Overview of Wireless Telecommunications Service and Facilities

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Wireless Service and Conventional Cell Sites

- Coverage and Capacity
  - "line of sight"
  - Macro sites: Wide area coverage, mounted high, transmit power high
  - *TREND – lower elevation / lower power cell sites which cover a smaller footprint; "more sites"*
- 4 carriers: Verizon, AT&T, T-Mobile, Sprint
- <u>Conventional Cell Sites</u>
  - Towers, Monopoles
  - Existing structures (e.g., Water Tanks and Rooftops)
  - "Stealth" Designs
  - Sometimes accommodate numerous carriers, and other antennas: EMS, Municipal DPW, Police / Fire ("co-location")
  - FirstNet

Wireless Service and Conventional Cell Sites – Application Reviews (Late 1990s - Present)

Site Plan and Special Permit
SEQRA, visuals (photosimulations; viewshed)
RF emissions; “sensitive receptors”
Alternate sites
Alternate heights / configurations
Co-location possibilities
Structural Analysis

Access roads
Environmental constraints, wetlands
Noise / Fuel storage

Re-certifications, Compliance, Reporting

DAS and Small Cell Sites

- Supplemental capacity
  (urban areas, stadiums, malls, airports)
- Network Densification
- Coverage supplements (rural roads, “canyons”)
- Reduced signal reach vs. conventional cell sites (“more nodes needed”)
- Lowers handset / devise transmit power (longer battery life)

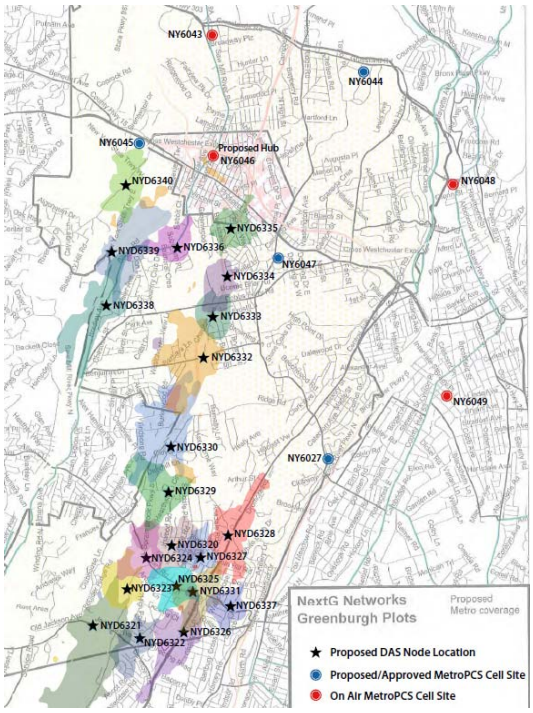
- Used in ROWs (utility poles) **
  - More coming to suburbia (trend)
  - Utility Companies and Carrier / Infrastructure Company issues

- Small Cells noted as a key element of “5G”
- FCC definitions
- Infrastructure companies: Crown Castle, Mobilitie, ExteNet

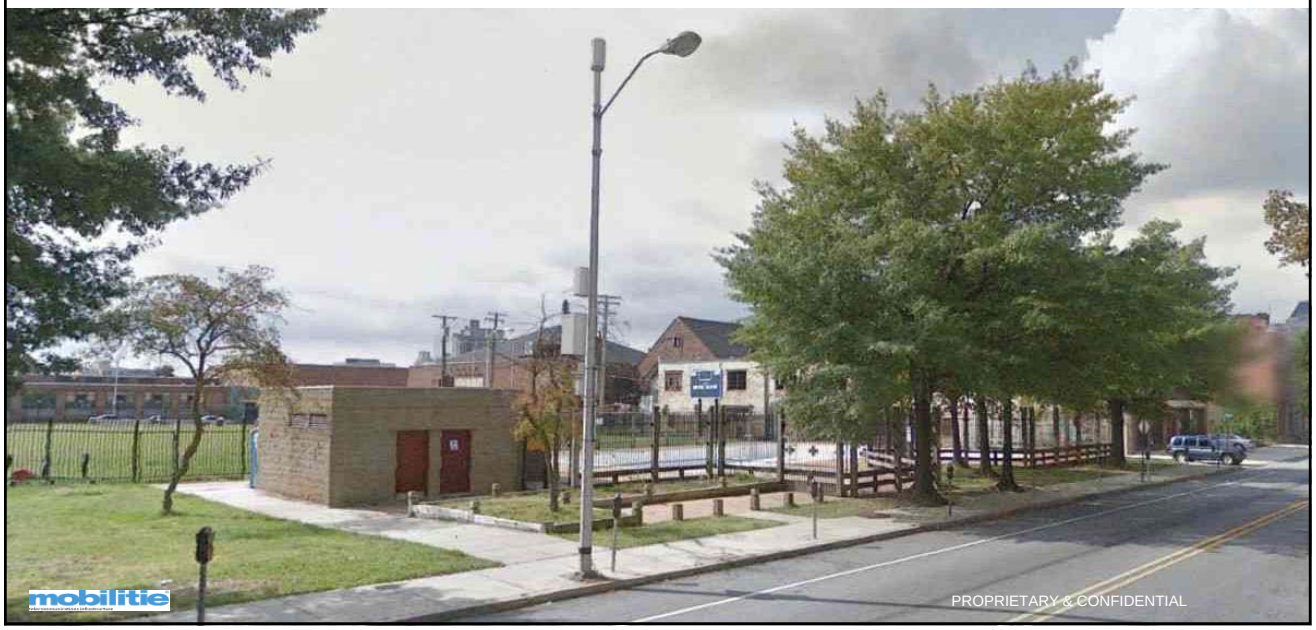
Multi-Faceted Wireless Networks

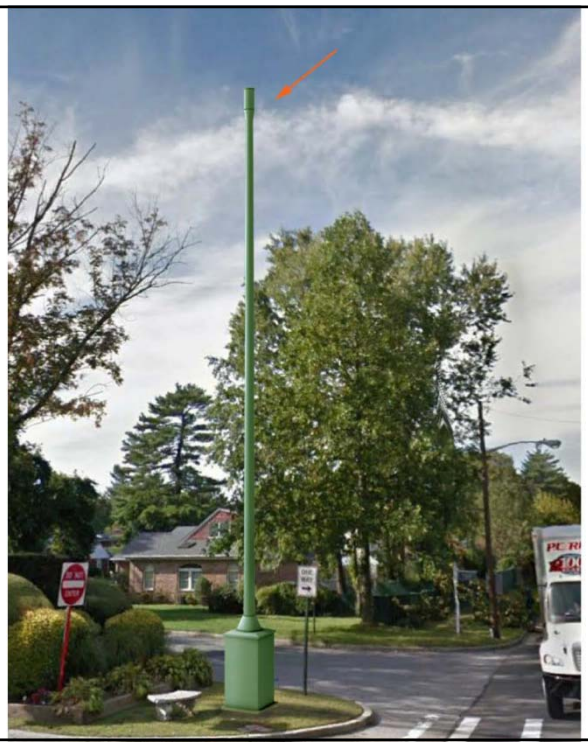
Het-Net Communication System
© 2016 Steel in the Air

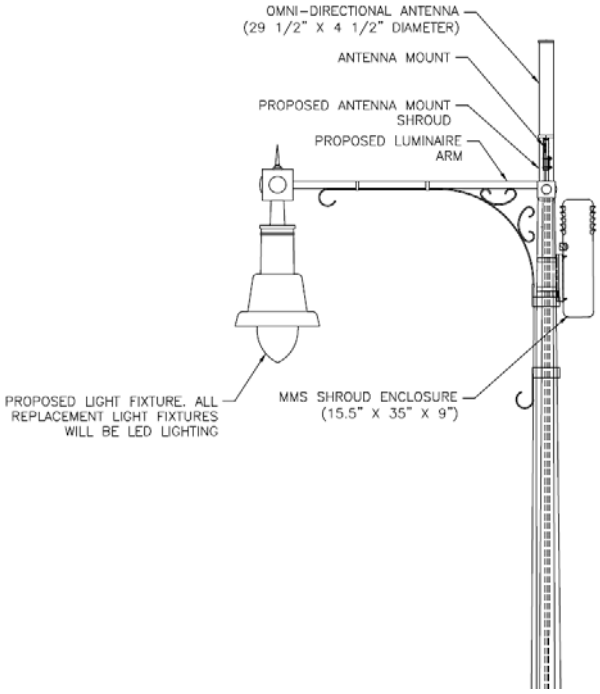
This illustration shows various types of cell sites and installation methods

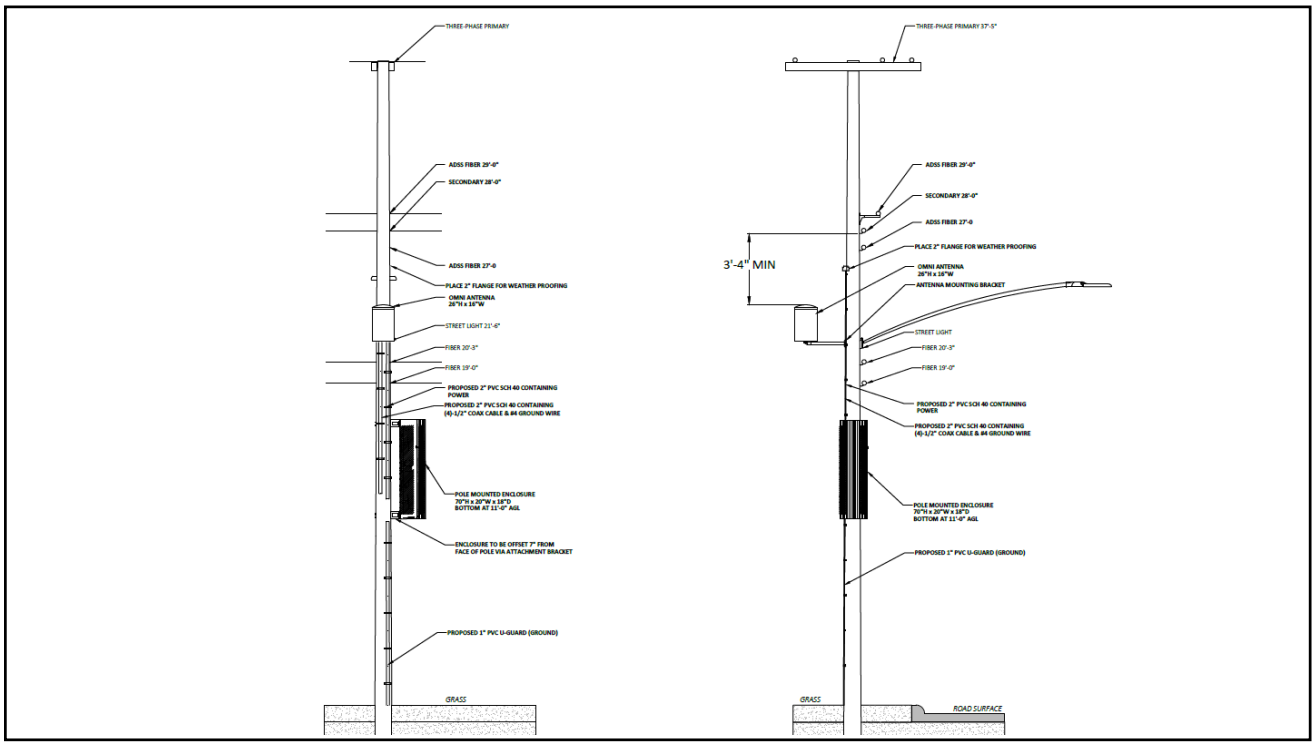


Small Cells – The New Solution ??

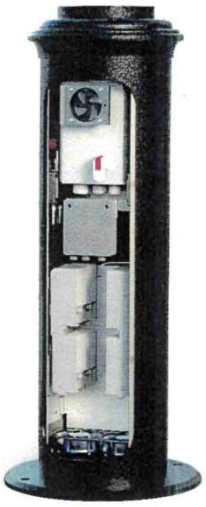





OMNI-DIRECTIONAL ANTENNA
(29 1/2" X 4 1/2" DIAMETER)
ANTENNA MOUNT
PROPOSED ANTENNA MOUNT
SHROUD
PROPOSED LUMINAIRE
ARM
PROPOSED LIGHT FIXTURE. ALL
REPLACEMENT LIGHT FIXTURES
WILL BE LED LIGHTING
MMS SHROUD ENCLOSURE
(15.5" X 35" X 9")



Base Cabinet

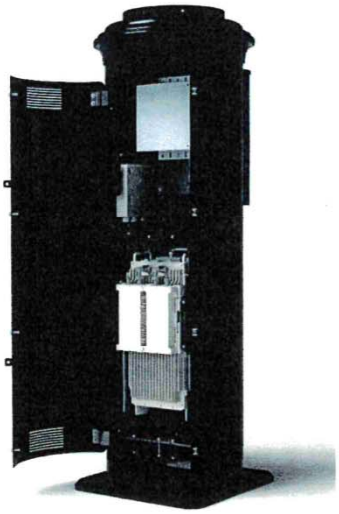


Electrical metering and external disconnects.

Slender variable diameters to satisfy equipment demands.

Flexible equipment mounting points (FlexMount) allows for future expansion and retrofit.

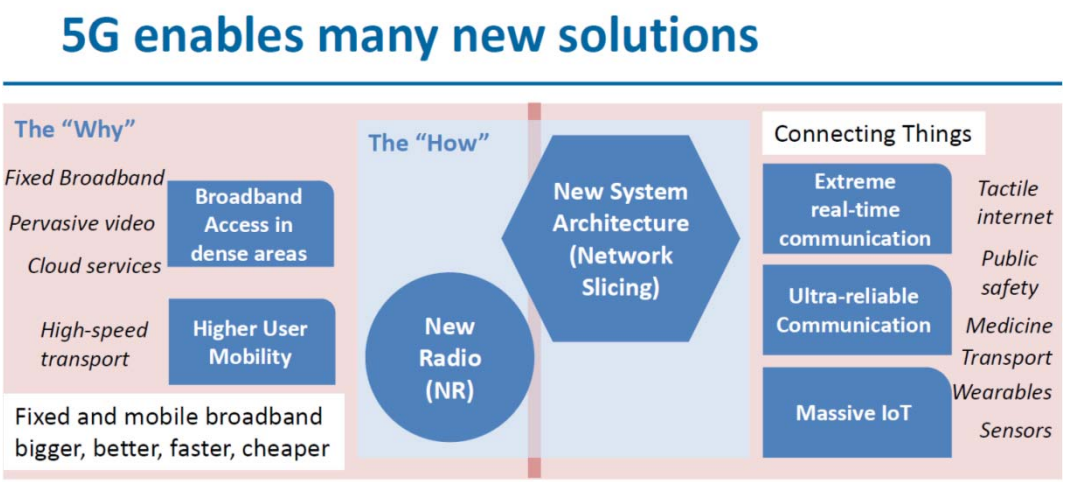
Thermal Management System, remote monitoring, Bluetooth coded locks.



5G

- Small Cells noted as a key element of "5G"
- 5G Taps new spectrum
- "Smart Cities" (IoT, M2M)
- Smart Homes (expands homes with high-speed internet access; remote access to security system, cameras, light switches, thermostats, appliances)
- Wearables – smart watches, health monitoring devices
- Remote Medicine
- Augmented and Virtual Reality applications; Hospitals
- Connected and Automated Vehicles – data transmittals for traffic congestions, improve fuel efficiency, accident reduction
  - Low-latency communication essential
- Public Safety
- Precision Agriculture
- Energy and utility efficiency
- Innovation and business development

5G Solutions (source: CCI)



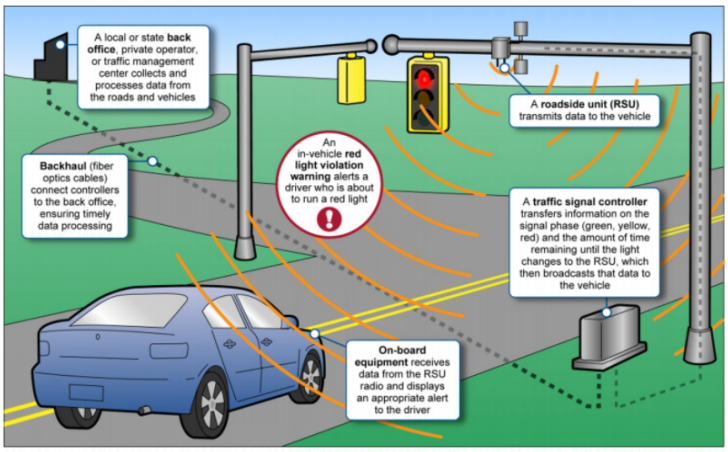
Connected Vehicles

- Vehicle to Infrastructure (V2I)
- Vehicle to Vehicle (V2V)
- Vehicle to Everything (V2X)

Current Issues Impacting Deployment:

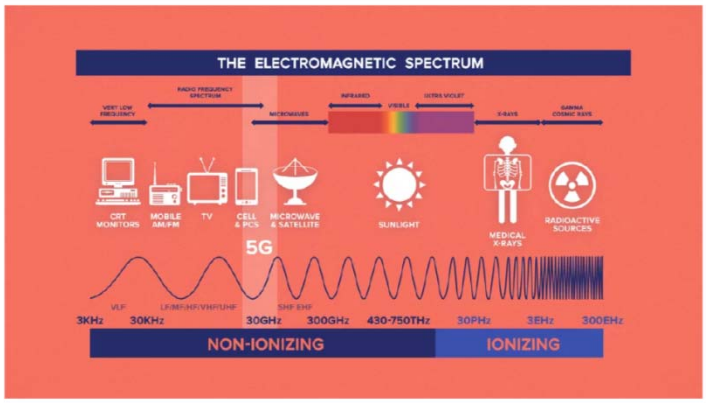
- DSRC vs. 5G
- Spectrum
- Backhaul

Connected Vehicles



Source: GAO analysis of Department of Transportation documents. | GAO-15-775

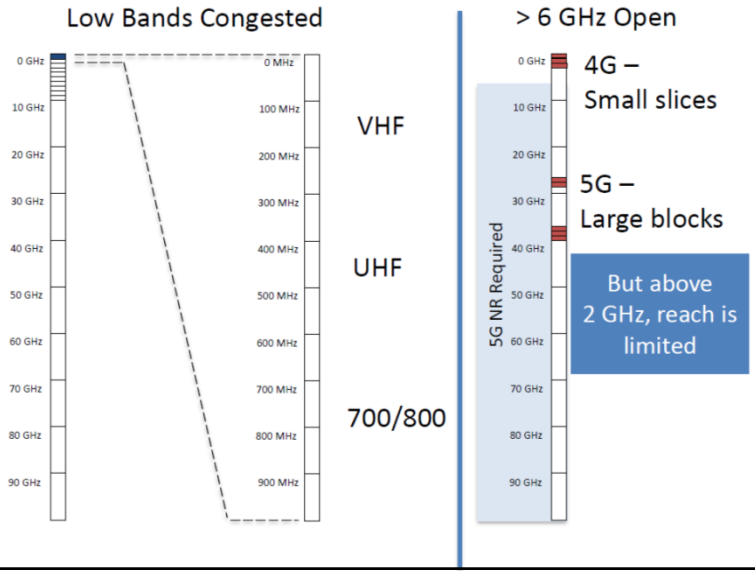
Electromagnetic Spectrum



The electromagnetic spectrum is broken up into two categories: ionizing and non-ionizing. The high-frequency millimeter wavelengths that are expected to be used for some 5G deployments are in the non-ionizing category.

CNET

3g, 4G, 5G Spectrum



5G

FCC RF Exposure Limits (1997 - present)

Frequency Range (F) (MHz)	Occupational Exposure (mW/cm2)	General Public Exposure (mW/cm2)
0.3 - 1.34	100	100
1.34 - 3.0	100	180 / F2
3.0 - 30	900 / F2	180 / F2
30 - 300	1.0	0.2
300 - 1,500	F / 300	F / 1500
1,500 - 100,000	5.0	1.0

FCC: 2013 – 2019 Review of RF Criteria, including 5G anticipation:

1. *Maintaining the current standard:* The item would maintain the existing RF exposure limits and thus resolve the Commission's 2013 Notice of Inquiry that sought public input on whether to strengthen or relax its existing RF exposure limits.
2. *Establishing uniform rules for determining compliance with RF standards:* The item would establish a uniform set of guidelines, agnostic to the service or technology, using science-based metrics around frequency, distance, and power, to determine how entities assess whether they are in compliance with RF standards.
3. *Formalizing the application of the existing standard to certain frequencies:* The item would seek comment on establishing a rule to formalize the Commission's existing methods of determining compliance with the RF exposure standard for devices operating at high frequencies.

Municipalities - Next Steps / Considerations

- Inventory of Cell Sites, land uses, and Rights-of-Way
- Review Application Flow, Process, Timelines
  - Building Permit – minor upgrades, some co-locations, EFR / non-substantial changes
  - Small Cells (ROW – existing infrastructure; small poles outside ROW)
    - New pole applications vs. Use of existing infrastructure and poles
  - Special Use Permit
- Code / Ordinance Updates
  - Definitions
  - Small Cells and 5G
  - Major and Minor modifications
- Aesthetic Standards –
  - Must be “reasonable”, no more burdensome than requirements for other tech gear, objective