that have asset management software

Chart 14 shows that utilities have been aggressively deploying asset management software to track for small cell equipment attachments. These applications are relatively new and include specialized logic to deal with specific business cases related to pole attachments – they are not generic asset management packages. The penetration of asset management software in utilities is likely to grow as utilities deal with an ever-increasing number of attachment requests related to the rollout of 5G telecommunications. Although difficult to determine from the chart, a substantial majority of responding utilities indicated that they are already using asset management software for three or all four of the attachment types shown in the chart.

Outage Protocols

Standard outage protocols enable recovery from an outage and specifies the roles and responsibilities of the utility and the attacher during restoration efforts. The detailed protocol may vary based on the type of outage, type of customer(s) and the expected length of the outage. Chart

15 shows that fewer than half of responding utilities have yet developed standard outage protocols – either planned or unplanned.

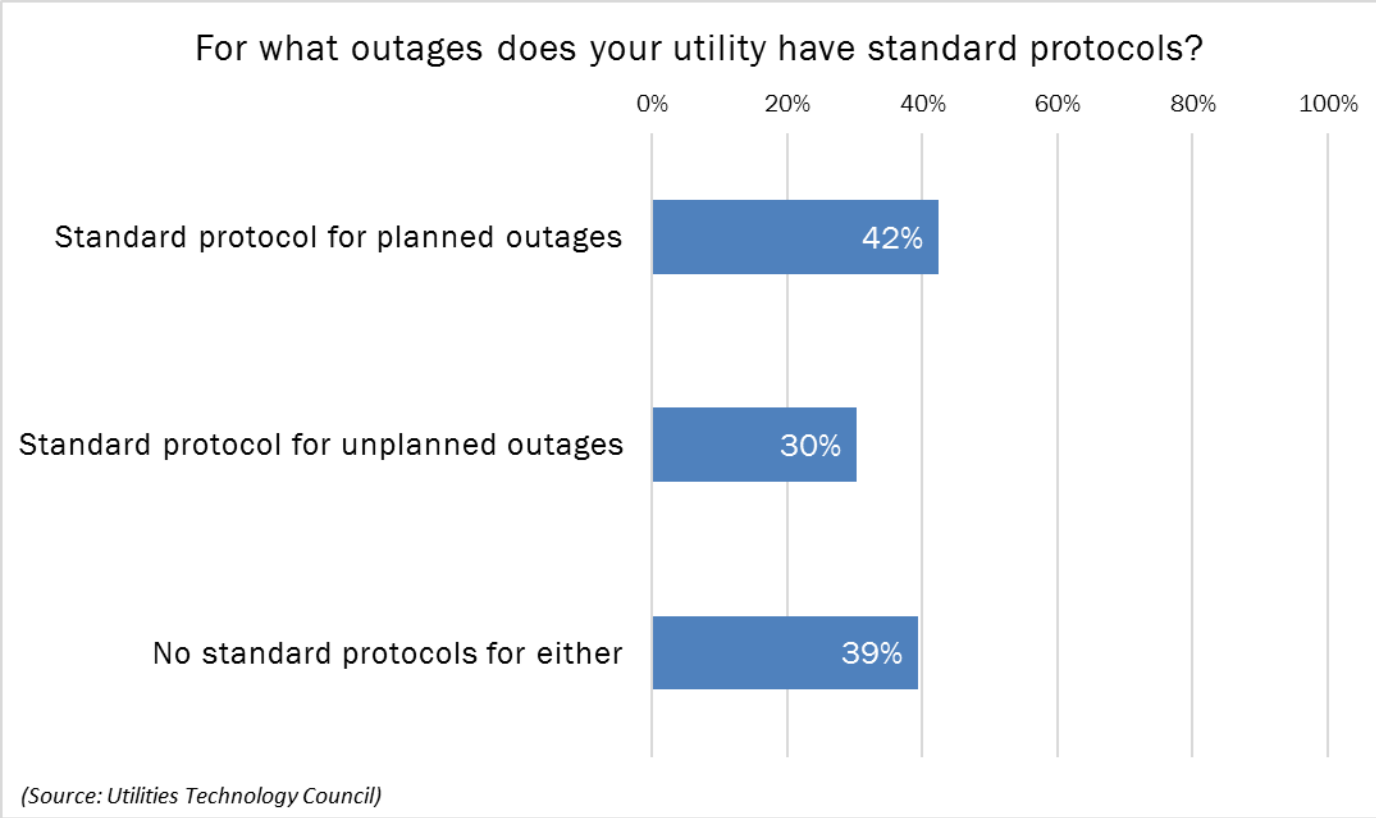

Chart 15 Standard protocols for outages

No utilities reported having only a protocol for unplanned outages.

Utility RF Safety Programs

Utilities' RF safety programs keep their employees in a safe working environment by helping field workers understand when they have encountered levels of RF that are higher than recommended safety levels. Tools and equipment measure current RF levels and sound or display an alarm when an employee is in an unsafe situation from which they should remove themselves immediately. Chart 16 shows that utilities are still developing their RF safety programs – the situation could not yet be characterized as mature. One-fourth of the respondents do not have an RF safety program, which is likely to become an issue as additional small cell equipment is attached to poles. Only 19% of responding utilities have an RF program that requires annual training, although another 15% of utilities recommend but do not require annual training. As also shown on the chart, the largest number of utilities have an RF safety program but with no required annual training.

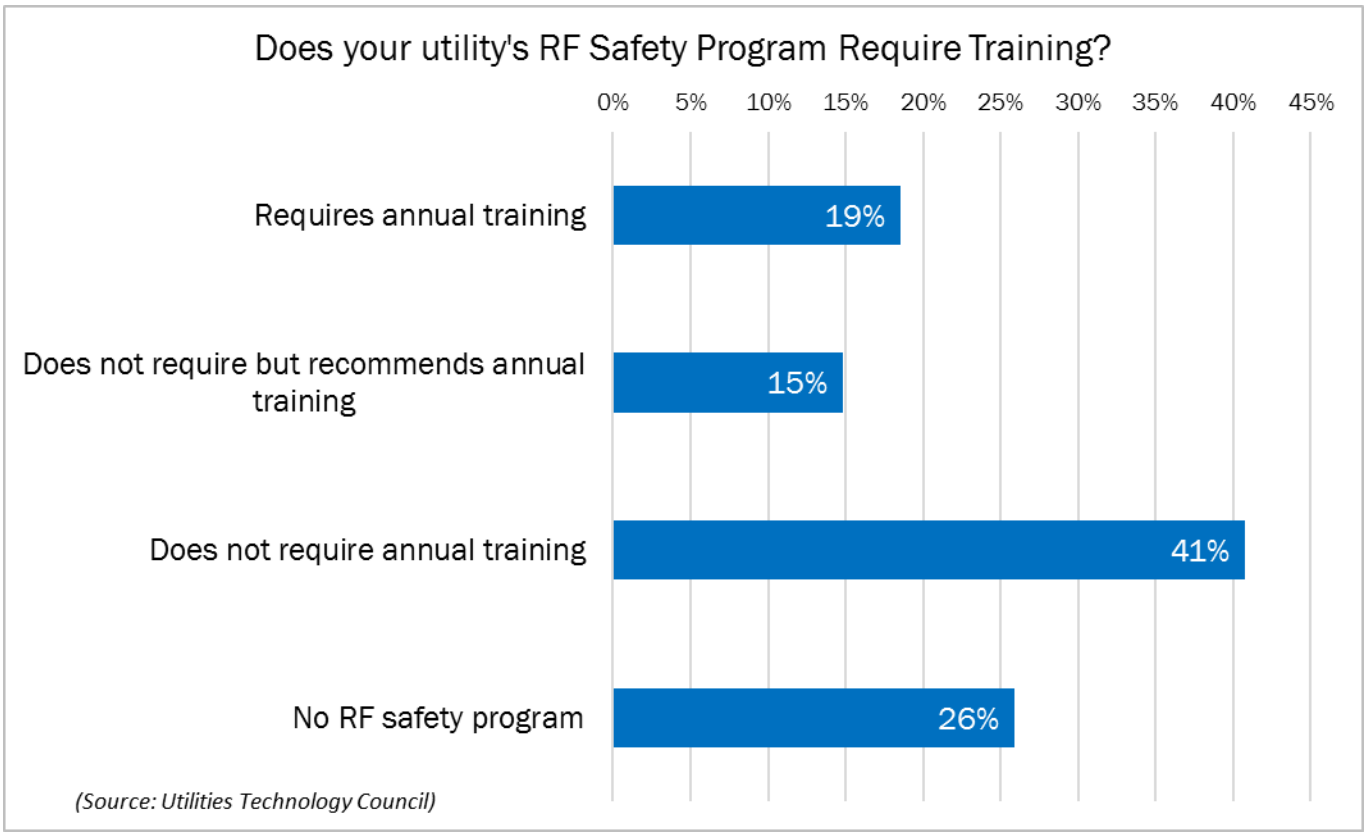

Chart 16 RF Safety Programs

Preventing RF Interference with Utility Systems

Utilities require that small cell attachments do not cause RF interference with their own Smart Metering and Distribution Automation systems. This is normally achieved via specific language in the agreement between a utility and a small cell customer. Many utilities also provide specific requirements in their Standards. Responding utilities gave these examples of requirements that they have included in their pole attachment agreements:

- Small cell equipment node poles must be at least 200' from utility automation and metering system equipment. If requested closer than that, a study must be done to ensure there will not be interference.
- RF analysis is required when wireless installation is within 2000' of a substation.
- Our wireless agreement has specific interference language allowing a cure period but also immediately disconnect if utility-affecting interference persists.
- The attacher is required to adhere to federal and industry standards and to certify that adherence to the utility.

- It is the responsibility of the attacher to determine this that there is no RF interference with utility systems, with a provision for spot checks by utility staff.
- Our agreement requires that the customer provide an *iNarte Review* to demonstrate no interference.
- Agreements state that small cell equipment may not cause RF interference with the utility's facilities - if interference is found it may result in removal of the equipment or other remediation if the attacher is unable to remedy the situation.

Some utilities require that each proposed small cell site must have an RF compliance report (prepared by a utility-approved RF Professional), which demonstrates that the proposed site will comply with all applicable RF emission rules and regulations as set by the FCC or the applicable state.

Lessons Learned

After completing the survey, our respondents shared a number of lessons that they had learned throughout their joint use small cell program development and execution. Some of the highlights are:

- Small Cell attachments have taken significant time with contract discussions and design criteria. We have executed wireless agreements with all the carriers and the majority of the infrastructure providers governing Macro, Transmission Collocation, and small cells on distribution and stand-alone streetlight poles. The carriers and infrastructure providers are consistently changing personnel requiring more and more time to be spent with little actual installs occurring. The carriers will indicate that a large number of installs is coming, but then the actual number of attachments is small. Our state small cell law allows carriers to place their own poles on state roads and there have been a number already installed. The carriers and infrastructure providers have told us that placing their own pole is their preferred practice.

- Our specifications are more restrictive than the NESC. While small cells do not have mandatory access to lighting poles, we do allow small cells on lighting poles when the mounter will sign an agreement with us.

- We are not sure how to restrict strand mounted wireless since it is not on the pole. Our expectation is that the attachers will notify us either before or after it is installed. We are not aware of any other than wi-fi antennas on cable systems

- Ownership of decorative street light pole where small cell is proposed is transferred to small cell operator with city permission.

- The regulatory field is evolving. New state regulations on rate calculations and current debate on the use of small cells on streetlight poles. Smart city issues do affect investor-owned facilities.

- Antenna operators and the FCC should be taking much greater caution about the resiliency of the infrastructure they are proposing to build. Some of the speed to deploy is undermining safe, planful, and resilient design.

Glossary of Terms

Collocation	Attaching equipment from multiple owners to the same piece of infrastructure or asset. This report uses collocation to mean the attaching of wireless antennas to macro sites (towers).
Communications Space	The area of the pole where communications equipment, cables, fiber and supporting equipment are mounted, starting at the bottom of the worker safety zone. The worker safety zone is unoccupied space required between the two and is governed by various Codes and Standards.
Distribution Pole	A pole that was erected by a utility primarily to support equipment and conductors that distribute power from substations to neighborhoods, usually rated in the range of 10-35 kV.
Distribution Power Space	The area of the pole where energized conductors and their supporting equipment is mounted. Usually found near the top of the pole, a dangerous working environment that requires properly trained and qualified workers. Electrical codes require a worker safety zone, a buffer space between the Power Space and Communications Space, to protect workers that are not trained to work in the Distribution Power Space.
Distribution Supply Space	Same as Distribution Power Space.
Joint Use	Use of the same asset by multiple entities, one of which may own the asset. This report uses "joint use" to mean the attachment of wireline equipment (including small cell radios) to utility distribution poles and other similar size poles such as streetlights.
Metering	Measuring the amount of energy consumed (in kilowatt hours) by customer equipment, so that the utility can bill the customer for consumption of that energy.
Pole Attachment	Any piece of third party equipment that is attached to a pole, such as fiber optic or other cables, power supplies, amplifiers, service drops, cable messengers, guy wires, radios, antennas and other wireless equipment.
Pole Loading	Identifies the forces acting on a pole (from equipment, cables, and other attachments) and analyzes its structural integrity in varying weather conditions

RF Safety	A set of procedures and protective equipment designed to protect workers from harmful amounts of radiofrequency (RF) waves, including a device to signal when RF exceeds safe limits.
Right-of-way (ROW)	A nonpossessory right to make a way over a piece of land, usually to and from another piece of land. In the context of this report, the right for electricity or telecommunications cables to pass over land owned by a third party. Separate rights of way are usually required for electricity and telecommunications – an electricity right-of-way does not automatically confer a telecommunication right of way.
Small Cell	Low-powered cellular radio access nodes that operate in licensed and unlicensed spectrum that have a range of 10 meters to a few kilometers. Recent FCC orders have provided size and elevation guidelines to help more clearly define small cell equipment.
Strand Mount	Equipment that is attached to a steel messenger running between two poles (the "strand"), normally seen in the Communications Space.
Streetlight	A lighting fixture to provide light to a street or roadway, usually mandated by the local municipal government.
Streetlight Pole	A pole that is specifically built to support a streetlight and to house within it the power and possibly telecommunications cables necessary for operation of the streetlight.

Websites – Standards Referenced in this Report

International Building Code:
https://www.iccsafe.org/products-and-services/i-codes/2018-i-codes/ibc/

National Electric Safety Code (U.S.):
https://standards.ieee.org/products-services/nesc/index.html

California Public Utilities Commission, General Order 95:
http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M217/K418/217418779.pdf

Telecommunications Industry Association:
https://tiaonline.org/

American Association of State Highway and Transportation Officials:
https://www.transportation.org/