

# 5G Telecom Buildout

**POLICY PLAYBOOK** | Investment Strategy for Key Policy Themes

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# 5G Buildout: US vs. China; FCC Initiative to Speed Up Deployment & Free Up Spectrum

## 36% Annual Growth

Monthly data per smartphone estimated to increase to 49 GB by 2023 (7.2 GB in 2017)

## \$130-150B Investment

Deloitte Consulting estimate of required investment in fiber infrastructure over the next 5-7 years

## Market Size: \$520B

Bain Consulting estimates the combined IoT markets will grow to \$520 Billion in 2021 (\$235 B in 2017)

## POLICY OVERVIEW | What's Happening?

5G deployment is a geopolitical battleground. The US and China are racing to develop their respective 5G networks, and the winner will likely set the technical standards for 5G. Setting standards is important because it means the country's equipment will be used globally in smartphones and Internet of Things (IoT) objects like self-driving cars. The US views the latter as a national security threat and doesn't want to rely on a Chinese 5G network and standards.

## OUR TAKE | The Market Opportunity & Investment Case

**The key use case driving 5G development** is the improvement of mobile broadband services as capacity demand grows with mobile data traffic and IoT functionalities. 5G technology will allow for easier streaming of high definition media in both densely populated areas and when customers are out of reach of Wi-Fi hotspots.

**To facilitate 5G deployment**, new millimeter (mm) wave spectrum, which can transmit large amounts of data over short distance, will have to be freed up. Since mm spectrum can't travel far, new communications infrastructure, such as small cells, will need to be deployed and linked to current network infrastructure. Additional fiber will be needed to connect the core networks with the "edges" (e.g. small cells) of the networks.

**This creates opportunities** for companies to increase revenues by: (i) selling small cells, (ii) managing and performing the work to deploy new fiber, (iii) selling infrastructure utilized in the backhaul of signals, and (iv) network operators charging backhaul fees to use their networks.

## TIMING | Significant Actions Taken & Next Steps

The Federal Communications Commission (FCC) is currently undergoing its first mm Wave spectrum auction and has already scheduled a second for the back half of 2019. Both will free up spectrum used in 5G to densify networks. The FCC has also taken deregulatory steps, such as decreasing the allowed time for reviews associated with attaching small cells to existing structures and declaring small cells exempt from environmental and historic preservation review requirements (e.g. eliminates cost and delay when deploying small cells).

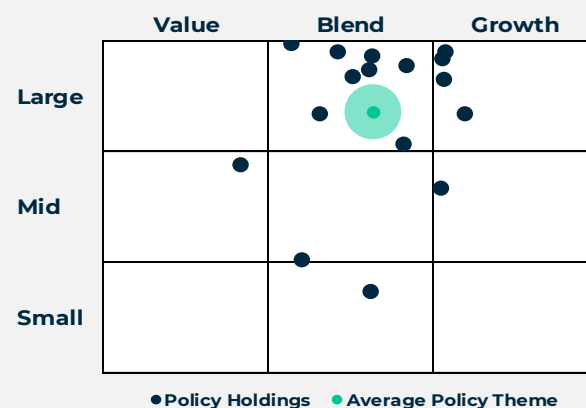
## Key Statistics

<b>Sector</b>	Technology
<b>Sub-Industries</b>	Telecom, Cell Tower, Communication Equipment
<b>Holdings</b>	16
<b>Average Market Cap (\$B)</b>	\$38.9
<b>Price to Earnings (P/E)</b>	34.3x
<b>Price/Book</b>	6.5x
<b>Price/Sales</b>	3.0x
<b>Price/Cash Flow</b>	18.6x
<b>Dividend Yield %</b>	1.48%

## Price Returns

	S&P 500	Basket
<b>3 Month</b>	1.59%	6.88%
<b>6 Month</b>	-1.57%	7.84%
<b>1 Year</b>	1.59%	16.03%

## Holdings Style Map



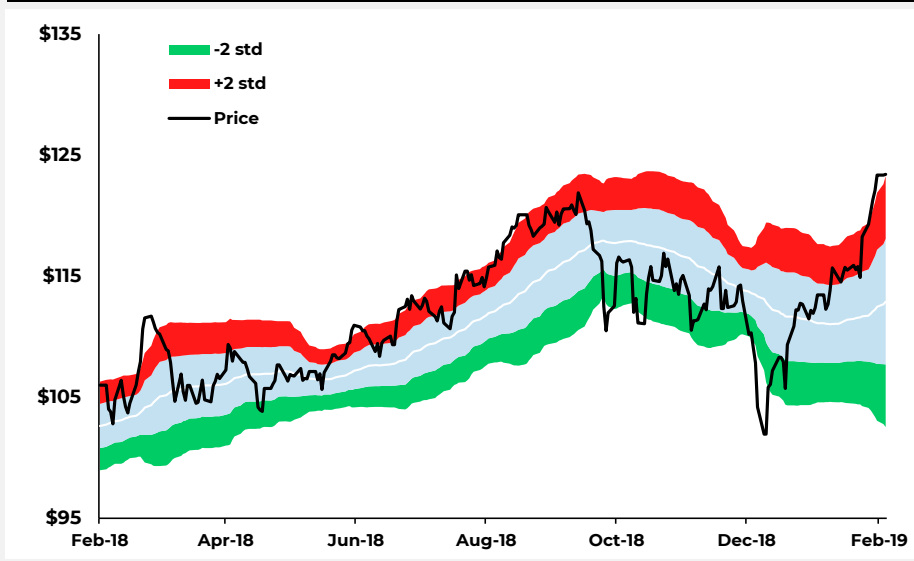
Source: FactSet (as of 2/17/2019)

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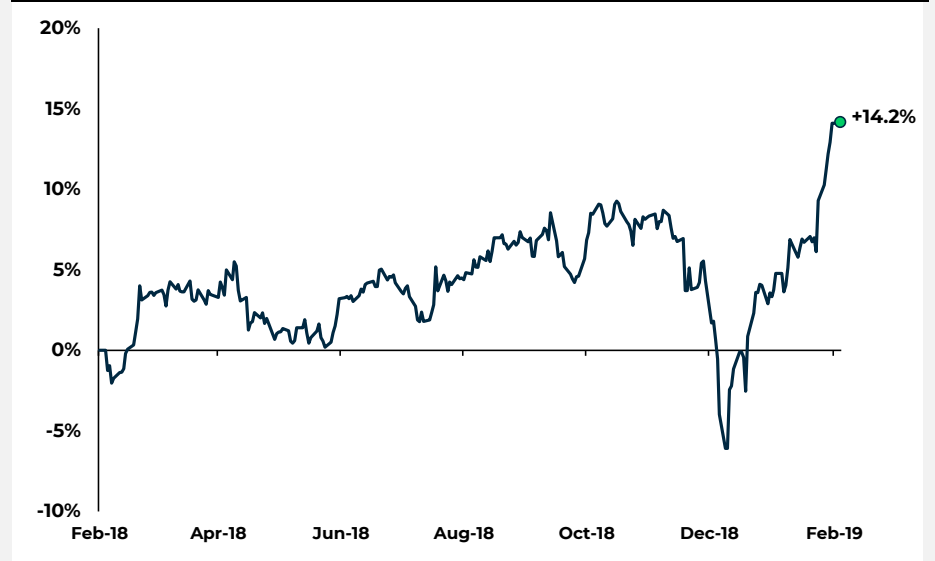
# CHARTS: 5G Buildout Policy Basket

Trading Range (Equal Weight Basket)



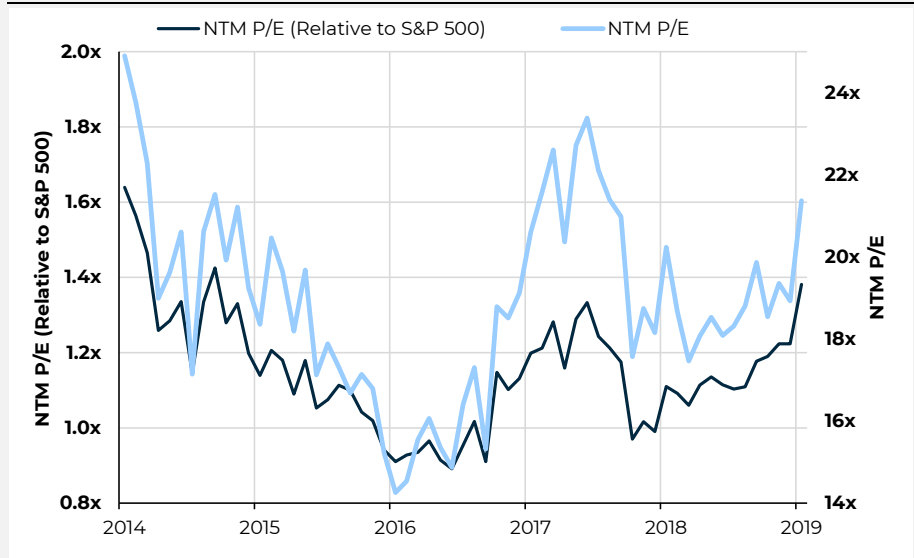
Source: FactSet (last 12-month; as of 2/17/2019)

Relative Returns to S&P 500 (Equal Weight Basket)



Source: FactSet (last 12-month; as of 2/17/2019)

Historical P/E Multiples (Basket Average)



Source: FactSet (as of 2/17/2019)

Rolling NTM P/E (Sub-industry and Basket Averages)



Source: FactSet (as of 2/17/2019)

## FUNDAMENTALS: 5G Buildout Policy Basket

Average Rank		Valuation NTM P/E	Size Market Cap (\$B)	Profitability EBITDA Margin	Cash Flow Yield	Leverage Debt / EBITDA	Liquidity Cash / Sales	Payout Div. Payout Ratio
1	Verizon	11.9x	\$227.92	36.8%	7.6%	2.3x	2.9%	63.4%
2	Ubiquiti Networks	28.1x	\$9.61	35.6%	4.3%	1.2x	35.7%	-
3	Qorvo	12.1x	\$8.00	29.9%	8.6%	0.7x	21.1%	-
4	Motorola	18.1x	\$22.72	24.3%	4.4%	2.3x	17.1%	37.9%
5	American Tower	55.3x	\$78.33	55.5%	3.7%	4.5x	19.4%	-
6	InterDigital	58.1x	\$2.48	60.8%	13.7%	1.9x	245.6%	-
7	QUALCOMM	13.8x	\$62.91	27.3%	2.6%	2.5x	48.0%	-
8	Nokia	19.1x	\$36.88	8.9%	-1.1%	1.3x	30.6%	-
9	Ciena	22.6x	\$6.29	11.8%	3.3%	1.5x	28.9%	-
10	Crown Castle Intl.	71.9x	\$49.85	43.7%	1.7%	5.0x	7.5%	319.0%
11	SBA Communications	123.6x	\$21.02	67.2%	3.8%	7.1x	8.8%	-
12	CommScope	11.0x	\$4.36	19.4%	9.0%	4.6x	7.6%	-
13	Ericsson	23.1x	\$28.70	8.3%	2.1%	1.5x	21.0%	-
14	T-Mobile	18.6x	\$61.26	27.7%	-3.0%	2.3x	2.8%	-
15	Comtech	26.9x	\$0.65	12.8%	3.0%	2.4x	7.0%	32.3%
16	Boingo Wireless	-	\$1.09	31.9%	-0.7%	0.3x	5.5%	-

## HOLDINGS: 5G Buildout Policy Basket

Ticker	Company	Market Cap (\$B)	Price to Earnings (P/E)	Price/ Book	Price/ Sales	Price/ Cash Flow	Dividend Yield %	Stock Price	52 Week Range
<b>Cell Tower REITs</b>									
AMT	American Tower	\$78.3	55.3x	14.6x	-	24.1x	1.89%	\$177.82	\$178.15 - 132.02
CCI	Crown Castle Intl.	\$49.9	71.9x	4.1x	8.3x	20.8x	3.75%	\$120.13	\$120.20 - 98.85
SBAC	SBA Communications	\$21.0	123.6x	-	-	25.3x	-	\$185.50	\$185.93 - 146.13
<b>Communications Equipment</b>									
UBNT	Ubiquiti Networks	\$9.6	28.1x	36.7x	6.5x	30.6x	0.73%	\$136.25	\$137.69 - 49.40
CIEN	Ciena	\$6.3	22.6x	3.2x	1.5x	27.7x	-	\$40.21	\$40.31 - 22.94
ERIC	Ericsson	\$28.7	23.1x	2.9x	1.2x	16.3x	0.71%	\$9.35	\$9.45 - 6.00
NOK	Nokia	\$36.9	19.1x	2.0x	1.2x	34.4x	2.47%	\$6.32	\$6.65 - 5.07
CMTL	Comtech	\$0.7	26.9x	1.3x	1.4x	22.3x	1.47%	\$27.20	\$36.94 - 21.66
COMM	CommScope	\$4.4	11.0x	2.5x	-	7.2x	-	\$22.68	\$41.60 - 15.09
MSI	Motorola	\$22.7	18.1x		2.7x	23.4x	1.64%	\$138.63	\$138.92 - 103.18
WIFI	Boingo Wireless	\$1.1	-	9.9x	-	10.7x	-	\$25.53	\$35.98 - 18.50
QRVO	Qorvo	\$8.0	12.1x	1.8x	3.0x	10.2x	-	\$65.16	\$86.84 - 54.74
QCOM	QUALCOMM	\$62.9	13.7x	3.2x	4.6x	18.9x	4.77%	\$51.98	\$76.50 - 48.56
<b>Telecom</b>									
VZ	Verizon	\$227.9	11.9x	4.2x	1.8x	6.7x	4.37%	\$55.16	\$61.58 - 46.09
TMUS	T-Mobile	\$61.3	18.6x	2.5x	1.3x	12.3x	-	\$72.05	\$72.07 - 55.09
<b>Technology Patents</b>									
IDCC	InterDigital	\$2.5	58.1x	2.5x	-	6.6x	1.91%	\$73.36	\$85.85 - 62.34

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