

Electricity Committee

NARUC  Summer
Policy Summit

Electricity and Telecommunications Committees

5G Small Cell – Coming to a Pole Near You

5G Small Cell: Coming to a Pole Near You!

Moderator: Hon. John Rosales, Ill.

Speakers:

Nelson Bingel, NESC

David Young, City of Lincoln

Hon. Karen Charles Peterson, Mass.

Dept. of Telecommunications & Cable

Panel:

5G Small Cell



Topic:

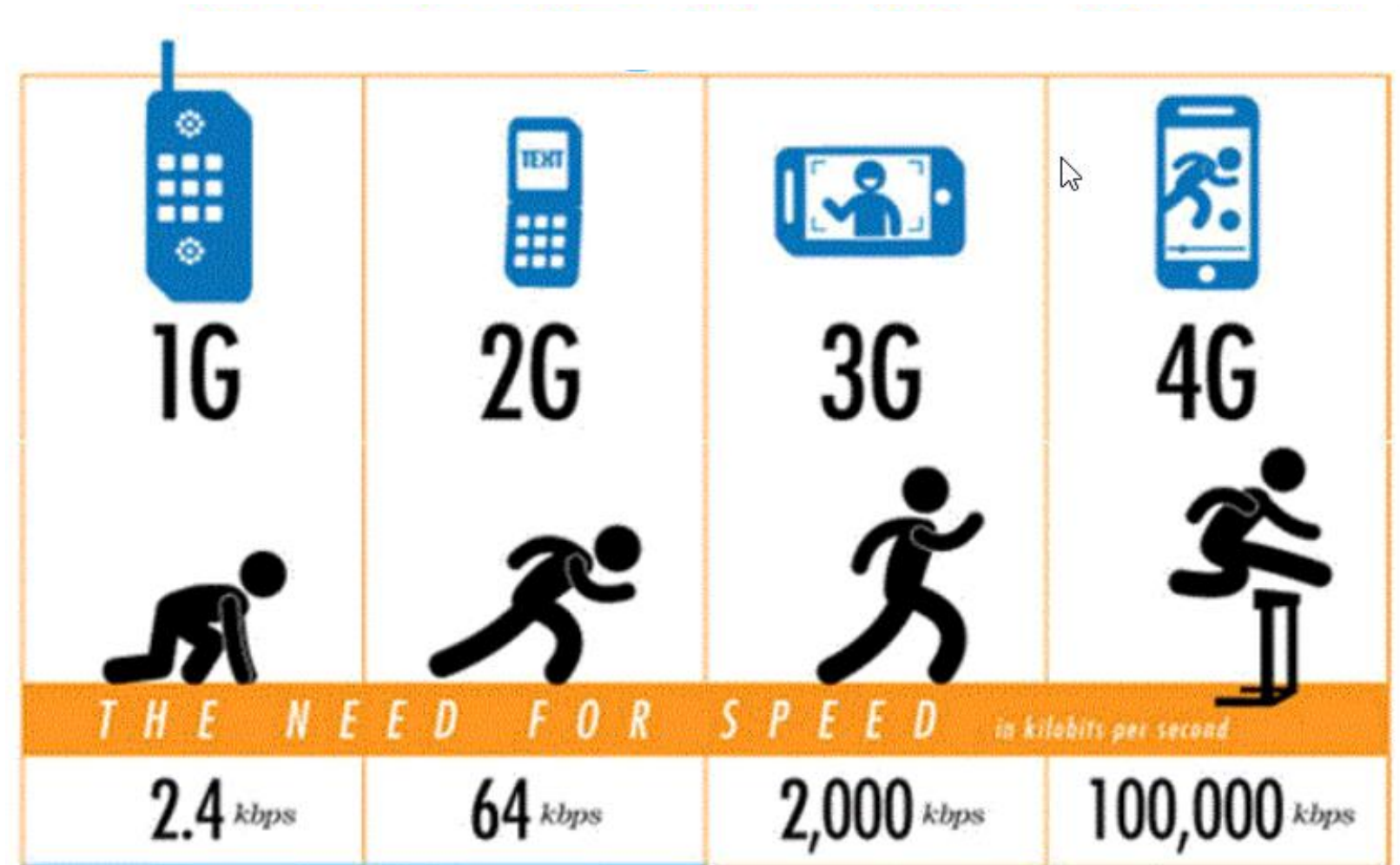
Technology Developments & Challenges

Nelson G. Bingel, III
Chairman - NESC

**NARUC Summer
Policy Summit**

17 July 2017
San Diego, CA

Kilobits Per Second



Wireless Infrastructure



Wireless Infrastructure



Wireless Infrastructure





5G Wireless vs 4G Wireless



10x Faster Response Time
25ms ping latency to 2.5ms

10x Higher Bandwidth
100Mbps to 1Gbps

10x the Number of Users

5G Wireless – Driverless Cars



5G Wireless – Connected Cities



Remote Healthcare

Drone Delivery

Internet of Things

Virtual Reality

Empowering Consumers

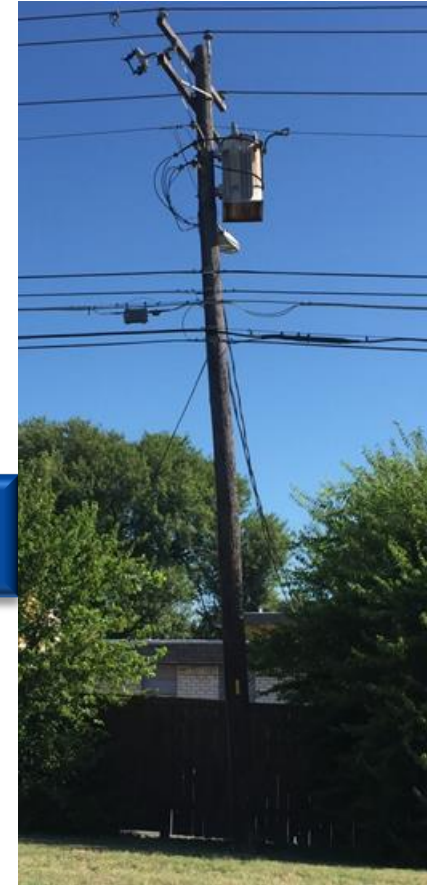
5G – The Next Wireless Network

- Faster Response and Data Speeds
- **Shorter signal range**
<300m
- Additional tall towers are not viable
- Communities want the technology without additional infrastructure
- Power is needed
- Fiber is needed

5G – The Next Wireless Network

- 150,000,000 locations
- Power is available
- Fiber is likely available

Existing utility poles



Telecom Needs

■ Space on a pole

- Direct Attachment
- On an arm
- On a strand

■ Power

- Transformer
- Breaker
- Meter
- Grounding

■ Fiber

- Connected to aggregation points

Electric Pole Owners Need

- Policies

- Permitting

- Analysis

- Equipment Spec's
 - Clearances
 - Grounding
 - Loading
 - Power connection
 - Metering
 - RF
 -

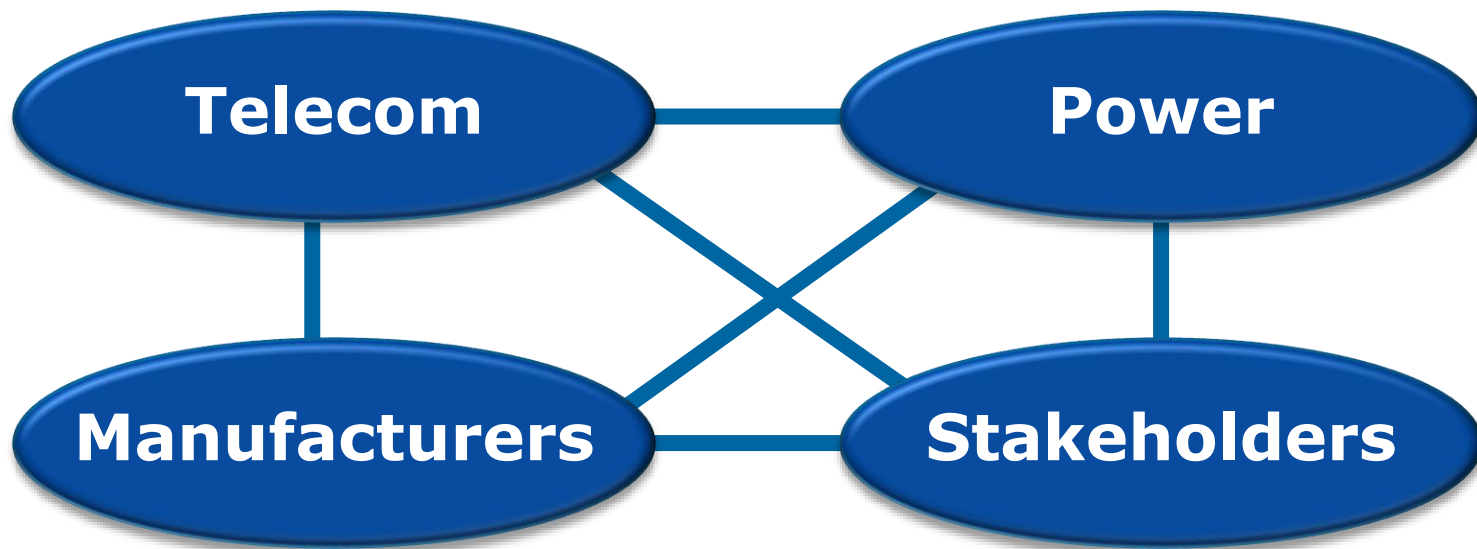
- Resources

- Processes

NESC Emerging Technologies WG



5G - Clearances Grounding Loading Work Rules



May 3, 2017
Atlanta, GA

19 Attendees

Regulatory Georgia PSC

Manufacturer Nokia

Provider AT&T
Verizon

Network Engnrg & Construction Crown Castle
McLean Engineering
Osmose Utilities Services

Electric IOU / NESC Georgia Power
Bonneville Power Admin.
AEP
Southern California Edison

Electric COOP / NESC National Rural Electric Cooperatives Assoc.

Telecom Organizations / NESC Society of Cable Telecom Engrs
Alliance for Telecom Industry Solutions

NESC 5G Working Group Mtg



World 5G

3.5 GHz to cover wide areas

28 GHz for downtown areas

United States 5G

Department of Defense owns 3.5 GHz

FCC is granting 28GHz - 39GHz

High frequency = short transmission distance

Considered mm wave (very short)

Maybe 3 years before granting 3.5 GHz

NESC 5G Working Group Mtg

4G is not going away

4G – Widespread Control Layer
Build-out will continue

5G – Hot Spots/Communication Layer

Both 4G and 5G infrastructure are necessary

5G requires 500m lateral spacing

Line of sight required

5G requires being closer to the customer

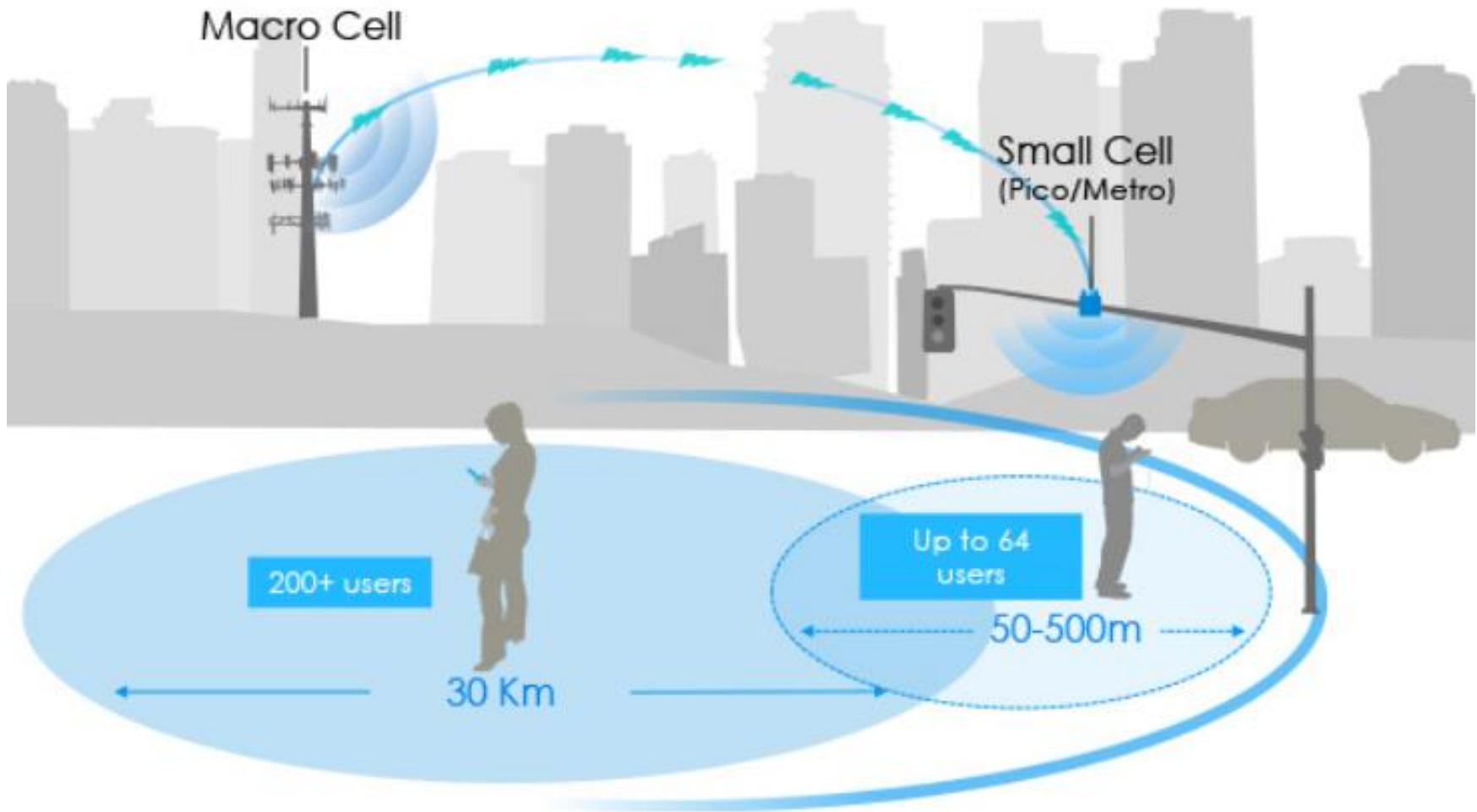
1 Provider per installation (antenna & radio)

5G is needed for added capacity

4G Is Not Going Away



4G Is Not Going Away



Equipment on the Strand

An Option for 4G



Equipment on the Strand

The background image shows a utility pole with various equipment attached to it, including what appears to be a transformer and some wiring. The image is slightly blurred and has a blue tint.

An Option for 4G

Not An Option for 5G
Movement would interrupt signal
due to short wave length

NESC 5G Working Group

Power Consumption

- Metering each antenna complicates installation
- Un-metered rates are currently excessive
- An equitable solution needs to be developed

Auto Industry investing heavily in autonomous vehicles

- 20% of floor space at Consumer Electronics Show (CES)
- Expectation of more rapid 5G deployment

Radio frequency emissions

- Few details about level of emissions
- Electric utility requiring shut off switch for their workers

NESC 5G Working Group

Electric utility company 5G specifications

- Legitimate concerns about safety
- Concerns about abandoned equipment
- Concerns about maintenance of telecom equipment installed in the supply zone
- Each electric company develops their own specs
Wide range of variation

Electric Utility Spec Variation



Conservative

- A. Single Phase Only
- B. Tangent only
- C. One antenna per pole
- D. No electric equipment on pole
- E. Bucket truck accessible

Less Conservative

- A. Three Phase OK
- B. Some angle poles ok
- C. Two antennas per pole
- D. Some electric equipment allowable
- E. Bucket truck access not required

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Still some companies say, "Not on my poles".

Hindrances to Build-Out

- Lack of standardization
- Permitting and inspection for all steps
- Meter installation and provided power
- Electric utility installation limitations
- Lack of process and resources at electric utility

NARUC Participation

-Rate Payers Will Expect 5G-



- Inquire at electric companies about status of small cell network build-out
- Measure level of cooperation with Telecom
- Gather telecom and electric nationally to standardize as much as possible
 - Identify conditions reasonable for all
 - Leave remaining issues to local resolution
- Work toward equitable metering rates

For more information, contact:

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Chairman - NESC

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**IEEE
STANDARDS
ASSOCIATION**



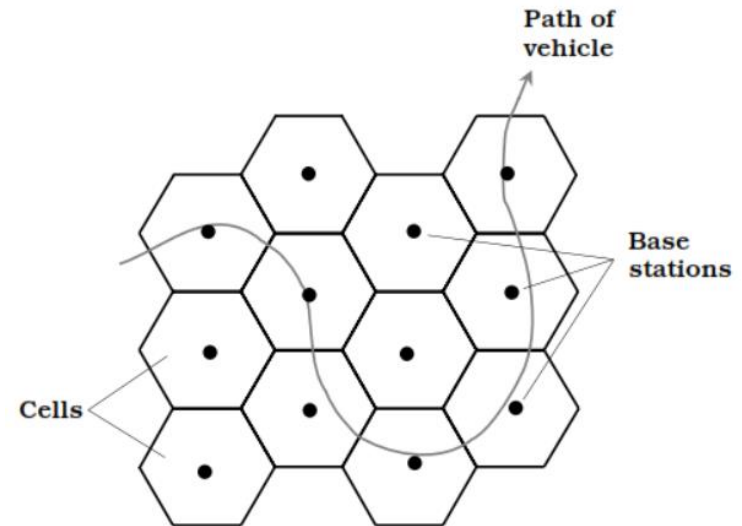
Appendix



Wireless History

1G

1982-Bell Labs
2.4 kbps
Cell Structure
Voice only
Analog



Wireless History

1G

1982-Bell Labs
2.4 kbps
Cell Structure
Voice only
Analog



2G

1991
64 kbps
Digital Encryption
Text



Wireless History

3G

Year 2000
2,000 kbps
Large emails
Audio files
Video files



Wireless History

3G

Year 2000
2,000 kbps
Large emails
Audio files
Video files



4G-LTE

2010
100,000 kbps
Video Streaming



SK Telecom demos 5G trial network using 3.5GHz spectrum

29 Jun 2017

 South Korea

South Korea's SK Telecom (SKT) has announced that, through collaborations with Samsung Electronics and Nokia, it has successfully demonstrated 5G communications using the 3.5GHz band – a first for the country. Outlining details of the development, SKT said it had worked with Samsung Electronics to develop a 3.5GHz 5G end-to-end network- comprised of 5G virtualised core, virtualized RAN, Distributed Unit (baseband unit and radio unit) and test device, with this based on the 3GPP 5G New Radio (5G NR) standards elements established to date. A trial of this infrastructure was then carried out at Samsung Electronics' R&D Center in Suwon.

Meanwhile, with regards to its collaboration with Nokia, SKT revealed it had collaborated on the development of 5G base station equipment and test devices in the 3.5GHz band, while successfully realising Gbps-level throughput during a field trial held near its Bundang Office Building, through the application of carrier aggregation (CA) techniques to expand bandwidth.

Following its successful trials of 3.5GHz 5G infrastructure, SKT now claims to have secured 'all essential technologies to deploy 5G networks using above-6GHz and below-6GHz frequencies'. The operator has confirmed it plans to roll out its 5G networks by leveraging the respective strengths of 3.5GHz and 28GHz frequencies, with it aiming to deploy commercial 5G networks using the latter band in downtown areas where data traffic is most concentrated, while covering wide areas using 3.5GHz spectrum, or a combination of 3.5GHz and 28GHz. With a view to securing key 5G technologies for early commercialisation of 5G networks in the 3.5GHz band, meanwhile, SKT has said it will continue to work with Samsung Electronics and Nokia to further enhance transmission speeds, expand coverage and improve communication stability while on the move.

Telecom Construction Blue Book

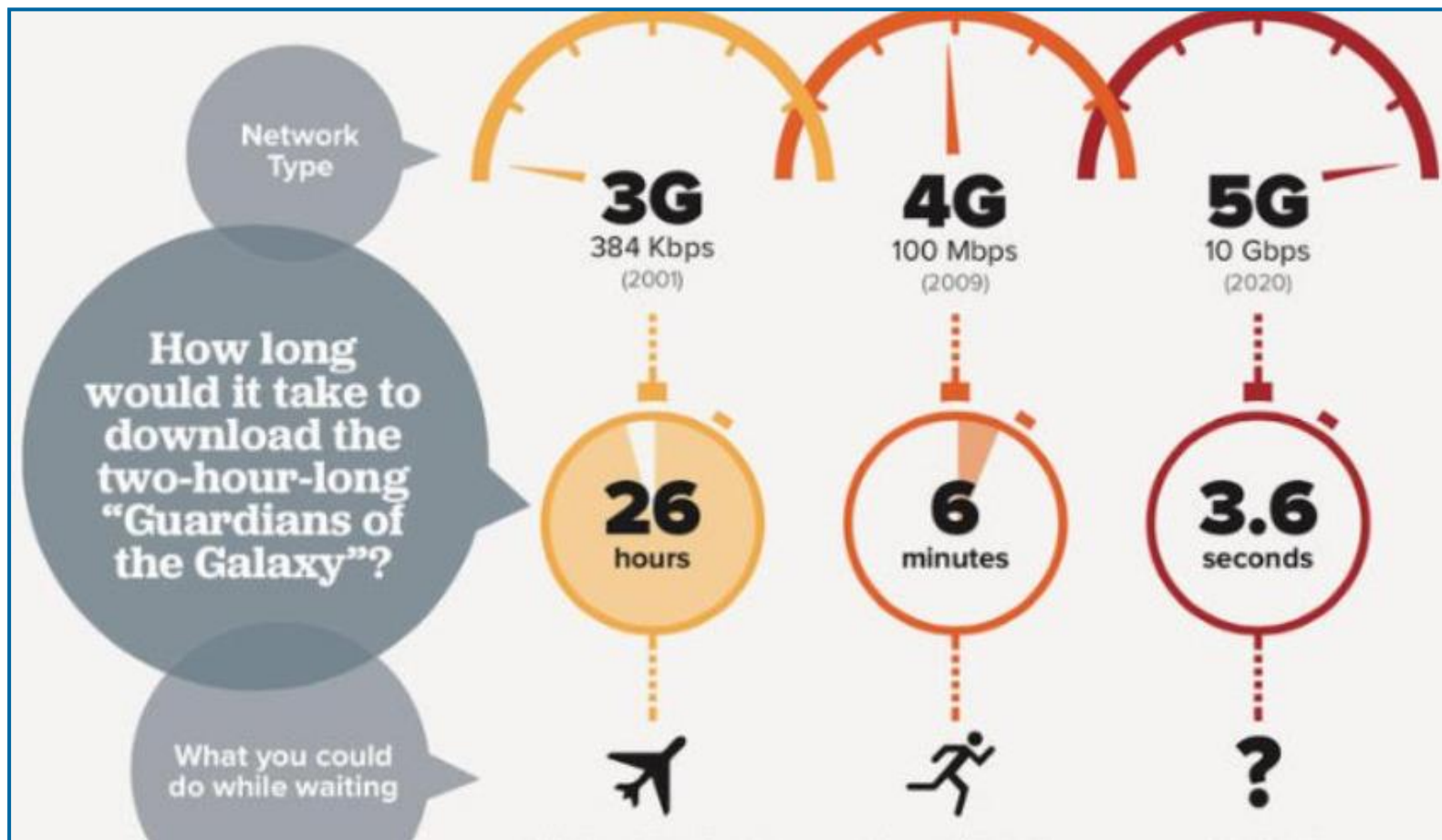
(Telcordia/Ericsson)



■ New Chapter 15 on Wireless Facilities

- RF safety programs
- RF exposure level markings/labels for poles
- Placement issues and recommendations based on NESC Section 23 – Clearances
- Compliance with NESC Work Rules in Part 4

Download Comparison



Sample Pole Owner Specifications

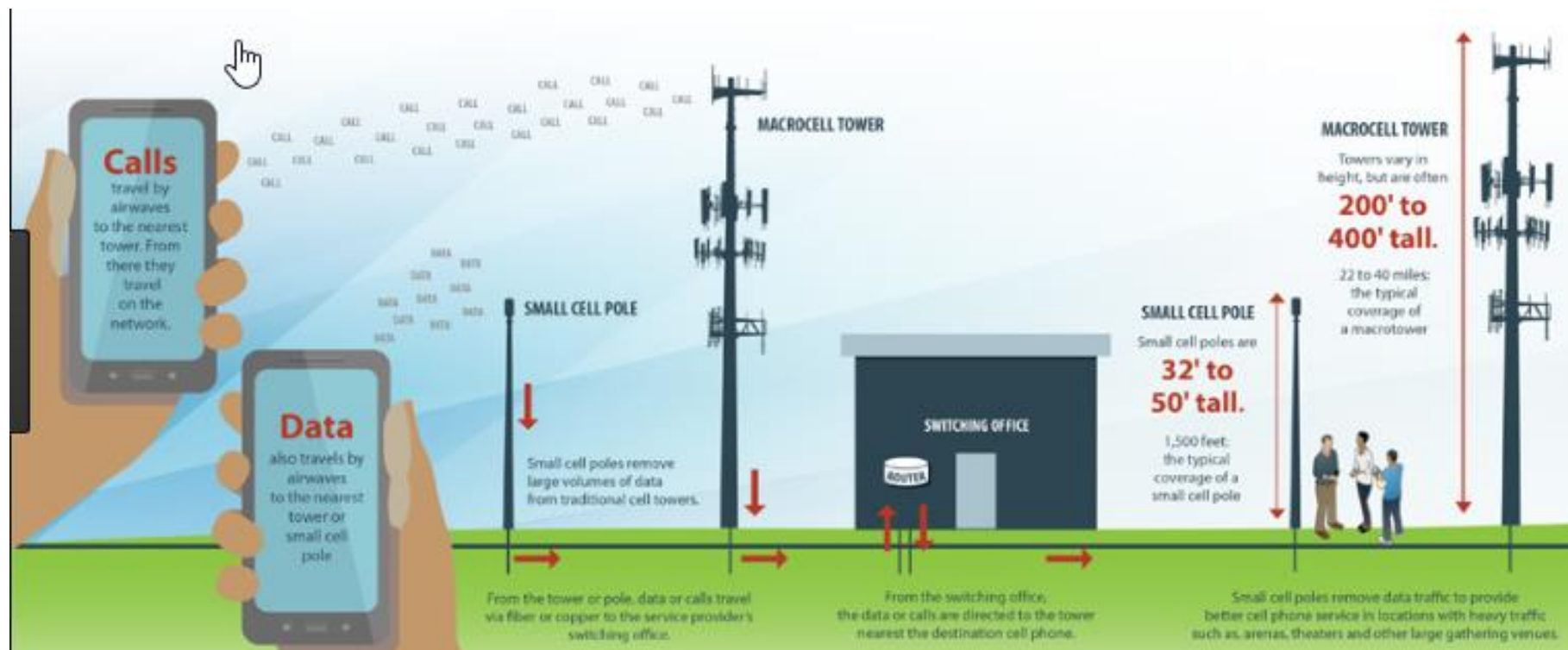
- Equipment can only be installed on ***tangent distribution and service poles*** which do not have equipment installed like:
 - Multiple transformers
 - Capacitors
 - Primary risers
 - Switches
 - Etc.
- With pole owner approval, equipment may be installed on poles with a single transformer or secondary riser
- OK to install on distribution poles that have streetlights
- Equipment can only be installed on poles located in the ***public right-of-way*** which are ***bucket truck accessible***

Sample Pole Owner Specifications

- Only **one antenna** attachment can be installed on a pole
- Poles where equipment is mounted shall be classified as **ANSI Class 3 or larger**
- No comm lines or equipment on metal, fiberglass or decorative street light poles
- On distribution poles, **power** can be obtained by connecting to the **overhead service or transformer** mounted on the pole
- Power cannot be obtained from the street light photo cell on distribution poles that have a streetlight installed

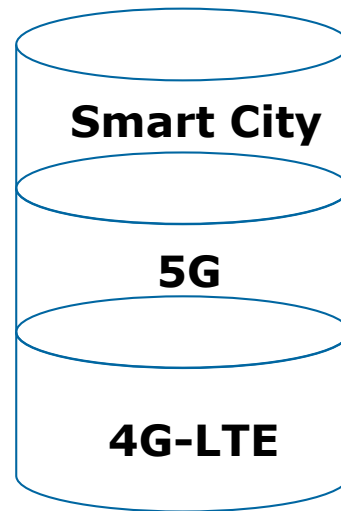
Sample Pole Owner Specifications

- Equipment may be attached on an approved bracket arm or directly to the pole. No equipment cabinets larger than **6" wide x 12" tall x 4" deep** shall be mounted directly to the pole.
- Single cabinet can be no larger than **24" wide x 30" tall x 20"** deep and weigh no more than 200 pounds when mounted in line and no more than 150 pounds when not mounted in line. Total weight of all cabinets shall not exceed 350 pounds
- Must position equipment to maintain the pole **climbing space**



NESC 5G Working Group

Concept 3-Tier Antenna



Advertising 5G

T-Mobile Ad Sept 2016



AT&T Ad



**Intel Ad
Autonomous Vehicles**



**Intel Ad
The Future**

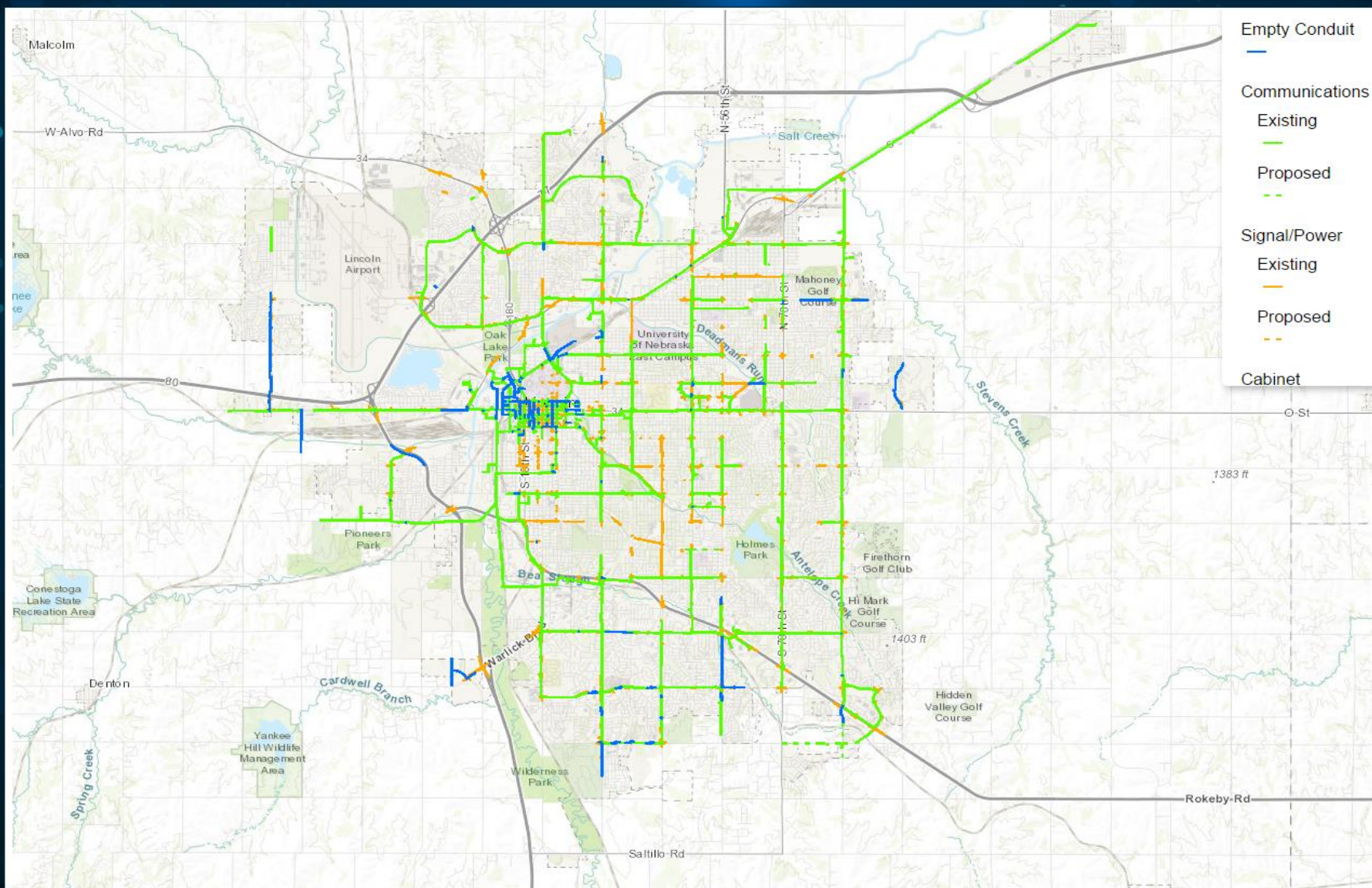




Lincoln TECHNOLOGY IMPROVEMENT System

Lincoln
Small Cell

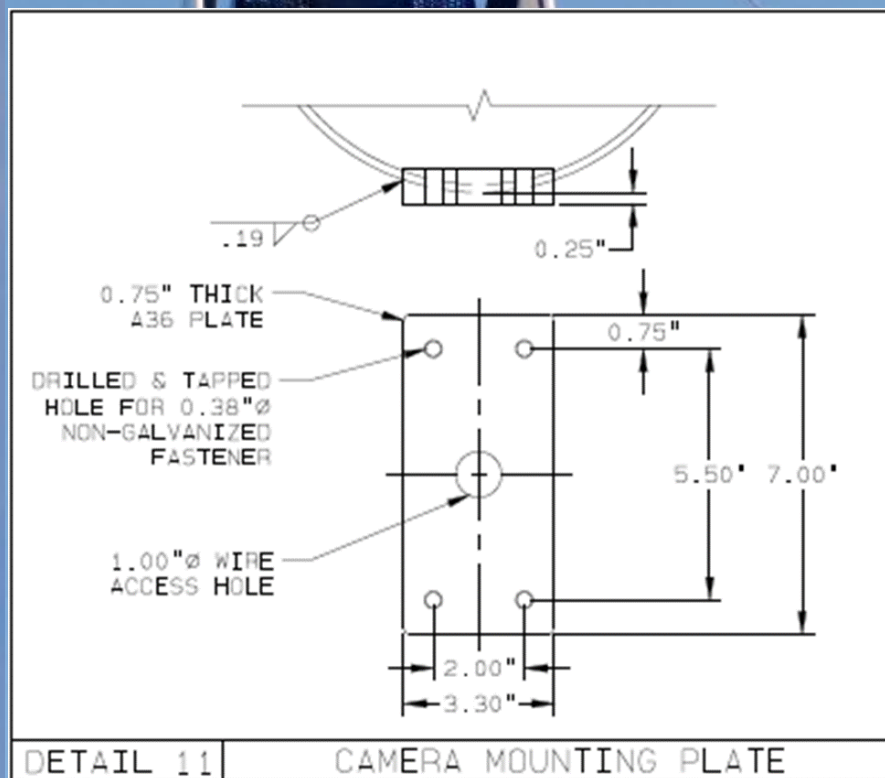


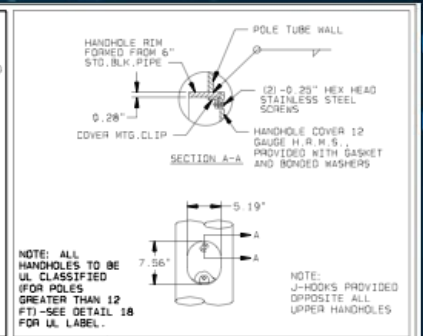
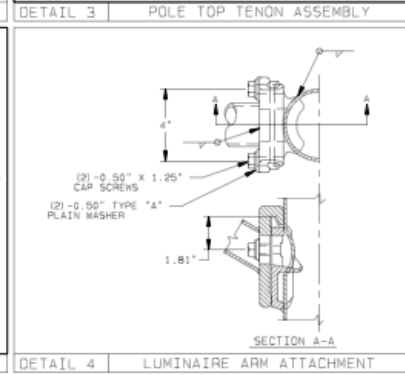
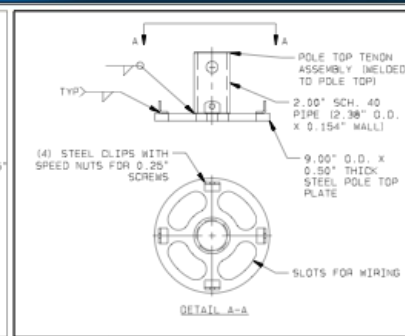
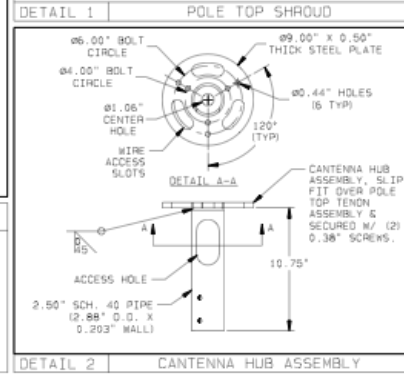
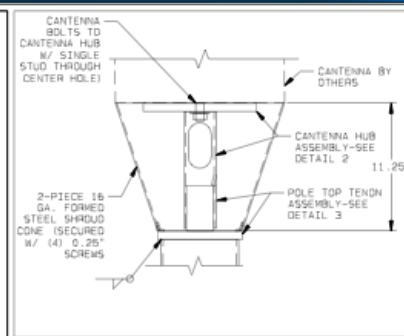
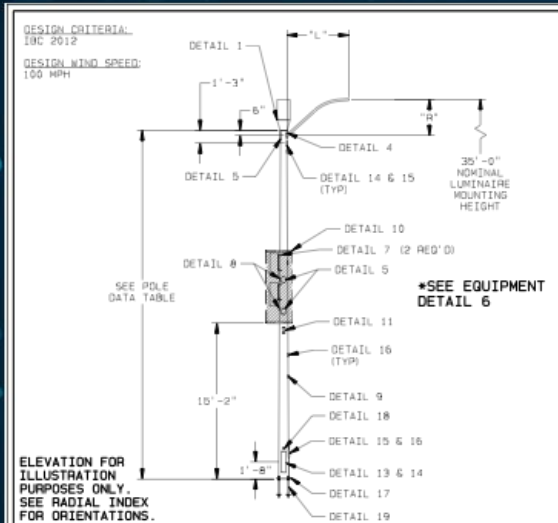






Public Port





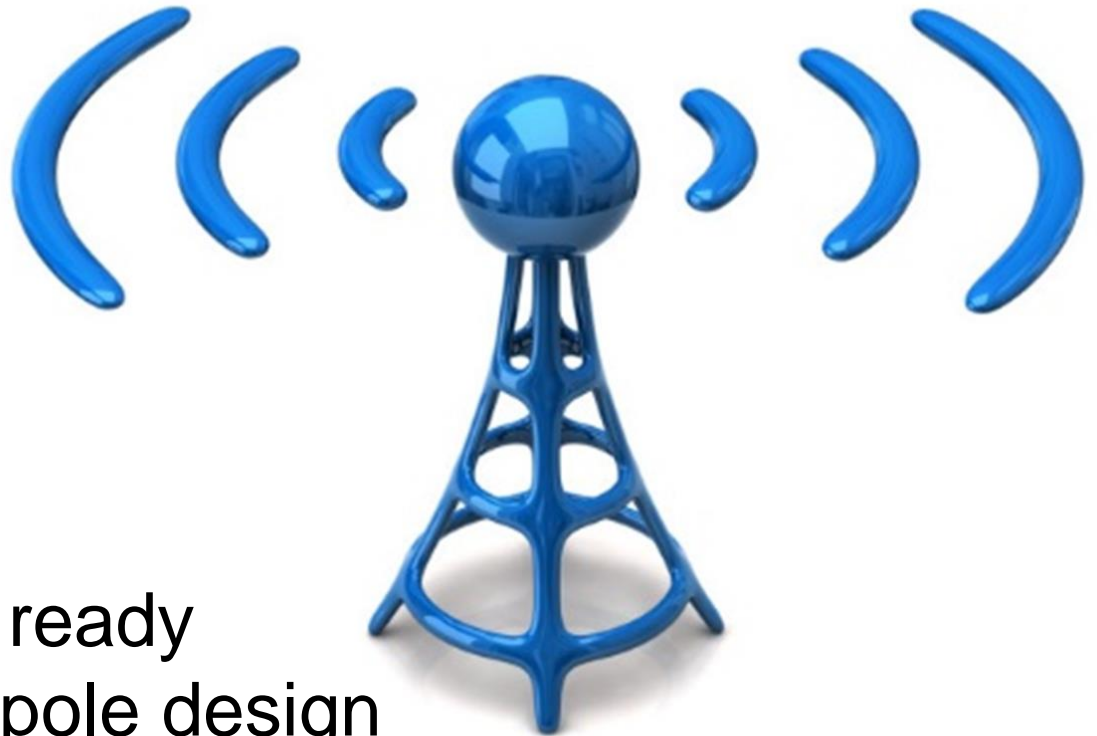
MATERIAL DATA			FINISH DATA	
COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)	SYSTEM:	
POLE TUBE	A599 GR. A	55	GALVANIZED (GV)	
ARM ATTACHMENTS	A27 GR.35-39 OR A36	35	BASE COAT: HOT-DIP GALVANIZED TO ASTM A123	
POLE BASE	A36	36	PRIME COAT: NONE	
ARM CONNECTING BOLTS	SAE GR. 5	--	FINISH COAT: NONE	
ARM PIPE- 2" SCH. 40	A513 OR EQV/36	36	COLOR: NONE	
ANCHOR BOLTS	F1554 GR. 55	55	SPEC: F-1	
			OPTIONAL FINISH COAT: TGIC OR URETHANE	
			POLYESTER POWDER	
			OPTIONAL COLOR: NOT TO BE DETERMINED	

POLE AND LUMINAIRE ARM DATA																	
TYPE	POLE DESCRIPTION	POLE TUBE				POLE BASE				ANCHOR BOLT			LUMINAIRE ARM				
		BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	GAUGE OR THK. (IN)	SQUARE "S" (IN)	BOLT CIRCLE "X" (IN)	THK. "N" (IN)	SLOT "Z" (IN)	DIA. "K" (IN)	LENGTH "J" (IN)	UPPER THREAD LENGTH "U" (IN)	LOWER THREAD LENGTH "H" (IN)	ARM SPAN "L" (FT)	RISE HEIGHT "R" (FT)	PIPE DIA. (IN)	WALL THK. (IN)
1	DS50-35" MH	12.00	7.52	32.00	7	17.00	16.00	1.25	1.38 X 1.94	1.25	47.00	8.00	6.00	6.00	3.50	2.38	0.154

- NOTES:
- (3) RIGID 0.25\"/>

EXHIBIT A - STANDARD SMALL CELL POLE INSTALLATION

B KJWS 05/09/17 KJWS 05/09/17 ADDED FESTOON TO RADIAL INDEX			SOLD TO:		JOB TYPE 1-35' MOUNTING HEIGHT D550 ARM		VALMONT INDUSTRIES, INC. RESERVES		ORDER NUMBER 326171P3	
A KJWS 05/05/17 KJWS 05/05/17 MOVED CAMERA PLATE FROM 270° TO 180°			SHIP TO:		CITY OF LINCOLN SMALL CELL		THE RIGHT TO INSTALL VARIOUS,		PAGE NUMBER: 1 OF 3	
KJWS 05/03/17 KJWS 05/03/17			P.O. #:		AGENT: LARRY GRIMES		ENGINEER APPROVED, MATERIAL HANGING		DRAWING NUMBER	
REV: DRAWN BY-DATE CHECK BY-DATE DESCRIPTION			TITLE LIGHTING STRUCTURES		ACCOMMODATIONS TO FACILITATE THE		MANUFACTURING PROCESS.		REV	
							valmont		NE326171P3 B	
							valley, NE 68054			
							(402) 359-2201			



Tips for Success

- Have a contract ready
- Pick a standard pole design
- Streamline permits
- Ask for Fiber and Power

5G Small Cell What States can Expect

Presentation to the National Association of Regulatory Utility
Commissioners

KAREN CHARLES PETERSON, COMMISSIONER

MASSACHUSETTS DEPARTMENT OF TELECOMMUNICATIONS & CABLE



Demand for Broadband Driving 5G

- Demand for mobile data is growing exponentially – CTIA reports that Americans used 13.72 trillion megabytes of mobile data in 2016 and that number is growing every year
- To keep pace with demand additional capacity is needed, particularly in high traffic areas
- 5G will likely be able to deliver data much faster than 4G
- 5G will require a more targeted and efficient use of spectrum
 - Requires more antennas closer together
 - Complements existing 4G networks not a replacement

Impact of 5G Deployment on Government

■ Federal

- FCC has two open dockets on Accelerating Wireline and Wireless Broadband Deployment by Removing Barriers to Infrastructure Deployment
- Broadband Deployment Advisory Committee (“BDAC”)

■ State

- 11 States have passed legislation dealing with small cell deployment
- Stakeholders pressuring states to address small cell deployment issues

■ Municipal/County

- Facing increasing numbers of citing applications
- Lack of resources and budget
- Lack knowledge of 5G technology and clarity of rules governing siting

What is the BDAC?

- Federal Committee chartered under the Federal Advisory Committee Act
- Members selected come from a range of expertise and viewpoints, to better address the issues BDAC is considering
- Established March 1, 2017
- Charter expires March 1, 2019



BDAC's Mission

Provide advice and recommendations to the FCC on accelerating the deployment of broadband nationwide, including through reduction and removal of regulatory barriers to infrastructure investment.



Working Groups

- Model Code for Municipalities
- Model Code for States
- Competitive Access to Broadband Infrastructure
- Removing State and Local Regulatory Barriers
- Streamlining Federal Siting



What to Expect from BDAC

- Open meeting & Workgroup Presentations
 - Thursday July 20, 2017 beginning at 9:30 am
 - Livestream at www.fcc.gov/live
- Oct/Nov (Date TBD): End-of-year BDAC meeting
 - Working groups present recommendations to full BDAC
 - Full BDAC deliberates, votes on final recommendations

State Impacts

- 11 states have small cell laws, and several additional states have proposed legislation
- Legislation is different in each state but generally addresses four topics
 - I. Providing standardized definitions
 - Provides a consistent definition of small cell antenna attachment
 - Provides a consistent definition of wireless infrastructure vs utility poles
 - II. Gaining timely access to the public rights of way
 - Shot clocks or prescriptive timeframes for review of applications
 - Limitations on the scope of application review (ex: health, safety, esthetic review)
 - III. Regulating the fees and rates that may be charged for small cell attachments
 - Legislation has set caps on both the fees that may be charged to review an application and the rates that may be charged for attachment.
 - IV. Gaining access to attach to publically owned infrastructure
 - Legislation has sought access to infrastructure such as street lamps, bridge and other publically owned infrastructure
 - Expedited process to build new poles which small cell antennas can installed on poles located on sidewalks, street corners, and other public ways

County and Municipal Impacts

- Because small cells have a different footprint than traditional macro-antennas an argument can be made that applications for small cell sites should be reviewed differently
- Due to spectrum limitations deploying a small cell networks requires more antenna sites than traditional macro-antennas, therefore localities should expect a dramatic increase in applications for 5G network deployment
- County and municipal governments frequently lack familiarity with small cell technology and the applicants seeking to install such equipment in their communities
- Many governments are struggling with finances, and face a difficult balancing act between receiving fair market value for attachments to public assets

Signs of Progress

- Communities and providers are beginning to open a dialogue to address issues like:
 - Fair compensation for attachments
 - Safety and accessibility within the rights of way so that small cell infrastructure does not interfere with movement around streets and sidewalks
 - Competitive equitability so that all providers have meaningful access and a single provider can not monopolize the best territory
 - Streamlined applications so that requests that meet pre-determined standards can be fast-tracked for approval
- We heard earlier of the efforts in Lincoln, Nebraska
- In Massachusetts we have experienced proactive efforts between the City of Boston and Verizon to work cooperatively to establish a Master License Agreement that benefits all

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