



Source: AT&T

Small Cell Wireless

An Introduction

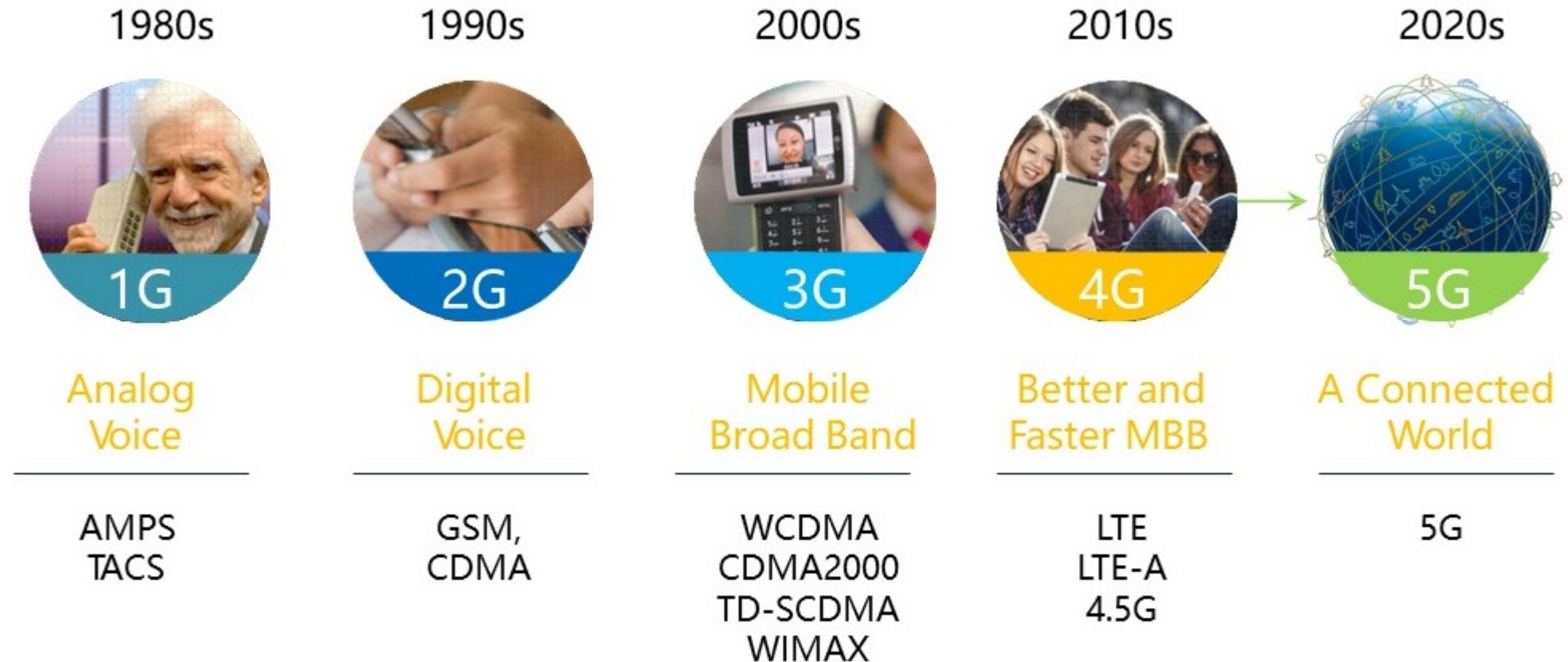
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Outline

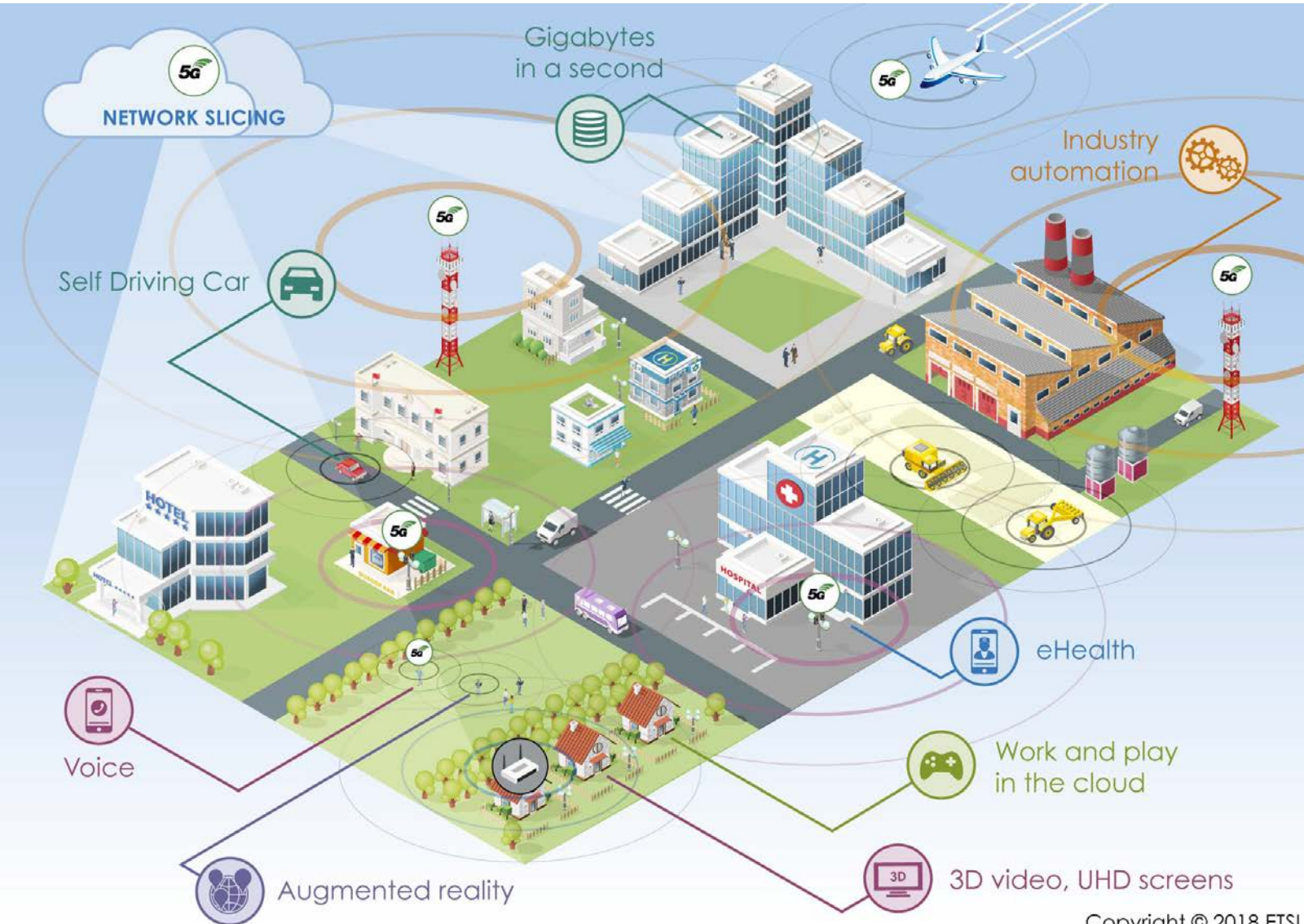
- Why do we need small cell technology?
- What is small cell technology and how does it look like?
- How does small cell technology compare with previous generation technologies?
- How will small cell technology benefit the community and the city?
- What is the status of small cell technology in USA?
- How can we get insights on updating our local code and regulatory framework?

We are entering the 5G era



Source: Huawei

the Vision of 5G



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>10 Gbps
peak data rates
10,000x
more traffic
100 Mbps
whenever needed



High Speed
Extreme mobile broadband

Unlimited experience

10 years
on battery
Ultra
low cost
10-100x
more devices



Massive Scale
Massive machine communication

For everything

Instant
action
<1 ms
radio latency
Ultra
reliability



Low Latency
Ultra Reliability
Critical machine communication

Instant action

Source: Verizon

5G vs. 4G (LTE)



Decrease in latency:
Delivering latency as low as 1 ms.



Connection density:
Enabling more efficient signaling
for IoT connectivity.



Experienced throughput:
Bringing more uniform, multi-Gbps
peak rates.



Spectrum efficiency:
Achieving even more bits per Hz with
advanced antenna techniques.



Traffic capacity:
Driving network hyper-densification
with more small cells everywhere.



Network efficiency:
Optimizing network energy consumption
with more efficient processing.

Source: visualcapital.com

5G Techniques



**Millimeter
Waves**



Small Cell



**Massive
MIMO**



Beamforming



Full Duplex

Source: Patently Apple

What is small cell technology?



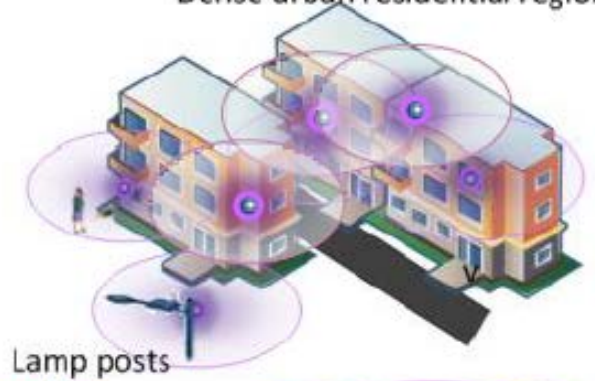
Source: ameronpoles.com

Enterprise small cells



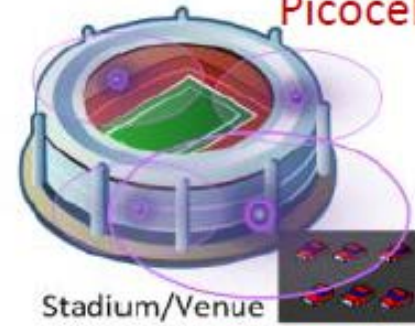
Downtown business region

Neighborhood Small Cells (NSCs) Dense urban residential region



Lamp posts

Picocells



Stadium/Venue



Mall/Enterprise

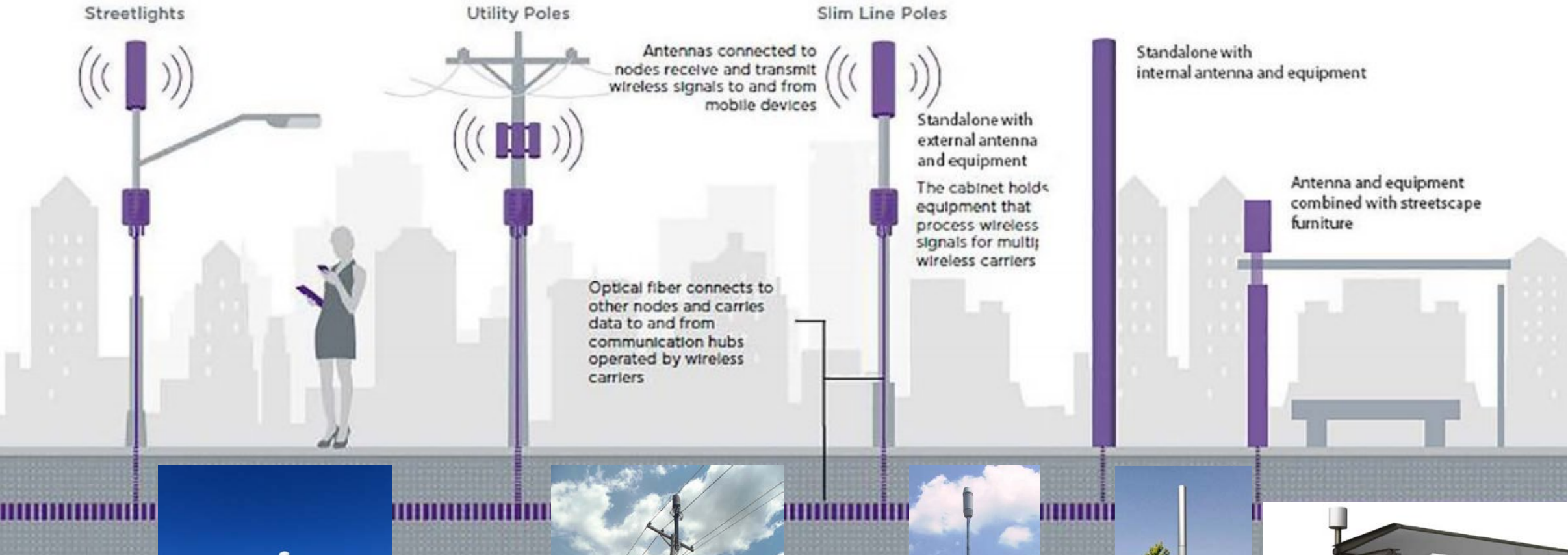
Enterprise small cells

Source: Qualcomm

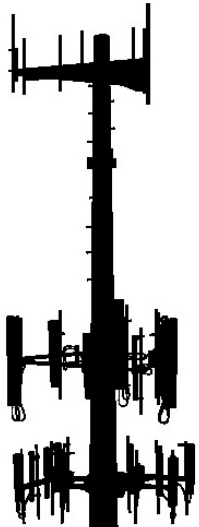
Small cells are portable miniature base stations that require minimal power to operate

best suited for dense areas

What does small cell technology look like?



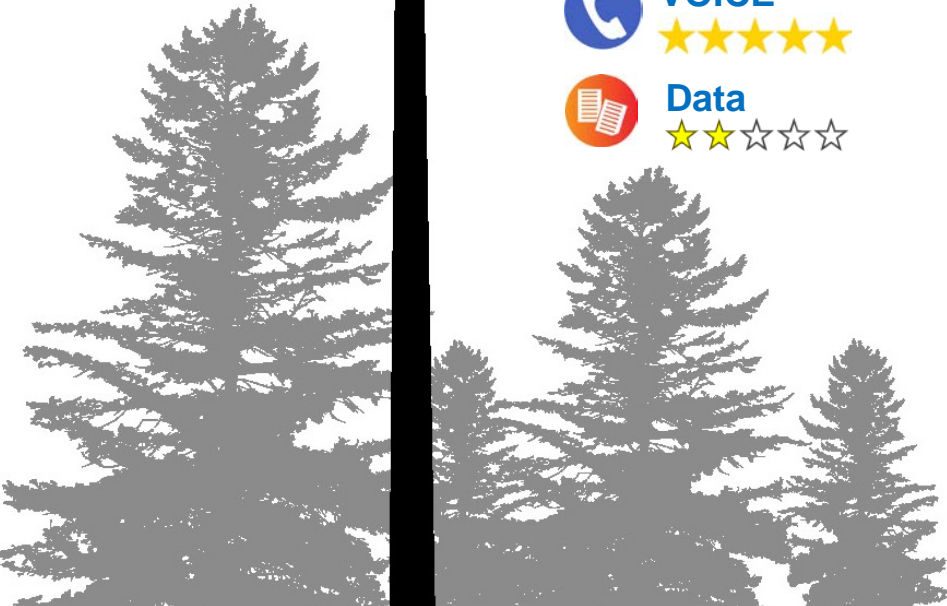
Small cell vs Macro cell



Macro Cell

High tower
coverage area spans several miles
Best for low-density populations

 VOICE ★★★★★
 Data ★★☆☆☆



Small Cell

Mounted on existing structures like rooftops and utility poles.
only supply a few hundred feet of coverage
Good complement for dense areas with high capacity needs

 VOICE ★★★★★
 Data ★★★★★



Small cell brings the network “closer” to its users to deliver

- increased data capacity
- faster connectivity speeds
- better wireless experience

Small cells' benefits to communities

Business friendly

Attracts businesses and customers

Convenient

More reliable wireless coverage throughout the community

Safe

Access to 911 services and better-connected first responders

Source: Crown Castle



Saratoga, CA
29,900 Pop.



Beaumont, TX
118,000 Pop.



Metro Chicago, IL
9,472,000 Pop.

Jobs Created

300

1,000

90,000

GDP Growth

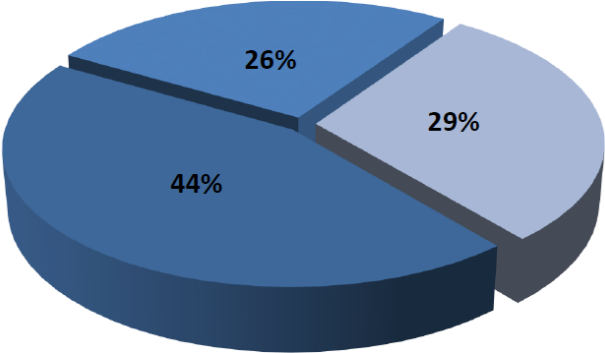
\$50M

\$180M

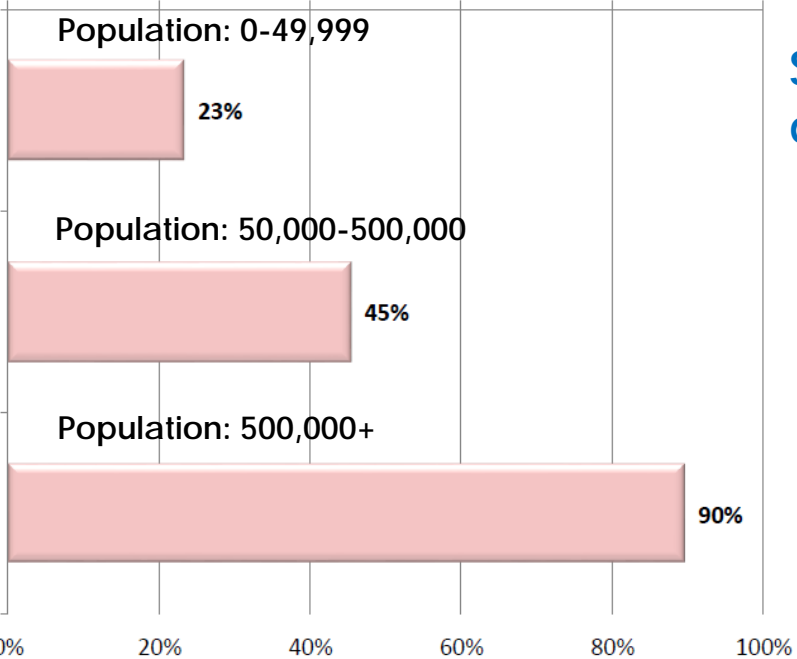
\$14B

Small cell in USA (statistics based on 176 interviews)

Small cell activity in community

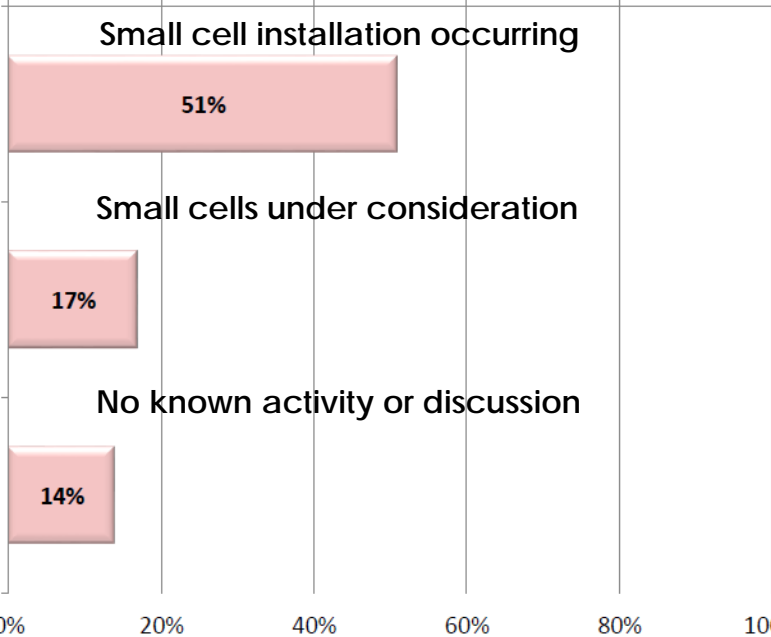


- Small cell installations
- Small cells under consideration
- No known activity or discussion



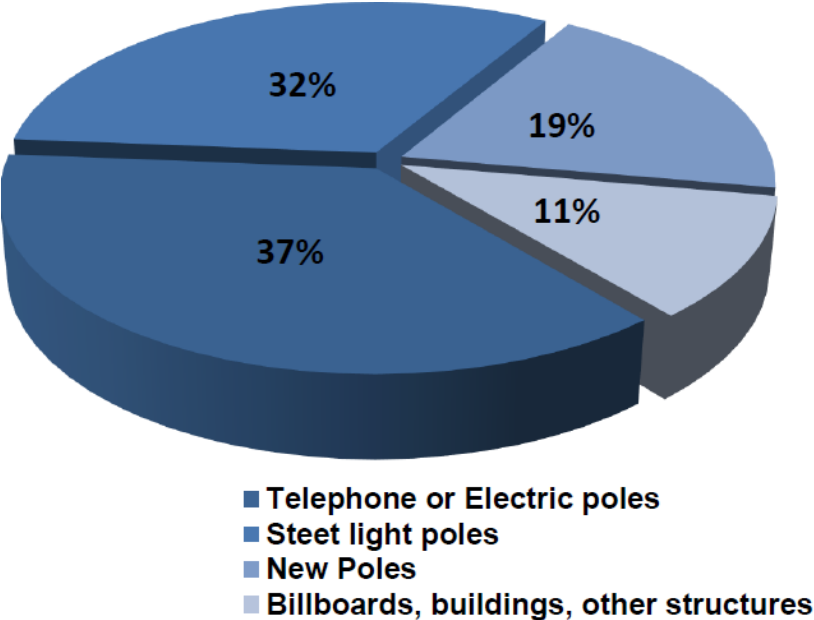
Small cell being deployed

Small cell policies completed

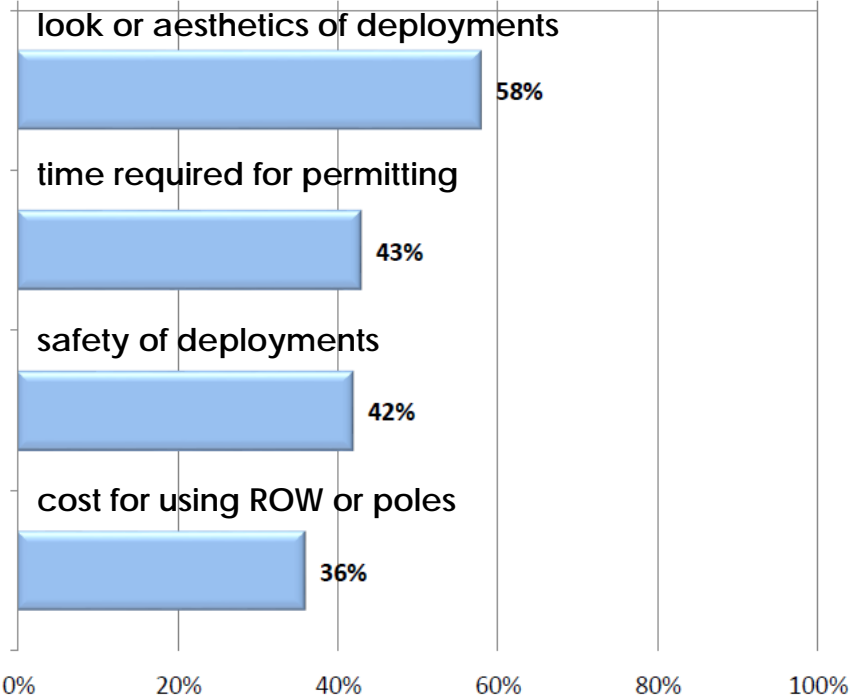


Small cell in USA *cont.* (statistics based on 176 interviews)

Small cell deployment location



Complaints Received Regarding Small Cell Deployment




Get insights on updating local codes

 **1** Gain a full understanding of the small cell technology and important safety considerations

 **2** Articulate local priorities for accommodating small cell technology

 **3** Create clear policies for permit review that let both city staff and industry applicants know the expectations

 **4** Develop a template right-of-way access policy/agreement, as well as a city pole attachment agreement

 **5** Think through in advance any beneficial items the city could negotiate with industry in exchange for use of the right-of-way — if allowed by state law

 **6** Give careful consideration to fee structures



Source: Kathrein

THANK YOU QUESTIONS?



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