



# Consolidation Series: Issue 2.1

## Verizon / Charter Merger Synergies Are Huge; But The Deal May Not Be Great For Charter

**What's New:** We launched our Consolidation Series with an analysis of a Sprint / T-Mobile merger in mid-January. We are splitting the second installment into two reports to make it manageable. The first half, which we are publishing today, focuses on the synergy analysis; the second half, which will be out in due course, will cover transaction structures, regulatory analysis and the pro forma valuation across different scenarios. The synergies from the deal are huge, with an NPV of \$45BN; however, much of the value stems from the avoidance of value destruction for Verizon rather than new value created. This is good for Verizon, but problematic for Charter, making the deal less likely than we initially thought. We are bullish on Charter, though they may lose some of the M&A premium that has crept in since mid-January. We remain cautious on Verizon.

**Analysis:** We focused on four categories of synergies: 1) hard cost synergies of \$16BN; 2) revenue and avoided cost synergies of \$3BN; 3) wireless capacity synergies of \$12BN, and; 4) value preserved by eliminating a competitor of \$13BN. We built detailed frameworks that highlight sources of value and issues not well understood by the Street previously, in our view.

**Thesis impact:** We have been wary of AT&T and Verizon because we believe investors have been underestimating competitive pressures in wireless generally and have been ignoring the impending Cable threat. Verizon is most poorly positioned because they have half the available capacity of their competitors. Acquiring Charter would help them close the capacity gap and it would eliminate the cable threat; however, it would only deliver these benefits in 36% of the country. To complicate matters further, Verizon would need to pay much of the transaction price in stock; Charter will be concerned about the impact on the value of the stock they receive due to the potential value destruction in the parts of the country they don't cover. We will explore transaction structures and the impact on valuation in the second part of this report (due out soon); however, our working hypothesis is that it will be very tough for Verizon to structure a deal that Charter will find compelling. We are bullish on Charter; they may lose some of the M&A excitement that has crept into the equity if expectations for a Verizon deal fade; however, we see considerable upside to these levels from the unrecognized growth in broadband and ultimately in wireless. And, while M&A doesn't drive our thesis, we think there are other deals for Charter that would be far more compelling than selling to Verizon (standby for the third issue in our consolidation series). As for Verizon, the new analysis we did in this report highlights just how structurally challenged they are.

### Neutral

Ticker: VZ US Equity  
 Target price, US\$: \$45.0  
 Potential Change: (8.1%)

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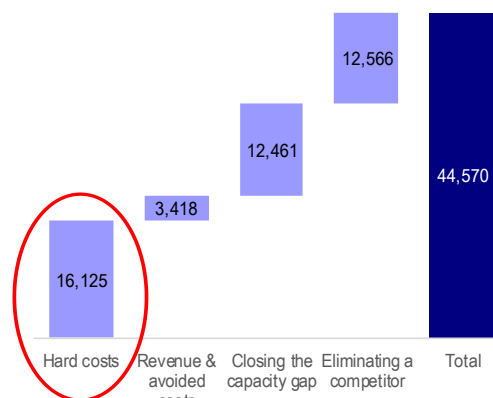
	1M	3M	12M
Performance	-7.2%	4.9%	-2.0%
52wk high/low	\$56.95	\$46.01	
Market cap. (\$bn)		200	
No. Shares:		4,088	
Avg daily trading volume (\$m):		719	
Free Float %:		99.6%	

### Valuation Summary

Forecasts, US\$	2017E	2018E	2019E
Revenue	126,055	128,864	128,574
EBITDA	44,940	45,108	44,443
EPS - Diluted	\$3.82	\$3.81	\$3.67
Net Debt / EBITDA	2.5x	2.5x	2.5x
<b>Multiples</b>			
EV / EBITDA	6.9x	6.9x	7.0x
EV / UFCF	11.3x	11.2x	11.5x
P / E	12.8x	12.8x	13.3x
Dividend Yield	4.8%	4.9%	5.0%

Source: New Street Research estimates

### Only \$16BN of the Value Benefits Charter; The Rest Plugs Holes for Verizon that the Market Doesn't Recognize

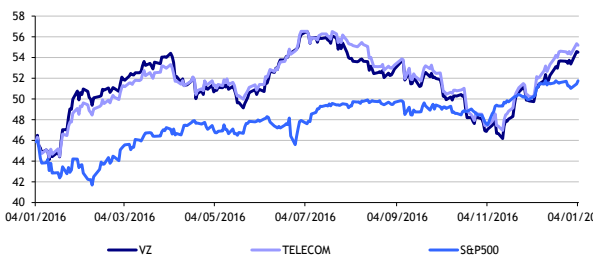


# Verizon (Neutral)

# Target: \$45 (-8.1%)

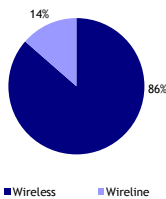
EV CALCULATION (\$m)	2017E	2018E	2019E	2020E	CAGR 17E-20E
Share price, \$	49.0				
Number of shares	4,088	4,088	4,088	4,088	
Market cap.	200,218	200,218	200,218	200,218	
Plus: Net debt/(Cash)	110,978	107,997	102,561	97,367	
Plus: Other financial liabilities	0	0	0	0	
Less: Associates	0	0	0	0	
Plus: Minorities	0	0	0	0	
Less: Cumulative dividends	9,531	19,266	29,205	39,348	
Less: NPV YE tax credit	0	0	0	0	
Enterprise Value	301,666	288,949	273,575	258,237	-5.0%

PRICE PERFORMANCE, -1Y

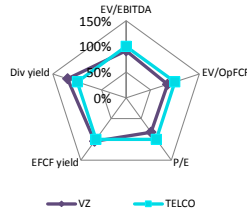


MULTIPLES & RATIOS	2017E	2018E	2019E	2020E	CAGR 17E-20E
EV/Revenue	2.4	2.3	2.3	2.3	-0.6%
EV/EBITDA	6.7	6.7	6.8	6.9	1.0%
EV/OpFCF	10.9	10.9	11.1	11.5	1.9%
EV/FCF	16.6	16.5	16.9	17.5	1.8%
EV/Invested capital	2.1	2.0	2.0	2.0	-0.4%
EV/NFA	3.5	3.5	3.4	3.4	-0.5%
P/EFCF	14.0	14.0	14.7	15.2	2.6%
Adjusted P/E	12.8	12.8	13.3	13.7	2.1%
Dividend yield	4.8%	4.9%	5.0%	5.1%	2.1%
EFCF yield	7.1%	7.1%	6.8%	6.6%	-2.5%
Net debt/EBITDA	2.47	2.46	2.50	2.55	1.0%
OpFCF/Net interest	-5.95	-5.88	-5.42	-5.50	-2.6%

BREAKDOWN OF VALUE



RELATIVE VALUATION (2016E)



SELECTED BOND DATA

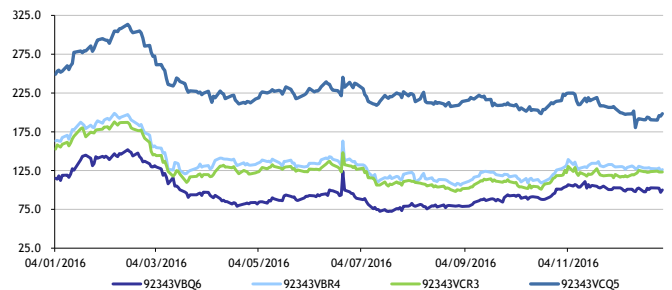
Issue	Moody's	S&P	Issue size	Yld to mat	Price
VZ 4.5 9/15/2020	Baa1	BBB+	4,000	1.9%	109.5
VZ 5.15 9/15/2023	Baa1	BBB+	8,517	2.6%	116.1
VZ 3.5 11/1/2024	Baa1	BBB+	2,500	2.6%	106.6
VZ 4.4 11/1/2034	Baa1	BBB+	2,500	4.0%	104.7
	OAS 12m chg	Yld to wor	OAS		
VZ 4.5 9/15/2020	-13%	1.9%	100.17		
VZ 5.15 9/15/2023	-23%	2.6%	126.44		
VZ 3.5 11/1/2024	-19%	2.6%	123.22		
VZ 4.4 11/1/2034	-20%	4.0%	198.44		

Source: Merrill Lynch Index System, Bloomberg, NSR, OAS-Option Adjusted Spread; \*\* / \* credit rating watchlists; Data as of 24-Mar-14

FINANCIALS (\$m)	2016A	2017E	2018E	2019E	2020E	CAGR 16A-20E
Revenue	124,700	126,055	128,864	128,574	128,468	0.7%
EBITDA	44,265	44,940	45,108	44,443	43,571	-0.4%
Capex	17,059	17,244	17,340	17,354	17,369	0.5%
OpFCF (EBITDA - capex)	27,206	27,696	27,768	27,089	26,203	-0.9%
FCF (OpFCF * (1-tax rate))	17,641	18,193	18,240	17,801	17,223	-0.6%
EFCF	14,671	14,267	14,292	13,628	13,214	-2.6%
Adj net Income	15,802	15,606	15,584	15,006	14,665	-1.8%
Clean EPS	3.87	3.82	3.81	3.67	3.67	-1.3%
DPS	2.29	2.34	2.39	2.44	2.49	2.1%
Cash flow						
OpFCF	27,206	27,696	27,768	27,089	26,203	
Less: Interest payments	-4,282	-4,658	-4,726	-5,000	-4,764	
Less: Tax paid	-8,253	-8,403	-8,391	-8,080	-7,897	
Less: Change in WC	-5,636	-9,000	-3,155	-132	168	
Less: Other	-5,180	4,916	-2,179	1,497	1,628	
Sub total	3,855	10,551	9,317	15,374	15,337	
Less: Dividends paid	-9,262	-9,531	-9,735	-9,939	-10,143	
Less: Acquisitions	-4,299	-6,800	-200	0	0	
Plus: Disposals/Reductions	9,882	0	3,600	0	0	
Chg in Net debt/Cash	-176	5,780	-2,982	-5,435	-5,194	
Net Debt (Cash)	105,198	110,978	107,997	102,561	97,367	

DIVISIONAL (\$m)	2016A	2017E	2018E	2019E	2020E	CAGR 16A-20E
Revenues						
Wireless revenue	89,186	21,569	21,217	21,595	22,841	-28.9%
Wireline revenue	31,345	7,732	7,650	7,663	7,723	-29.5%
Other revenue	4,169	1,214	1,257	2,670	2,924	-8.5%
Total	124,700	30,515	30,124	31,928	33,488	-28.0%
% change		-75.5%	-1.3%	6.0%	4.9%	
EBITDA						
Wireless EBITDA	39,036	10,125	10,167	9,681	8,359	-32.0%
Wireline EBITDA	6,141	1,794	1,740	1,763	1,794	-26.5%
Other EBITDA	-912	-319	-111	-161	106	
Total	44,265	11,601	11,796	11,283	10,260	-30.6%
% change		-73.8%	1.7%	-4.3%	-9.1%	
EBITDA margin	35.5%	38.0%	39.2%	35.3%	30.6%	
Capex						
Wireless capex	11,240	2,287	2,940	2,894	3,618	-24.7%
Wireline capex	4,504	894	724	921	1,465	-24.5%
Other capex	1,315	216	282	386	616	-17.3%
Total	17,059	3,398	3,946	4,201	5,699	-24.0%
% change		-80.1%	16.1%	6.5%	35.7%	
Capex/sales	13.7%	11.1%	13.1%	13.2%	17.0%	

OPTION ADJUSTED CREDIT SPREAD HISTORY (BPS)



DEFINITIONS: OpFCF = EBITDA - capex; FCF = OpFCF \* (1 - tax rate); EFCF = Clean net income + depreciation - capex. EFCF yield adjusts mkt cap. for the NPV of tax credits & all other one-off cash items.

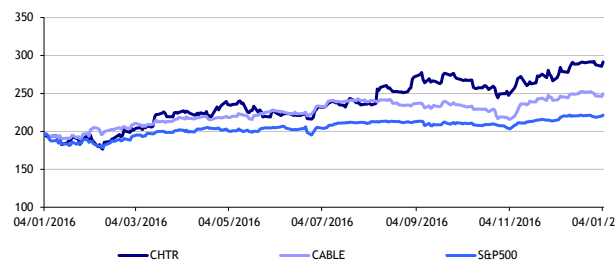


# Charter (Buy)

# Target: \$360 (+10.9%)

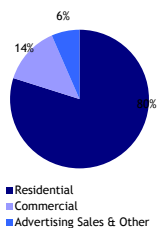
EV CALCULATION (\$m)	2017E	2018E	2019E	2020E	CAGR 17E-20E
Share price, \$	324.6				
Number of shares	294	267	241	216	
Market cap.	95,284	86,649	78,360	70,153	
Plus: Net debt/(Cash)	65,199	67,571	71,777	75,984	
Plus: Other financial liabilities	0	0	0	0	
Less: Associates	0	0	0	0	
Plus: Minorities	0	0	0	0	
Less: Cumulative dividends	0	0	0	0	
Less: NPV YE tax credit	5,583	5,583	5,583	5,583	
Enterprise Value	154,900	148,637	144,555	140,554	-3.2%

PRICE PERFORMANCE, -1Y

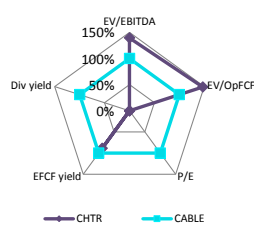


MULTIPLES & RATIOS	2017E	2018E	2019E	2020E	CAGR 17E-20E
EV/Revenue	3.7	3.4	3.2	3.0	-6.8%
EV/EBITDA	9.6	8.7	8.3	7.7	-6.9%
EV/OpFCF	17.9	14.1	12.9	11.6	-13.5%
EV/FCF	28.9	22.8	20.8	18.7	-13.5%
EV/Invested capital	1.4	1.5	1.5	1.5	1.6%
EV/NFA	5.0	5.2	5.4	5.6	4.0%
P/EBITDA	29.2	21.0	19.9	18.8	-13.6%
Adjusted P/E	45.8	31.7	26.2	22.0	-21.6%
Dividend yield	0.0%	0.0%	0.0%	0.0%	
EFCF yield	3.4%	4.8%	5.0%	5.3%	15.8%
Net debt/EBITDA	4.03	3.68	3.48	3.25	-6.9%
OpFCF/Net interest	-2.82	-3.35	-3.49	-3.63	8.8%

BREAKDOWN OF VALUE



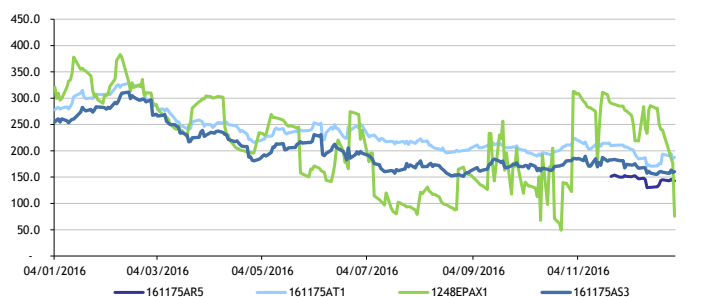
RELATIVE VALUATION (2016E)



FINANCIALS (\$m)	2016A	2017E	2018E	2019E	2020E	CAGR 16A-20E
Revenue	39,975	42,373	45,599	48,716	52,407	7.0%
EBITDA	14,568	16,161	17,720	18,757	20,038	8.3%
Capex	7,427	7,528	6,752	6,717	6,684	-2.6%
OpFCF (EBITDA - capex)	7,141	8,632	10,968	12,040	13,353	16.9%
FCF (OpFCF * (1 - tax rate))	5,764	5,352	6,800	7,465	8,279	9.5%
EFCF	3,065	3,268	4,542	4,783	5,073	13.4%
Adj net income	1,286	2,079	3,003	3,636	4,322	35.4%
Clean EPS	4.14	7.08	11.25	15.06	20.00	48.3%
DPS	0.00	0.00	0.00	0.00	0.00	
Cash flow						
OpFCF	7,141	8,632	10,968	12,040	13,353	
Less: Interest payments	-2,804	-3,061	-3,275	-3,448	-3,675	
Less: Tax paid	-387	-1,533	-2,206	-2,697	-3,260	
Less: Change in WC	729	372	484	468	554	
Less: Other	-21,726	293	442	-517	-535	
Sub total	-17,047	4,703	6,413	5,847	6,437	
Less: Share Repurchases	-1,679	-8,913	-8,785	-10,053	-10,644	
Less: Acquisitions	-28,810	0	0	0	0	
Plus: Disposals/Reductions	0	0	0	0	0	
Chg in Net debt/Cash	47,535	4,210	2,372	4,206	4,207	
Net Debt (Cash)	60,989	65,199	67,571	71,777	75,984	

DIVISIONAL (\$m)	2016A	2017E	2018E	2019E	2020E	CAGR 16A-20E
Revenues						
Video	16,425	16,883	17,457	18,518	19,775	4.7%
Internet	12,631	14,030	15,599	17,252	18,841	10.5%
Telephone	2,880	2,621	2,669	2,401	2,043	-8.2%
Residential	31,936	33,533	35,725	38,171	40,658	6.2%
Small and Medium Business	0	0	0	0	0	
Enterprise	0	0	0	0	0	
Commercial	5,428	6,235	6,936	7,677	8,433	11.6%
Advertising Sales	1,701	1,657	1,934	1,802	2,178	6.4%
Other	911	948	1,003	1,066	1,137	
Total Revenues	39,975	42,373	45,599	48,716	52,407	7.0%
% change		6.0%	7.6%	6.8%	7.6%	
EBITDA						
Cable	14,568	16,161	17,720	18,757	20,038	8.3%
Total	14,568	16,161	17,720	18,757	20,038	8.3%
% change		10.9%	9.6%	5.9%	6.8%	
EBITDA margin	36.4%	38.1%	38.9%	38.5%	38.2%	
Capex						
Cable	7,427	7,528	6,752	6,717	6,684	-2.6%
Total	7,427	7,528	6,752	6,717	6,684	-2.6%
% change		1.4%	-10.3%	-0.5%	-0.5%	
Capex/sales	18.6%	17.8%	14.8%	13.8%	12.8%	

OPTION ADJUSTED CREDIT SPREAD HISTORY (BPS)



CHTR 3.579 7/23/2020	Moody's	S&P
CHTR 4.908 7/23/2025	Ba1	BBB
CHTR 6.625 1/31/2022	Ba1	BBB
CHTR 4.464 7/23/2022	B1	BB+
	Ba1	BBB
CHTR 3.579 7/23/2020	Issue size	Yld to mat
CHTR 4.908 7/23/2025	2,000	2.3%
CHTR 6.625 1/31/2022	4,500	3.6%
CHTR 4.464 7/23/2022	750	5.5%
	3,000	3.0%
CHTR 3.579 7/23/2020	OAS 12m chg	Yld to wor
CHTR 4.908 7/23/2025	NM	2.3%
CHTR 6.625 1/31/2022	-32%	3.6%
CHTR 4.464 7/23/2022	-76%	0.6%
	-37%	2.9%
		160.41

Source: Merrill Lynch Index System, Bloomberg, NSR; OAS-Option Adjusted Spread; \*\* / \* - credit rating watchlists; Data as of 24-Mar-14

DEFINITIONS: OpFCF = EBITDA - capex; FCF = OpFCF \* (1 - tax rate); EFCF = Clean net income + depreciation - capex. EFCF yield adjusts mkt cap. for the NPV of tax credits & all other one-off cash items.

## Synergy Analysis: Considerable Value at Stake

Verizon would derive two distinct categories of value from acquiring Charter: the first is from value that is created, largely by eliminating redundant costs; the second is from eliminating a threat and a liability. The first category is additive to the value of the two companies and so can help fund an acquisition premium.

The second is more problematic: the market does not recognize the threat or the liability today, and so Verizon can't claim new value by eliminating them. They will be incredibly important drivers of Verizon's desire to do a deal, but they don't help fund an acquisition premium or help make the financial impact of a deal more palatable.

To complicate matters further, while mitigating threats and liabilities may provide a very strong motive for Verizon to do a deal, they may also discourage Charter from wanting to do the deal, assuming at least part of the consideration will be in Verizon equity. Acquiring Charter mitigates problems in Charter's 36% of the country; however, these problems will persist, and are unrecognized by the market, in the remainder of the country. In other words, Charter would be paid partly in Verizon equity, the value of which would be at risk as these issues are more properly accounted for by the market.

To put all of this in perspective, we see \$45BN of value created for Verizon from an acquisition of Charter, but only \$20BN is new value created that would benefit Charter. Furthermore, we believe the market will be reluctant to give the companies credit for the portion of this value creation that would stem from new revenues or avoided costs, at least at the outset. We see just \$16BN in value that the companies can reasonably expect to get credit for upfront. This is real value, but it doesn't seem to be enough to offset the risks that Charter would take on by taking Verizon equity.

### Value Creation: Hard Cost Synergies; Revenue & Avoided Cost Synergies

We focused on two sources of new value that would be created: 1) hard cost synergies, that we would regard as dependable, from consolidating infrastructure, operations, marketing and corporate overhead, and; 2) more speculative synergies from cross-selling products and reducing churn. We would expect the companies to get credit for the hard cost synergies when the deal is announced; however, we believe the market will be more skeptical of cross-selling and churn benefits (we would be too).

### Value Preservation: Closing Capacity Gap; Eliminating a Competitor

We also focused on two sources of value that would be preserved for Verizon by acquiring Charter: 1) Verizon has much less capacity than their main wireless competitors, and owning Charter would help them close the gap in 36% of the country, and; 2) Cable companies will enter the wireless market this year, and by acquiring Charter Verizon eliminates a potential competitor in the same 36% of the country. These are very important strategic benefits for Verizon; however, we would argue that Verizon isn't being penalized for their capacity shortfall or the Cable threat today. As such, they shouldn't get credit for eliminating these issues if they acquired Charter. Quietly eliminating problems in 36% of the country before the market recognizes them is good for Verizon; however, Charter will be concerned about the impact on Verizon's stock when the problems that persist in the remaining 64% of the country are recognized by the market.

### Four Categories of Synergies: \$8BN Annually

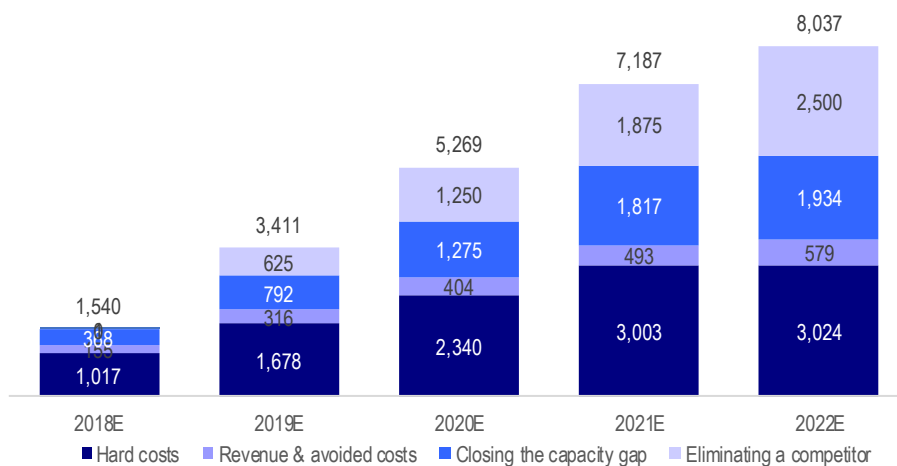
Verizon may be focused on value that is created in four areas:

- 1) **Hard Cost Synergies: \$3.0BN.** We focused on savings from network opex, cell site back-haul, programming expense, customer care, selling & marketing, corporate overhead and capex. We believe the companies should get credit for the vast majority of these upfront.
- 2) **Revenue & Avoided Costs: \$0.6BN.** Verizon could increase the penetration of their wireless product among Charter's broadband and pay-tv customers and increase the penetration of broadband and pay-tv among Verizon's wireless customers that reside in the Charter footprint. We also quantify potential churn synergies (that we are skeptical of). Finally, we touch on new products that the companies could launch; however, these are too speculative to quantify at this stage.

- 3) **Closing the Capacity Gap: \$1.9BN.** Verizon has a considerable capacity shortfall relative to its competitors. The company would be able to close this gap using small cells at much lower cost in Charter’s footprint, if they owned the asset. These are real savings for Verizon; however, the market has never penalized them for the shortfall, and so they shouldn’t get credit for mitigating it.
- 4) **Eliminating a Competitor: \$2.5BN.** The Cable companies will all launch wireless offerings in the near future and Verizon has a great deal of value at risk, given 38% of industry revenues, considerable operating leverage, and considerable financial leverage on top of that. Acquiring Charter would eliminate this threat in 36% of the country and it would weaken the Cable threat more generally, outside of the Charter footprint.

**Exhibit 1: Total Opex & Recurring Capex Synergy Forecast**

USD, millions



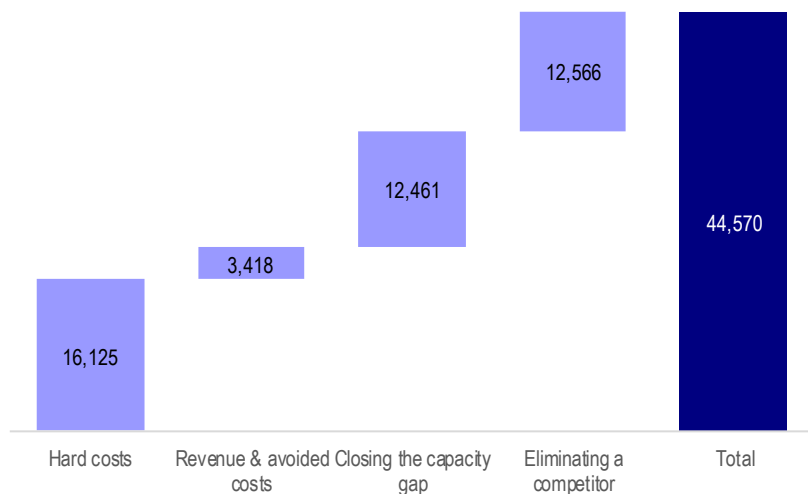
Source: New Street Research, Company Data

**Total Value Creation Opportunity of \$45BN (For Verizon)**

After factoring in \$0.6BN in integration opex, \$5.5BN in integration capex, and \$6.0BN in one-time capex benefits over the five years during which the businesses are integrated, we arrive at an NPV of synergies of \$45BN. The hard cost synergies, net of integration impacts, have an NPV of \$16BN, while revenues and avoided costs could add \$3BN, closing the capacity gap could add \$12BN and eliminating a competitor could add \$13BN.

**Exhibit 2: Sources of Value**

USD, millions



Source: New Street Research, Company Data

**Hard Opex & Capex Synergies: \$3.0BN Annually**

We focus on six areas of hard cost and capex synergies in this report:

- 1) **Network opex:** We estimate \$0.8BN annually from integrating network operations in Charter's footprint. We would expect most of these savings to stem from integrating infrastructure and systems (one backbone; one Network Operations center) and IT, and from using Charter's fiber for connecting to enterprises in Charter's footprint.
- 2) **Backhaul:** We estimate an additional \$0.2BN annually from switching backhaul from other providers to Charter. We estimate that 36% of Verizon's cell sites are in Charter's footprint and 52% of these could be switched to Charter backhaul. In 35% of cases Charter will already have fiber at the cell site in question - switching is virtually costless. In most of the rest there would be some additional opex and capex to pull fiber to the site; however, the savings would still be considerable.
- 3) **Programming:** We estimate \$0.3BN annually from migrating Verizon subs to the legacy TWC rate card and another \$0.2BN from renegotiating the TWC rate card lower over time with the increase in the base (volume discount applied to the entire base). We assume the second category takes ten years to capture, such that only \$0.1BN is realized by the end of our forecast period. We see opportunities for additional savings on programming purchased at Verizon Wireless, such as for a DIRECTV Now competitor; however, we ignore these for now.
- 4) **Customer care:** We estimate \$0.4BN annually from eliminating redundant customer care costs from Charter customers that take Verizon wireless service.
- 5) **SG&A:** We estimate \$1.1BN annually from eliminating sales and marketing and corporate overhead expenses.
- 6) **Capex:** we estimate \$0.1BN annually primarily from maintenance capex savings tied to the integration of network operations mentioned above. We estimate a much greater opportunity for savings on capacity related capex; however, we deal with that separately in a following section.

**Exhibit 3: Hard Opex & Capex Synergies**

USD, millions

	2018E	2019E	2020E	2021E	2022E
<b>Recurring Hard Cost Synergies</b>					
Network expense	188	376	564	751	751
+ Backhaul	47	94	142	191	192
+ Programming	277	297	318	339	359
+ Customer care	109	219	328	438	438
+ SG&A	359	617	877	1,135	1,135
<b>= Hard cost synergies</b>	<b>980</b>	<b>1,604</b>	<b>2,229</b>	<b>2,854</b>	<b>2,876</b>
+ Net recurring capex synergies	37	74	112	149	149
<b>= Recurring cost synergies</b>	<b>1,018</b>	<b>1,678</b>	<b>2,341</b>	<b>3,003</b>	<b>3,024</b>
<b>One-time impacts</b>					
One-time backhaul capex	95	96	97	98	2
+ Backhaul termination costs	98	103	0	0	0
<b>= Net one-time costs</b>	<b>193</b>	<b>199</b>	<b>97</b>	<b>98</b>	<b>2</b>

Source: New Street Research, Company Data

**Exhibit 4: Valuing Hard Opex & Capex Synergies**

USD, millions

	2018E	2019E	2020E	2021E	2022E	TV
<b>Net cost synergies</b>	980	1,604	2,229	2,854	2,875	2,933
- Taxes	382	626	869	1,113	1,121	1,144
<b>= After tax cost synergies</b>	431	829	1,216	1,600	1,754	1,789
+ Net recurring capex synergies	37	74	112	149	149	149
+ One-time capex synergies	(193)	(199)	(97)	(98)	(2)	0
<b>= Total after tax synergies</b>	<b>275</b>	<b>705</b>	<b>1,230</b>	<b>1,651</b>	<b>1,901</b>	<b>1,938</b>
/ Discount factor	1.21	1.33	1.46	1.61	1.77	1.95
<b>= Discounted synergies</b>	<b>227</b>	<b>529</b>	<b>840</b>	<b>1,025</b>	<b>1,073</b>	<b>994</b>
memo: WACC	10%	10%	10%	10%	10%	10%
memo: Tax Rate	39%	39%	39%	39%	39%	39%
PV of cash flows	3,695					
+ PV of TV	12,430					
<b>= NPV of operating synergies</b>	<b>16,125</b>					
memo: Terminal Growth	2%					

Source: New Street Research, Company Data

**Network Expense Synergies: \$0.8BN Annually**

We focused on two areas of network related savings that we felt we could quantify (this is likely conservative; there are probably other areas of network related savings that are harder for us to quantify):

- 1) **Core network & IT systems:** We analyzed European fixed / mobile convergence deals to approximate the synergy potential from consolidating networks and IT systems. We analyzed six deals over the past five years, and focused on two (VOD-KDG and VOD-ONO) that involved a wireless operator acquiring a



fixed player which covered ~40% of the wireless footprint. Vodafone guided to network / IT synergies of \$0.70-0.81 per home passed in the transactions. If we apply that figure to Charter's footprint, post divestitures, we estimate network / IT synergies of \$0.4BN (Exhibit 6).

- 2) **Special access:** We estimate that Verizon will be able to generate Special Access savings of \$0.3BN annually. Verizon will be able to use Charter's infrastructure to service enterprise customer locations in Charter's footprint, where Verizon is currently purchasing Special Access circuits from someone other than Charter. We had a hard time finding good data on Verizon's Special Access costs; however, based on discussions with industry sources and data disclosed by the FCC in the Special Access proceeding, we arrived at a very rough estimate of Verizon's out-of-footprint special access costs of \$1.4BN. 36% of these costs or roughly \$0.5BN will be incurred in Charter's footprint. If 70% of these costs can be eliminated by moving the traffic onto Charter's fiber, it would generate savings of \$0.3BN annually. Charter will need to deploy new fiber to connect many of the buildings where Verizon needs service. We estimate one-time capex of \$1.2BN to connect these buildings.

### Exhibit 5: Network Expense Synergies

USD, millions

	2018E	2019E	2020E	2021E	2022E
<b>Recurring cost synergies</b>					
Network / IT synergies	101	202	303	404	404
+ Special Access synergies	87	174	260	347	347
<b>= Total network synergies</b>	<b>188</b>	<b>376</b>	<b>564</b>	<b>751</b>	<b>751</b>
<b>One-time impacts</b>					
Special Access termination costs	289	289	289	289	0

Source: New Street Research, Company Data

### Exhibit 6: Network Expense Synergies

USD, millions

	VOD - KDG	VOD - ONO
Network / IT synergies	129	70
Homes Passed ('000)	15,300	7,200
Network / IT per home	<b>\$0.70</b>	<b>\$0.81</b>
memo: EUR/USD	0.93	
Average network / IT savings per home	\$0.76	
x CHTR homes excluding divestiture	44,530	
<b>= Network / IT synergies</b>	<b>404</b>	

Source: New Street Research, Company Data



**Exhibit 7: Special Access Savings**

USD, millions

VZ 2016 Enterprise Revenues	11,621
x % of which is out-of-footprint	40%
<b>= VZ 2016 Out-of-footprint Revenues</b>	<b>4,648</b>
x % of which is domestic	75%
<b>= VZ 2016 US Out-of-footprint Revenues</b>	<b>3,486</b>
x % of which is special access costs	40%
<b>= Current VZ US Special Access Costs</b>	<b>1,395</b>
x % of which in CHTR footprint	36%
<b>= Potential Synergies</b>	<b>496</b>
x % of which is addressable	70%
<b>= Actual Synergies</b>	<b>347</b>

Source: New Street Research, Company Data

**Exhibit 8: Special Access One-Time Capex**

USD, millions

Location Already Has CHTR?	Yes	No	Total
Total Synergies	351	351	351
x % of locations	50%	50%	100%
<b>= Synergies In Locations w/ or w/o CHTR</b>	<b>176</b>	<b>176</b>	<b>351</b>
x ROIC on incremental investment		15%	3.33
<b>= One-Time Capex To Achieve</b>		<b>1,171</b>	<b>1,171</b>

Source: New Street Research, Company Data

**Backhaul Expense Synergies: \$0.2BN Annually**

Estimating the backhaul synergy opportunity requires four steps:

- 1) **Cell sites in footprint:** We estimate that Verizon will have 63,000 cell sites when the deal closes (YE17 for the purposes of this analysis), and 22,000 of these are in Charter's footprint. We assume the distribution of cell sites tracks the distribution of homes or population, such that the share of cell sites in Charter's footprint is equal to the share of homes nationally in Charter's footprint.
- 2) **Addressable sites:** Based on conversations with the carriers, we estimate that Verizon currently purchases backhaul from Charter on roughly 13% of their cell sites in Charter's footprint. In addition, we estimate that a further 34% are served with Verizon owned fiber, fiber that they have leased under very long term contracts (dark fiber IRUs), or are not served with fiber at all. This leaves 52%, or 11,800 sites, that are addressable.
- 3) **Existing facilities:** We estimate that Charter currently has fiber serving 35% of the addressable sites where Verizon is a tenant, making switching providers very easy. The company would need to pull fiber to the remainder, requiring some additional capex. Verizon may be able to capture additional backhaul revenues on sites they pull fiber to; however, we have ignored this opportunity for now.
- 4) **Additional costs:** Verizon would incur some additional cost and maintenance capex to serve the sites it pulls fiber to; we have ignored this for now as we think it is negligible in the grand scheme of things.

**Exhibit 9: VZ Cell Sites in CHTR Footprint**

Cell sites

VZ cell sites	62,992
x PF CHTR share of US homes	36%
<b>= VZ macro sites in CHTR footprint</b>	<b>22,454</b>

Source: New Street Research, Company Data

**Exhibit 10: VZ Cell Sites With CHTR Backhaul**

Cell sites

Legacy TWC macro sites with backhaul	20,000
/ Legacy TWC homes passed	30,863
= Macro sites per home passed	648
x PF CHTR homes passed	43,929
<b>= CHTR macro sites with backhaul</b>	<b>28,467</b>
x VZ share of macro site tenancies	25.1%
<b>= CHTR macro sites with VZ on them</b>	<b>7,150</b>
x CHTR share of backhaul	41.5%
<b>= VZ macro sites taking CHTR backhaul</b>	<b>2,967</b>

Source: New Street Research, Company Data

**Exhibit 11: VZ backhaul Matrix In CHTR Footprint**

Cell sites

	Cell Sites	Share
VZ backhaul	1,530	7%
CHTR backhaul	2,967	13%
IRU	3,928	17%
Other fiber	11,784	52%
Non-fiber	2,245	10%
<b>Total</b>	<b>22,454</b>	<b>100%</b>

Source: New Street Research, Company Data

**Exhibit 12: Backhaul Replacement Synergies**

USD, millions

	2018E	2019E	2020E	2021E	2022E
VZ 2017E standalone macro sites	62,992	62,992	62,992	62,992	62,992
x CHTR share of homes	36%	36%	36%	36%	36%
<b>= VZ standalone sites in CHTR footprint</b>	<b>22,454</b>	<b>22,526</b>	<b>22,652</b>	<b>22,778</b>	<b>22,905</b>
x Percent without VZ/CHTR/IRU backhaul	52%	52%	52%	52%	52%
<b>= Sites in CHTR footprint with backhaul synergies</b>	<b>11,784</b>	<b>11,822</b>	<b>11,888</b>	<b>11,954</b>	<b>12,020</b>
Sites In CHTR Footprint w/out CHTR backhaul	11,784	11,822	11,888	11,954	12,020
x Percent with backhaul replaced	25%	50%	75%	100%	100%
<b>= Backhaul sites replaced</b>	<b>2,946</b>	<b>5,911</b>	<b>8,916</b>	<b>11,954</b>	<b>12,020</b>
x Backhaul cost / month	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600
<b>= Backhaul replacement synergies</b>	<b>57</b>	<b>113</b>	<b>171</b>	<b>230</b>	<b>231</b>
<b>Capex Required to Replace Backhaul</b>					
Sites In CHTR Footprint w/out CHTR backhaul	11,784	11,822	11,888	11,954	12,020
- Sites where CHTR already offers backhaul	4,183	4,196	4,220	4,243	4,267
<b>= Sites with new backhaul</b>	<b>7,601</b>	<b>7,626</b>	<b>7,668</b>	<b>7,711</b>	<b>7,754</b>
x Percent with backhaul replaced	25%	50%	75%	100%	100%
<b>= Sites With Add'l Capex</b>	<b>1,900</b>	<b>1,913</b>	<b>1,938</b>	<b>1,960</b>	<b>43</b>
x Capex / site	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
<b>= Backhaul Capex Dissynergies</b>	<b>95</b>	<b>96</b>	<b>97</b>	<b>98</b>	<b>2</b>
<b>Maintenance capex</b>					
Sites with backhaul replaced	1,900	3,813	5,751	7,711	7,754
/ Depreciable Life	10.0	10.0	10.0	10.0	10.0
<b>= Sites requiring maintenance</b>	<b>190</b>	<b>381</b>	<b>575</b>	<b>771</b>	<b>775</b>
x Maintenance capex / site (\$ in '000)	50,000	50,000	50,000	50,000	50,000
<b>= Maintenance Capex Dissynergies</b>	<b>10</b>	<b>19</b>	<b>29</b>	<b>39</b>	<b>39</b>
<b>Summary</b>					
Backhaul replacement synergies	57	113	171	230	231
- Maintenance capex dissynergies	10	19	29	39	39
<b>= Net recurring backhaul synergies</b>	<b>47</b>	<b>94</b>	<b>142</b>	<b>191</b>	<b>192</b>
One-time backhaul capex	95	96	97	98	2
+ Backhaul termination costs	98	103	0	0	0
<b>= Net one-time costs</b>	<b>193</b>	<b>199</b>	<b>97</b>	<b>98</b>	<b>2</b>

Source: New Street Research, Company Data

**Programming Cost Synergies: \$0.4BN Annually**

Verizon doesn't disclose programming costs (annoyingly); we estimate their cost based on their pay-tv subs applied to our programming cost curve. To complicate matters further, we derived our cost curve in 2015 when we had more disclosed data points; we have adjusted our original curve to reflect the annual increases that we have seen and expect to see since 2015. The programming expense synergies should be realized in two steps:

- 1) **Rate card impact:** We assume that Verizon is able to move their pay-tv subs to the old TWC rate card. This would require some clever structuring such that the old TWC corporate entity is the surviving owner of at least the wireline assets of Verizon. We assume there are some clever bankers that will figure this out; if not, these savings would fall into the category below, where they would be captured over a longer period of time.
- 2) **Scale impact:** Using the same cost curve, we estimate what programming costs would be for an entity negotiating with 19MM subs as opposed to the 17MM that New Charter had before the deal. We have assumed that 2.9MM are divested. In reality, there would be a bigger step down from the old TWC rate card negotiated with 13MM subs to a rate card negotiated with 19MM subs; however, much of this benefit stemmed from the prior Charter / TWC deal; we only reflect the incremental savings from Verizon / Charter here. We assume these savings are captured as content contracts are renegotiated over ten years (very conservative; most deals are 5 years); as such, only \$103MM of the \$206MM in savings are captured in the forecast period.

### Exhibit 13: Programming Cost Synergies

USD, millions

	2018E	2019E	2020E	2021E	2022E
Rate Card Programming Synergies	256	256	256	256	256
+ Scale Programming Synergies	21	41	62	82	103
<b>= Total Programming Synergies</b>	<b>277</b>	<b>297</b>	<b>318</b>	<b>339</b>	<b>359</b>

Source: New Street Research, Company Data

### Exhibit 14: Rate Card Driven Synergies

USD, millions

VZ 2018 programming costs per sub (est.)	\$56
- CHTR 2018 programming costs per sub	\$52
= Step Down To CHTR Rate Card (\$ / sub / month)	\$4.50
x VZ video subs	4,747
x 12 months	12
<b>= Benefit From Rate Card Step Down</b>	<b>256</b>

Source: New Street Research, Company Data

### Exhibit 15: Scale Driven Synergies

USD, millions

	CHTR standalone	CHTR / VZ PF
Programming costs / sub based on 2015 cost curve	\$42	\$41
x Annual cost growth between 2015 and 2018	7.4%	7.4%
<b>= 2018 programming costs</b>	<b>\$52</b>	<b>\$51</b>
Difference in programming costs		\$0.89
x PF avg. 2017 video subs		19,279
<b>= Scale prog. cost synergies (10 years to achieve)</b>		<b>206</b>

Source: New Street Research, Company Data

## Service Cost Synergies: \$0.4BN Annually

We estimate that Verizon could save \$0.4BN annually from eliminating redundant costs associated with serving the 8.7MM Verizon Wireless customers that are also Charter customers. We applied legacy TWC's customer care costs per relationship of \$4.19 to these homes to derive synergies of \$438MM over four years.

### Exhibit 16: Total Customer Care Synergies

USD, millions

	2018	2019	2020	2021	2022
Customer care synergies	110	219	329	438	438

Source: New Street Research, Company Data

### Exhibit 17: Run-rate Customer Care Synergies

USD, millions

CHTR residential relationships	23,795
- Divestitures	2,721
<b>= PF residential relationships</b>	<b>21,074</b>
x VZ postpaid market share	41%
<b>= CHTR homes that take VZ wireless</b>	<b>8,715</b>
x TWC customer care per relationships	\$4.19
<b>= Customer care savings</b>	<b>438</b>

Source: New Street Research, Company Data

## SG&A Synergies: \$1.1BN Annually

We focus on two categories of savings within SG&A:

- 1) **Selling & marketing expense:** we estimate \$0.7MM annually from rationalizing advertising and marketing expense by consolidating down to one brand and one set of agencies. In addition, Charter has a small store footprint that could be consolidated with Verizon stores. There may also be churn benefits; however, we capture those in a later section.
- 2) **Corporate overhead:** We estimate \$0.4BN in annual savings from rationalizing corporate overhead. Charter reports a management fee that was a \$0.4BN annual run-rate cost in the quarter prior to the TWC acquisition, and has swelled to \$0.9BN annually as of the third quarter. We expect this to return to pre-TWC levels as the synergies from that deal are captured. We would assume the remaining management fee would be eliminated with this deal, resulting in the \$0.4MM in savings we reflect here. There could be corporate overhead savings over and above this; we would regard our estimate as conservative.

**Exhibit 18: Total SG&A Synergies**

USD, millions

	2018E	2019E	2020E	2021E	2022E
<b>Recurring synergies</b>					
Selling & marketing	182	363	545	727	727
+ Corporate overhead	102	204	306	408	408
<b>= Total recurring SG&amp;A synergies</b>	<b>284</b>	<b>567</b>	<b>851</b>	<b>1,135</b>	<b>1,135</b>
<b>Integration costs</b>					
Store shutdown costs	42	42	42	42	0
+ Other SG&A costs	99	99	99	99	0
<b>= Total integration costs</b>	<b>141</b>	<b>141</b>	<b>141</b>	<b>141</b>	<b>0</b>

Source: New Street Research, Company Data

**Exhibit 19: Selling & Marketing Synergies**

USD, millions

Store employee savings	68
+ Store rent savings	100
+ Media spending savings	442
+ Creative agency savings	20
+ Production savings	20
+ Marketing overhead synergies	77
<b>= Total selling &amp; marketing synergies</b>	<b>727</b>

Source: New Street Research, Company Data

**Revenue & Avoided Cost Synergies: \$0.6BN Annually**

As with Sprint, we think there are categories of synergies that the companies could talk to that we wouldn't necessarily give them credit for. The two primary areas we can think of are: 1) cross-selling Charter products to Verizon's customers, and vice versa, and; 2) supposed churn reduction benefits from selling multiple products to a household. We estimate that the companies could talk to \$0.6BN in annual savings from these two sources, with an NPV of \$3.4BN.

**Exhibit 20: Revenue & Avoided Cost Synergy Summary**

USD, millions

	2018E	2019E	2020E	2021E	2022E
Cross-selling	83	166	249	332	414
+ Churn benefits	33	68	71	73	75
<b>= Total revenue &amp; avoided costs EBITDA</b>	<b>116</b>	<b>234</b>	<b>319</b>	<b>405</b>	<b>489</b>
+ Recurring capex benefits	39	82	85	88	90
<b>Total revenue &amp; avoided cost synergies</b>	<b>155</b>	<b>316</b>	<b>404</b>	<b>493</b>	<b>579</b>

Source: New Street Research, Company Data

**Exhibit 21: NPV of Revenue & Avoided Cost Synergies**

USD, millions

	2018E	2019E	2020E	2021E	2022E	TV
Total revenue & avoided costs	116	234	319	405	489	499
- Taxes	45	91	125	158	191	195
<b>= After tax cost synergies</b>	70	143	195	247	298	304
+ Capex synergies	39	82	85	88	90	92
<b>= Total after tax synergies</b>	110	224	280	335	388	396
/ Discount factor	1.21	1.33	1.46	1.61	1.77	1.95
<b>= Discounted synergies</b>	<b>91</b>	<b>169</b>	<b>191</b>	<b>208</b>	<b>219</b>	<b>203</b>
memo: WACC	10%	10%	10%	10%	10%	10%
memo: Tax Rate	39%	39%	39%	39%	39%	39%
PV of cash flows	877					
+ PV of TV		2,541				
<b>= NPV of operating synergies</b>		<b>3,418</b>				
memo: Terminal Growth		2%				

Source: New Street Research, Company Data

**Cross Selling Opportunities**

We estimate that roughly 9MM of Charter's households, and 22MM people within those households take Verizon Wireless service today. There are 31MM individuals in Charter's households that don't take Verizon Wireless service today and could. Similarly, there are 15MM Verizon wireless customers across 6MM households that are in the Charter footprint and don't take Charter broadband or pay-tv today that could (Exhibit 22).

If 10% of the 31MM individuals in Charter households that don't take Verizon Wireless were to take it, it would boost revenue by about \$1.7BN and EBITDA by \$1.1BN (Exhibit 23).

Similarly, if 10% of the 6MM households in Charter's footprint that are Verizon Wireless subscribers but don't take Charter's broadband and pay-tv service were induced to take it, it would boost revenue by \$0.7BN and EBITDA by \$0.3BN (Exhibit 24).

The company would have to offer a discount to Charter subs taking Verizon Wireless to meaningfully increase penetration (in past surveys we have found consumers place very little value in getting multiple services on a single bill, but they do value a bundling discount). In addition, the discount would probably have to be offered to the subs that are currently Verizon and Charter subscribers today, resulting in some lost value. If the company offered a \$10 discount to all subs taking a wireless / wireline bundle, this would cost the Companies \$1.0BN (Exhibit 25).

Taken together, we estimate net benefit of \$0.4BN annually. While certainly plausible, we wouldn't give the companies much credit for these kinds of synergies up front and we wouldn't expect the market to either. They aren't likely to materialize in the first year and they can be hard to capture in general, as we have seen with AT&T / DTV.



**Exhibit 22: Charter + VZ Overlap Matrix***Subs and homes in '000*

	Homes	Subscribers	Share
CHTR+VZ Bundle	8,701	21,749	20%
CHTR no VZ	12,373	30,928	28%
VZ no CHTR	6,012	15,028	14%
Neither VZ or CHTR	17,444	43,603	39%
<b>Total Subs / Homes in PF Charter Footprint</b>	<b>44,530</b>	<b>111,308</b>	<b>100%</b>

*Source: New Street Research, Company Data***Exhibit 23: EBITDA Benefit from Selling Verizon to Charter Subscribers***USD, millions*

CHTR subs that don't take VZW	30,893
x Increase in penetration	<u>10%</u>
<b>= New VZW subs</b>	<b>3,089</b>
x ARPU	<u>\$47.00</u>
<b>= Revenue from new VZW subs</b>	<b>1,742</b>
x Incremental margin	<u>65%</u>
<b>= EBITDA from new VZW subs</b>	<b>1,133</b>

*Source: New Street Research, Company Data***Exhibit 24: EBITDA Benefit from Selling Charter to Verizon Subscribers***USD, millions*

VZ HH that don't take CHTR	6,012
x Increase in penetration	<u>10%</u>
<b>= New CHTR subs</b>	<b>601</b>
x Discounted ARPU	<u>\$100.00</u>
<b>= Revenue from new CHTR subs</b>	<b>721</b>
x Incremental margin	<u>45%</u>
<b>= EBITDA from new CHTR subs</b>	<b>325</b>

*Source: New Street Research, Company Data***Exhibit 25: Bundling Discount & Net Impact***USD, millions*

Existing bundled homes	8,701
x Bundling discount	<u>\$10.00</u>
<b>= Revenue loss</b>	<b>1,044</b>
x Incremental margin	<u>100%</u>
<b>= EBITDA loss from bundling</b>	<b>1,044</b>
EBITDA from VZW upselling	325
+ EBITDA from CHTR upselling	1,134
- EBITDA from bundling discount	<u>1,044</u>
<b>= Net impact</b>	<b>414</b>

*Source: New Street Research, Company Data*

## Churn Benefits from Bundling

We doubt there is much room from improvement in Verizon's wireless churn. Customer churn or phone churn has been consistently between 0.8% and 0.9% which barely leaves much room for competitive churn (mortality and immigration probably account for a significant portion of their phone churn and customers who fall on bad times make up a chunk of the rest).

Cable churn is much higher though - we estimate this at 2.5% monthly. In the deals that have been announced in Europe, carriers have estimated churn improvements from Wireless-Wireline convergence. A 25bps improvement in Charter's Cable churn could save the company \$0.2BN in opex and capex annually (set-top-boxes and installs are mostly capitalized).

We would note that we are highly skeptical that carriers see benefits from bundling. We acknowledge that churn may be lower for double-play than single-play subs and lower still for triple-play subs; however, these differences may be driven entirely by selection bias (customers only take more services from you if they like you and are less likely to churn; bundling may not *cause* lower churn). We have no data series that demonstrates this in the US; however, Virgin in the UK has consistently claimed that bundling benefits churn and yet we see very little evidence of churn improvement stemming from bundling in their data (Exhibit 27).

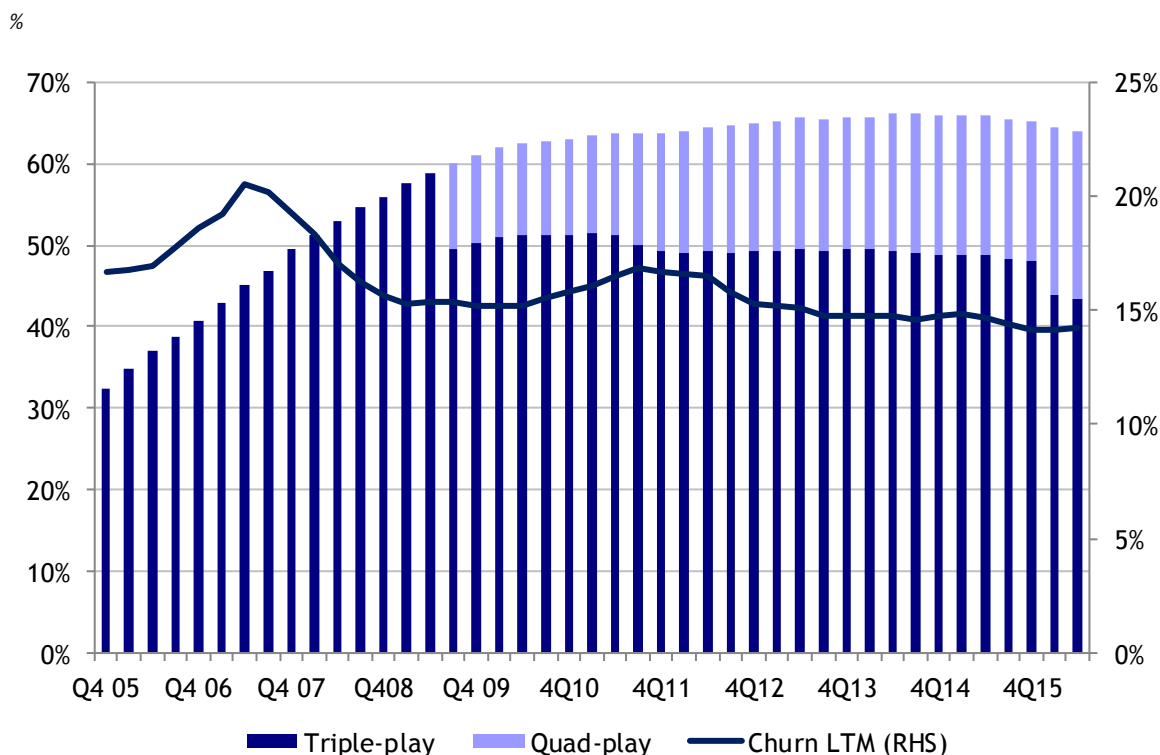
### Exhibit 26: Churn Reduction Benefit

USD, millions

	2018	2019	2020	2021	2022
CHTR standalone churn (estimated)	2.5%	2.5%	2.5%	2.5%	2.5%
- Churn benefit	0.1%	0.3%	0.3%	0.3%	0.3%
<b>= CHTR PF Churn</b>	<b>2.4%</b>	<b>2.3%</b>	<b>2.3%</b>	<b>2.3%</b>	<b>2.3%</b>
<i>memo: Addn'l Pen. Recognition</i>	<i>50%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
Beginning VZW / CHTR subs	8,701	9,078	9,429	9,777	9,986
+ Gross adds	2,857	2,803	2,894	2,849	2,920
- Churn	(2,480)	(2,451)	(2,546)	(2,640)	(2,696)
<b>= Ending VZW/CHTR subs</b>	<b>9,078</b>	<b>9,429</b>	<b>9,777</b>	<b>9,986</b>	<b>10,210</b>
Avoided gross add opex	33	68	71	73	75
x Incremental EBITDA margin	100%	100%	100%	100%	100%
<b>= Incremental EBITDA</b>	<b>33</b>	<b>68</b>	<b>71</b>	<b>73</b>	<b>75</b>
<i>memo: Opex cost/gross add</i>	<i>\$250</i>	<i>\$250</i>	<i>\$250</i>	<i>\$250</i>	<i>\$250</i>
<i>memo: Reduction in gross add</i>	<i>131</i>	<i>272</i>	<i>283</i>	<i>293</i>	<i>300</i>
<b>Avoided capital expenditures</b>	<b>39</b>	<b>82</b>	<b>85</b>	<b>88</b>	<b>90</b>
<i>memo: Capex / gross add</i>	<i>\$300</i>	<i>\$300</i>	<i>\$300</i>	<i>\$300</i>	<i>\$300</i>

Source: New Street Research, Company Data

**Exhibit 27: Virgin Media Churn vs. Bundle Penetration**



Source: New Street Research, Company Data

**New Products (Like DIRECTV Now)**

Verizon would be in a better position to launch new products with the increase in scale and scope they would gain from acquiring Charter. For example, the significantly improved content costs would put the company in a much better position to launch on over-the-top offering like DIRECTV Now. There may be opportunities to build upon the Go90 platform or launch entirely new products that we haven't thought of. These kinds of benefits are so speculative that there isn't much to be gained from trying to estimate the potential benefit; however, the companies would speak to these sorts of benefits also, if they attempted a deal.

**Wireless Capacity Synergies: \$1.9BN Annually**

The cost synergies are great; however, they aren't sufficient for Verizon push ahead with this transaction on their own. The most important strategic driver for the transaction would stem from Verizon being able to affordably create capacity using small cells by leveraging Charter's infrastructure. We estimate that Verizon could save \$1.9BN by leveraging Charter's infrastructure in the roughly 36% of the country where they operate (Exhibit 28). We value these at \$12BN (Exhibit 29). Verizon would continue to face a tremendous challenge in the remaining 50% of the country where they would still lack fixed infrastructure, unless they can strike attractive deals to leverage Cable infrastructure in those areas too.

**Exhibit 28: Capacity Cost & Capex Savings**

USD, millions

	2018E	2019E	2020E	2021E	2022E
<b>Recurring capacity synergies</b>					
Avoided macro site opex	372	802	1,290	1,839	1,957
- Lost backhaul revenue	12	26	42	60	64
- Cost to replace capacity with small cells	34	74	119	170	180
<b>= Capacity cost savings</b>	<b>326</b>	<b>702</b>	<b>1,129</b>	<b>1,610</b>	<b>1,713</b>
+ Avoided macro site maintenance capex	114	245	394	561	597
- Small cell maintenance capex	72	154	248	354	376
<b>= Recurring capacity synergies</b>	<b>368</b>	<b>792</b>	<b>1,275</b>	<b>1,817</b>	<b>1,934</b>
<b>One-time impacts</b>					
+ Avoided one-time capex per macro site	1,135	1,311	1,490	1,675	361
- One-time capex for small cells	716	826	939	1,056	228
<b>=Net one-time capacity costs</b>	<b>420</b>	<b>485</b>	<b>551</b>	<b>619</b>	<b>133</b>

Source: New Street Research, Company Data

**Exhibit 29: NPV of Capacity Cost Savings**

USD, millions

	2018E	2019E	2020E	2021E	2022E	T1
Avoided macro site opex	372	802	1,290	1,839	1,957	1,996
- Lost backhaul revenue	12	26	42	60	64	68
- Cost to replace capacity with small cells	34	74	119	170	180	192
<b>= Avoided net cost synergies</b>	<b>326</b>	<b>702</b>	<b>1,129</b>	<b>1,610</b>	<b>1,713</b>	<b>1,737</b>
- Taxes	127	274	440	628	668	677
<b>= After tax cost synergies</b>	<b>199</b>	<b>428</b>	<b>689</b>	<b>982</b>	<b>1,045</b>	<b>1,059</b>
+ Net recurring capex synergies	42	90	146	207	221	235
+ Net one-time capex synergies	420	485	551	619	133	0
<b>= Total after tax synergies</b>	<b>661</b>	<b>1,003</b>	<b>1,385</b>	<b>1,809</b>	<b>1,399</b>	<b>1,294</b>
/ Discount factor	1.21	1.33	1.46	1.61	1.77	1.95
<b>= Discounted synergies</b>	<b>546</b>	<b>754</b>	<b>946</b>	<b>1,123</b>	<b>790</b>	<b>664</b>
memo: WACC	10%	10%	10%	10%	10%	10%
memo: Tax Rate	39%	39%	39%	39%	39%	39%
PV of cash flows	4,159					
+ PV of TV	8,303					
<b>= NPV of operating synergies</b>	<b>12,461</b>					
memo: Terminal Growth	2%					

Source: New Street Research, Company Data

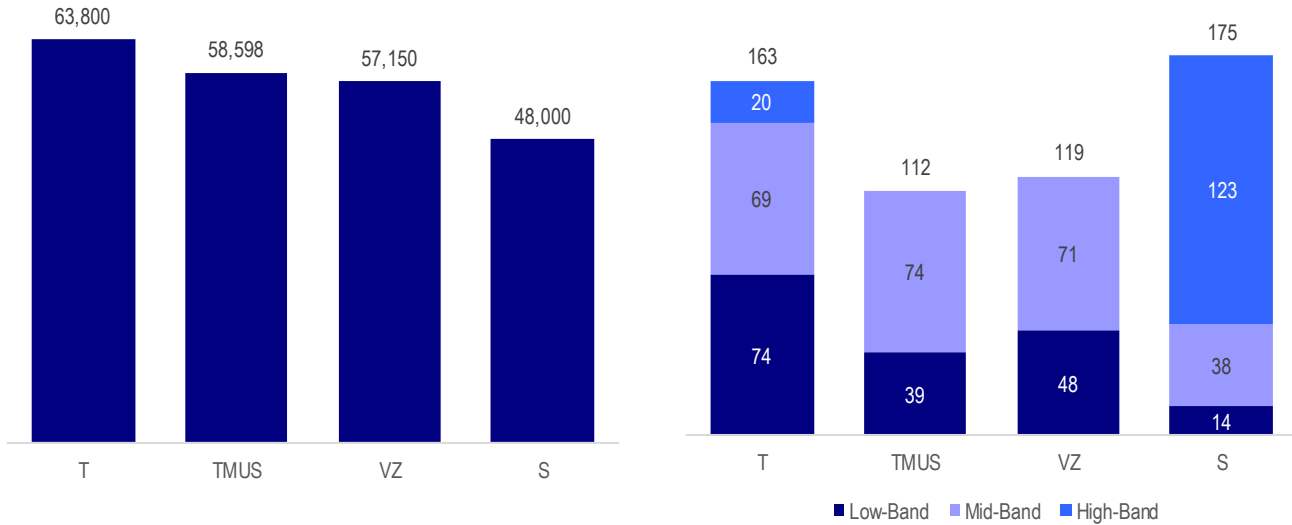
**Verizon Faces a Considerable Capacity Shortfall**

Verizon has fewer cell sites and less spectrum than their peers (Exhibit 30). The gap is even more stark when viewed on a per subscriber basis: Verizon has roughly half the capacity per subscriber that AT&T and T-Mobile do, measured based on MHz-sites (Exhibit 31). MHz-sites is a crude metric for measuring capacity for sure; Verizon may

have better spectrum bands that have been more efficiently deployed; however, a shortfall of this magnitude is too great to cope with through better engineering alone. Verizon needs more capacity.

**Exhibit 30: Cell Sites and Spectrum by Carrier**

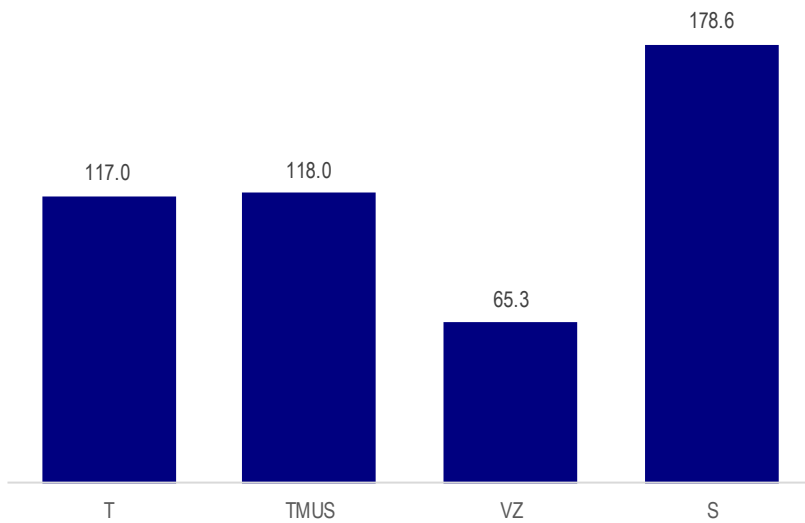
Cell Sites (LHS); MHz (RHS)



Source: New Street Research, Company Data

**Exhibit 31: MHz-Sites Per Subscriber**

Units



Source: New Street Research, Company Data

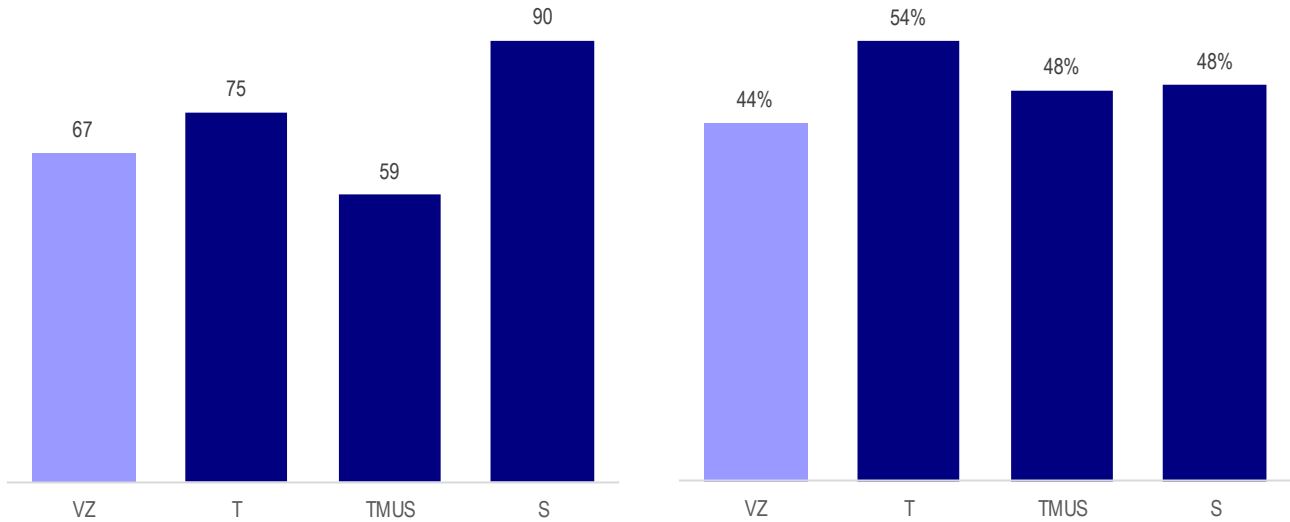
**Capacity Gap Doesn't Matter Now, But It Will**

Verizon is adding capacity to its LTE network by: migrating spectrum from less efficient 3G and 2G standards to LTE; deploying fallow spectrum; growing macro sites; deploying small cells, and; through other measures that improve throughput or efficiency like carrier aggregation. The company is keeping pace with rapidly growing data usage at present; however, it is a matter of time before they run out of capacity. Verizon can still move about 44% of its spectrum in its top markets to the LTE network (Exhibit 32); however, this would buy them

little more than a year of usage growth, and usage growth has been accelerating (Exhibit 33). Maybe they can stretch this to two years with capacity gains from other sources; however, it could take two years to deploy whatever long-term capacity solution Verizon settles on. They need to act soon.

**Exhibit 32: Spectrum Deployed for LTE in Top 25 Markets; Share of Spectrum Not Deployed On LTE**

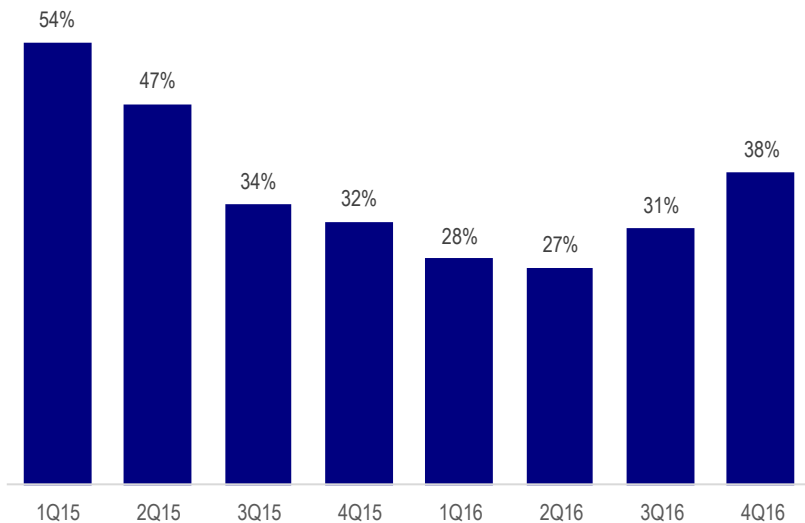
MHz (LHS); % (RHS)



Source: New Street Research, Company Data

**Exhibit 33: Growth in Usage Per Subscriber On LTE at Verizon**

%

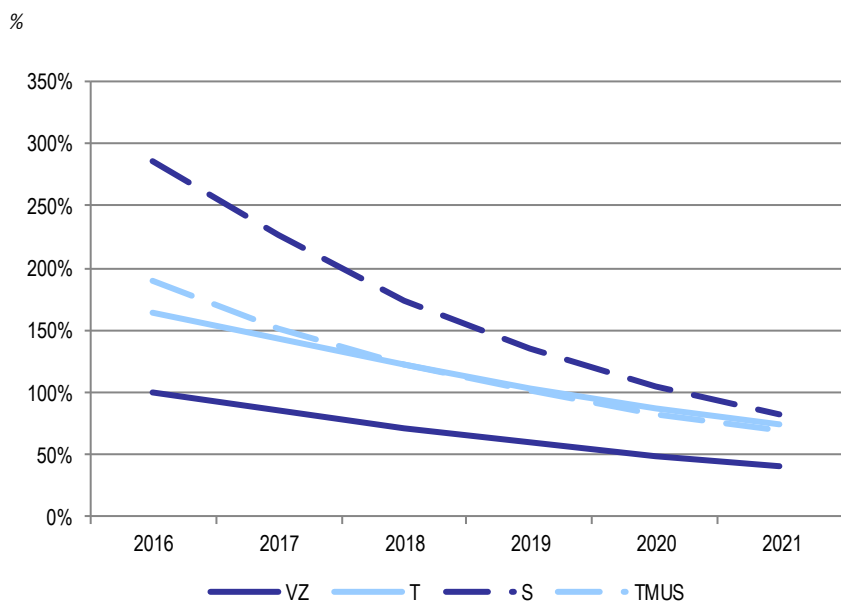


Source: New Street Research, Company Data

**Capacity Problem Is a Hill Not A Wall**

Verizon won't run out of capacity the way a reservoir runs out of water. If Verizon has less capacity per subscriber than their competitors, assuming subscribers across carriers consume similar amounts of data, and usage grows at a similar rate, Verizon would see its network performance deteriorate at a faster pace than competitors'. The network will work; it will just work more slowly and less reliably. If the company did nothing to correct the capacity shortfall, assuming they don't want to discount their service to correct for its inferiority, they would lose subscribers until their network performance was more comparable to competitors'.

### Exhibit 34: Data Capacity as a Percentage of Demand



Source: New Street Research, Company Data

### Three Avenues to Gain Capacity

Verizon can add capacity to its network one of three ways: add spectrum, add sites, improve throughput per unit of spectrum. All carriers gain improvements in spectrum efficiency at roughly the same time and they can deploy sites at roughly the same pace; the easiest way for Verizon to correct the relative shortfall vs competitors is to acquire more spectrum. There are sources of spectrum available; however, they are either very expensive (DISH), impaired presently (Ligado), or have power limitations (GSAT). Improvements to spectral efficiency are available to all simultaneously, so they won't help close the gap. If Verizon doesn't solve the capacity shortfall with spectrum the only alternative is a significant increase in site density.

### Exhibit 35: Sources of Unused Spectrum

Source	MHz	Frequency Bands	Notes
Sprint	63	2.5 GHz	Sprint has deployed 60MHz of a total of 123MHz nationwide
DISH	76	700 MHz, PCS, AWS-3, AWS-4	DISH includes 40MHz of AWS-4, 10MHz H-Block, 8MHz AWS-3 paired, 13MHz AWS-3 uplink, and 5MHz 700MHz E Block
Ligado	20-40	1.5-1.6 GHz	Ligado has asked the FCC for terrestrial authorization for 2 10x10 bands, but one of these 10x10 bands faces significant opposition
Globalstar	12	2.4 GHz	GSAT spectrum is nationwide, low-powered, and TD-LTE protocol, only suitable for small cell deployments

Source: New Street Research, Company Data

### Verizon Would Need 69,000 Macros Sites to Close the Capacity Gap

Based on the MHz-sites framework, Verizon would need to add 69,000 cell sites to match AT&T's capacity per subscriber. This would effectively double Verizon's cell sites and their fixed network opex and maintenance capex, and this would just be to close the gap. Network costs would likely grow at a faster rate once they had closed the gap, if they continued to satisfy usage growth with higher cell site density.



**Exhibit 36: Macro Sites Required to Close the Capacity Gap***Sites*

	2018E	2019E	2020E	2021E	2022E
AT&T sites	66,940	68,589	70,278	72,010	73,786
x AT&T MHz	163	163	163	163	163
= AT&T MHz-sites	10,933	11,203	11,479	11,762	12,052
/ AT&T retail subs	90,618	89,799	88,812	87,705	86,611
= AT&T MHz-sites per sub	121	125	129	134	139
x VZ retail subs	115,387	115,249	114,782	114,080	113,215
= VZ required MHz-sites	13,922	14,378	14,835	15,299	15,753
/ VZ MHz	119	119	119	119	119
= VZ sites required	116,655	120,473	124,306	128,189	132,000
- VZ 2017E sites	62,992	62,992	62,992	62,992	62,992
<b>= Incremental VZ sites required</b>	<b>53,664</b>	<b>57,482</b>	<b>61,315</b>	<b>65,198</b>	<b>69,009</b>

Source: New Street Research, Company Data

**Getting from Macro Cells to Small Cells**

Verizon could deploy small cells rather than macro cells to close the capacity gap in large, dense markets. They would need significantly more small cells than macro cells; however, small cells are cheaper to deploy and cheaper to run. It requires about 10 small cells to cover the same geographic area as a macro cell; however, we estimate that it may only take 1.3 small cells to double the capacity of a macro cell, because usage is generally highly concentrated. We have assumed 2 small cells for every macro cell to be conservative, and this may not be conservative enough (but it is a starting point). If they need 69,000 macro cells to close the gap, this would imply they need 138,000 small cells.

Our MHz-sites approach provides a very simplistic framework for comparing capacity across carriers. Factoring small cells into this simplistic framework is problematic for a number of reasons, but we have done it nonetheless, because...well, we need to start somewhere. Our 138,000 small cell estimate is based on the following:

- We assume a carrier would need roughly 10 small cells to cover the geographic area of a macro cell because of power limits, cell site height and topographical limits (this is a fairly broadly accepted rule of thumb in the industry).
- If usage was evenly distributed across Verizon's 69,000 macro sites and they need to increase capacity 107% to offer the same capacity per subscriber as AT&T, they would need 690,000 small cells (if every macro cell carries the same amount of traffic and the traffic is evenly dispersed across those cells then they need 10 small cells for every macro cell).
- Alternatively, if usage is highly concentrated such that they only faced capacity constraints in say 10% of sites that cover the preponderance of traffic, they may only need another 69,000 small cells to double capacity. The same would be true if usage was evenly spread across the 69,000 sites but highly concentrated within a site in about 10% of the area of the site.
- Based on some very rough analysis of population densities and comments that the carriers have made in the past, it appears that usage is in fact very concentrated. We estimate that Verizon would need roughly 1.3 small cells for every macro cell in order to double the capacity across their network. We round up to 2 macro sites per macro site, to take into account shifts in where usage is concentrated over the course of a day or week.
- On this basis, Verizon would need 138,000 small cells to match AT&T's capacity per sub.

### Exhibit 37: Small Cell Requirement Calculation

Sites

Small cells required per macro site	1.0	1.3	2.0	5.0	10.0
x Macro sites required	69,009	69,009	69,009	69,009	69,009
<b>= Small cells required to replace macro sites</b>	<b>69,009</b>	<b>89,711</b>	<b>138,017</b>	<b>345,043</b>	<b>690,086</b>

Source: New Street Research, Company Data

### Exhibit 38: Small Cell Requirement Calculation

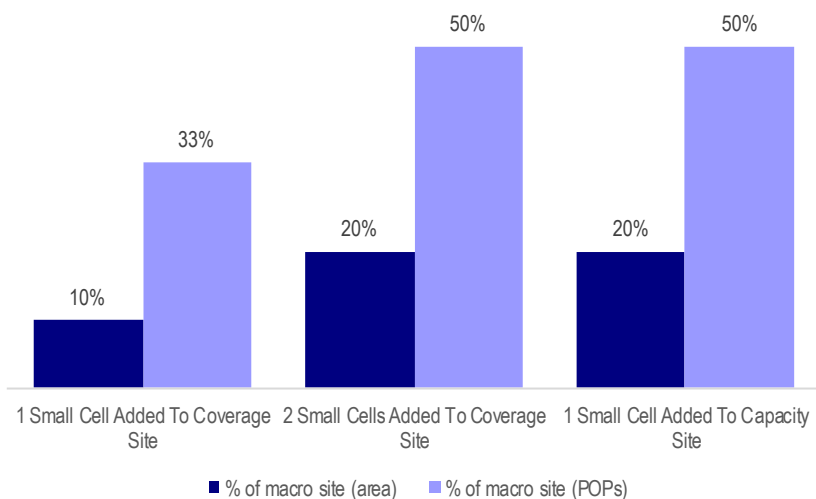
Sites

Type Of Macro Site	Coverage	Capacity	Total
Small Cells To Reduce Macro Load By 50%	2.0	1.0	1.3
x VZ Macro Sites	20,000	42,992	62,992
<b>= Total Small Cells Needed</b>	<b>40,000</b>	<b>42,992</b>	<b>82,992</b>

Source: New Street Research, Company Data

### Exhibit 39: Small Cell Area Coverage Vs. Pop Coverage

%



Source: New Street Research, Company Data

## Fiber Assets Could Change Economics of Cell Site Deployment

All carriers should be able to deploy macro cell sites or small cell sites at a similar pace; however, if a carrier owns dense fiber infrastructure, they will be able to deploy sites at a much lower incremental cost. In addition, a carrier may be able to deploy sites faster on infrastructure that they own and control. The cost difference would confer a considerable competitive advantage, and this advantage would grow as carriers move towards 5G, when all carriers will need to significantly increase network density.

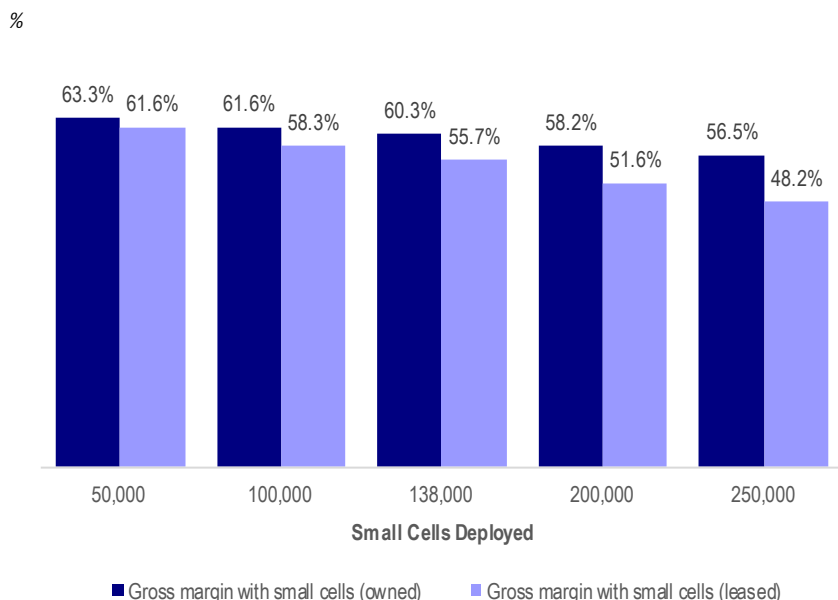
**Exhibit 40: Comparing Margins for Representative Carriers With & Without Fiber**

%

	Owned	Leased
ARPU	\$50.00	\$50.00
- Macro site costs	\$13.00	\$13.00
- Other network costs	\$4.50	\$4.50
<b>= Gross margin on macro sites</b>	<b>\$32.50</b>	<b>\$32.50</b>
- Small cell costs	\$2.34	\$4.64
<b>= Gross margin with small cells</b>	<b>\$30.16</b>	<b>\$27.86</b>
<i>memo: Macro sites</i>	<i>60,000</i>	<i>60,000</i>
<i>memo: Small cells</i>	<i>138,000</i>	<i>138,000</i>
<i>memo: Gross margin with small cells</i>	<i>60.3%</i>	<i>55.7%</i>
<i>memo: Gross margin macro site only</i>	<i>65.0%</i>	<i>65.0%</i>

Source: New Street Research, Company Data

**Exhibit 41: Comparing Margins for Different Levels of Site Density**



Source: New Street Research, Company Data

**Comparing Small Cell Costs: Owned Infrastructure vs. Leased**

In this section we compare the ongoing opex, maintenance capex and the one-time deployment capex associated with deploying small cells on owned infrastructure to doing the same on leased infrastructure. We estimate that a small cell would cost \$300 monthly to operate on owned infrastructure, compared to \$800 on leased. We also estimate that a small cell would cost \$75,000 to deploy on owned infrastructure compared to \$55,000 on leased.

We would stress that these cost estimates are very rough. Based on our conversations with carriers, small cell companies, equipment vendors, and others in the ecosystem, it is clear that it is very difficult to generalize these costs; they vary widely based on a whole host of factors. This is an area that we will do more work on over time.

**Exhibit 42: Monthly Operating Expense and Maintenance Capex***USD per site, monthly*

	Owned	Leased
Site attachment	\$75	
+ Property taxes	\$64	
+ Utilities	\$85	
+ Repair & maintenance	\$75	
+ Backhaul in small cell system	\$0	
<b>= Small cell costs</b>	<b>\$300</b>	<b>\$700</b>
+ Backhaul to network switch	\$0	\$100
<b>= Operating costs</b>	<b>\$300</b>	<b>\$800</b>
+ Maintenance capex	\$208	\$208
<b>= Total cash operating costs</b>	<b>\$508</b>	<b>\$1,008</b>

*Source: New Street Research, Company Data***Exhibit 43: Capex to Deploy Small Cells***USD*

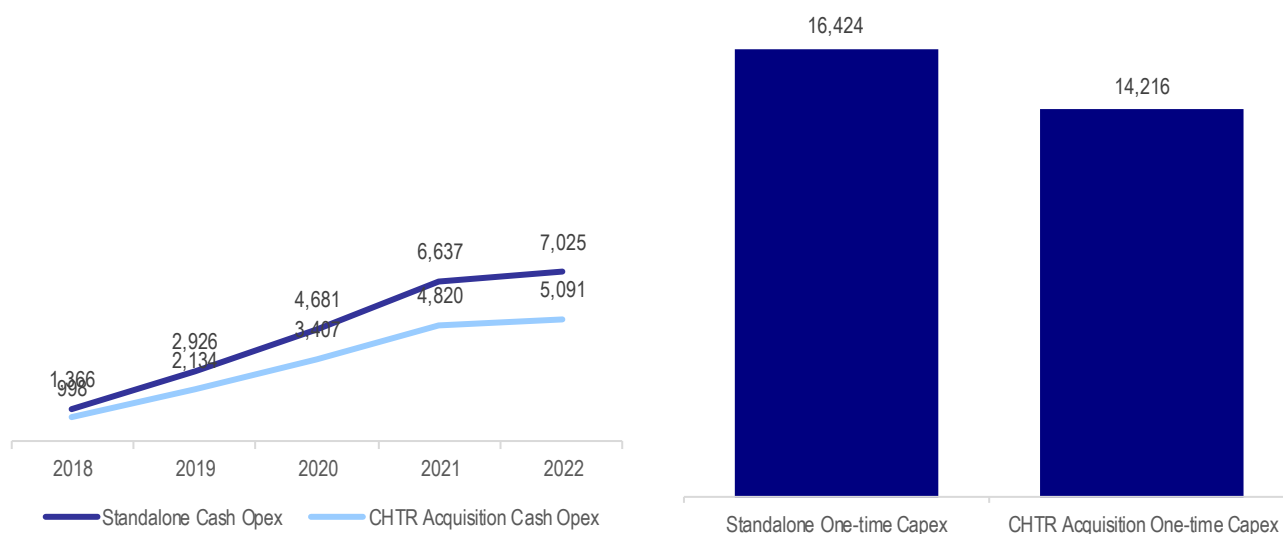
	Owned	Leased
Fiber	50,000	30,000
+ Equipment	25,000	25,000
<b>= Capex per site</b>	<b>75,000</b>	<b>55,000</b>

*Source: New Street Research, Company Data***Cost Savings from Charter Footprint**

Based on the cell sites and cost per site calculated above, it would cost Verizon \$5.1BN in annual cash operating costs to increase their capacity using Charter's Cable infrastructure compared to \$7.0BN without Charter, for savings of \$1.9BN annually. In addition, we estimate one-time capex savings of \$2.2BN. Taken together, we estimate an NPV of savings of \$12BN.

**Exhibit 44: Comparing Total Cost with & Without Cable Infrastructure**

USD, millions



Source: New Street Research, Company Data

**Cable Assets Not Perfect, But Better Than Alternatives**

Verizon and others have claimed that Cable assets aren't ideal for small cell deployments, particularly for the purposes of 5G, because the HFC infrastructure is capacity limited and because the capacity is shared. We think this misses the point for three reasons:

- 1) **Cable has more fiber:** Cable has much greater fiber density than their wireline competitors. To put this in perspective, the Cable industry has 320,000 nodes today, the vast majority of which are fed with fiber. By contrast, telecom carriers have 23,000 fiber fed central offices. Outside of fiber-to-the-node deployments and fiber-fed macro sites, we estimate that the Cable plant is ~4x more fiber-rich than the alternative today, and we expect fiber nodes in the Cable plant to multiply at least 10x as Cable moves towards N+0<sup>1</sup>, at which point Cable will then be ~40x denser than telco. Cable will be able to serve more small cell locations with the fiber they have today and it will be much cheaper for them to extend fiber to additional locations (Cable fiber will be closer to small cell sites; deployment costs are driven by distance from the closest fiber).
- 2) **Cable fiber is more accessible:** We believe about 60% of Cable plant is aerial, compared to about 40% for the wireline carriers. It is cheaper and easier to extend fiber from aerial plant to small cell locations. In addition, it is possible to hang small cells from the aerial fiber plant, saving on fiber costs and real estate costs. Even where cable plant is not aerial, it is a much better starting point for backhaul fiber deployment than a blank canvas.
- 3) **HFC is much better than copper in areas without fiber:** With DOCSIS 3.1 Cable will be able to deliver 1-2Gbps upstream over their HFC plant compared to 10-15Mbps for copper plant (Cable will be able to deliver up to 10Gbps downstream; however, it is the upstream that matters for small cell backhaul). With full duplex, Cable HFC will be able to deliver 10Gbps in both directions. In addition, Altice USA has announced plans to deploy fiber-to-the-home across all of their homes instead of upgrading the HFC plant with DOCSIS 3.1.

<sup>1</sup> N+0 refers to "node plus zero", a Cable architecture where there are no longer amplifiers required between a node and a subscriber household.

**Exhibit 45: Comparing Fiber Density Assuming Cable Goes to N+0**

%

	DSL	FTTN	Total FTTN/DSL
HHs	52,890	35,670	123,000
/ Bband HH per Fiber Node	-	300	1
<b>= Fiber Nodes For Home Bband</b>	-	<b>118,900</b>	<b>118,900</b>
+ Fiber Macro Sites	19,658	13,258	32,915
+ Telco COs	9,890	6,670	16,560
<b>= Total Telco Fiber Nodes</b>	<b>29,548</b>	<b>138,828</b>	<b>168,375</b>
/ Cable Fiber Nodes	1,290,000	870,000	2,160,000
<b>= Telco Fiber As % Of Cable</b>	<b>2%</b>	<b>16%</b>	<b>8%</b>

Source: New Street Research, Company Data

**Strategic Benefit of Eliminating a Competitor: \$2.5BN Annually**

Comcast has announced that they will enter the wireless market by mid-2017, and we believe Charter and others will follow. Comcast will start by using an MVNO agreement with Verizon - the legacy of a 2011 spectrum deal (Charter has access to the same MVNO). The MVNO is not a long-term strategy though; the companies will either move to a network sharing deal with one of the carriers that would give them greater control over the product and the customer experience than the current MVNO does, or they will acquire a carrier (most likely T-Mobile). Whether they network share or acquire a carrier, we assume the Cable companies will enter wireless with a common strategy, leveraging a common platform. They will not be eager to compete against each other in wireless.

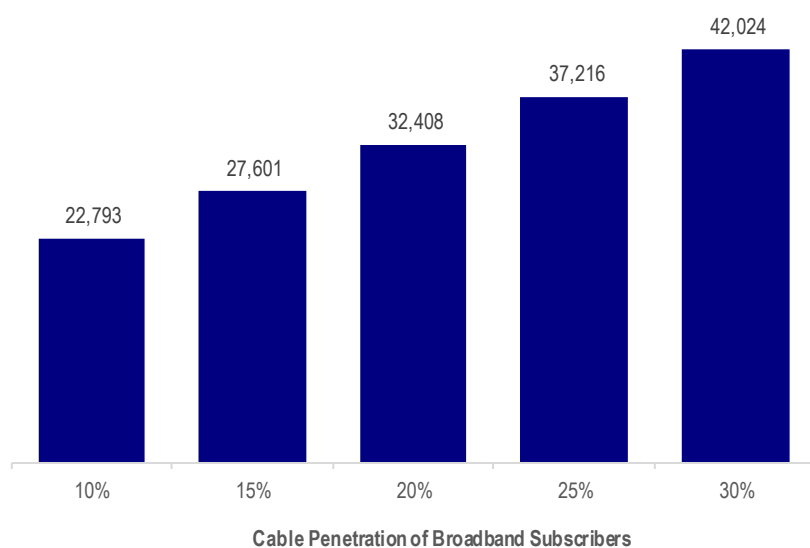
**Verizon Has Most to Lose**

Verizon, with 38% of industry revenues, has the most to lose from a well-funded new entrant. Virtually the entire ~\$300BN in enterprise value rests on wireless; the business has considerable operating leverage and the Company has considerable financial leverage; if Cable captures 20% penetration of their customers, Verizon would stand to lose 18% of their equity value. This assumes they lose share in proportion to their market share; they may be more exposed given that the Cable companies will be targeting high-value subs that tend to reside at Verizon or AT&T.

If Verizon acquires Charter they eliminate the threat of a new competitor in 36% of the country. They also disrupt the Cable strategy in Wireless more broadly. Comcast would no longer have access to Charter's infrastructure on the same terms, if they acquired a carrier or pursued a network sharing arrangement. In other words, buying Charter eliminates a competitor in 36% of the country and weakens the threat in the rest of the country.

**Exhibit 46: Equity Value at Stake at Different Levels of Cable Penetration**

USD, millions

*Source: New Street Research, Company Data***Acquiring Charter Could Save Verizon \$2.5BN Annually; Worth \$12.3BN**

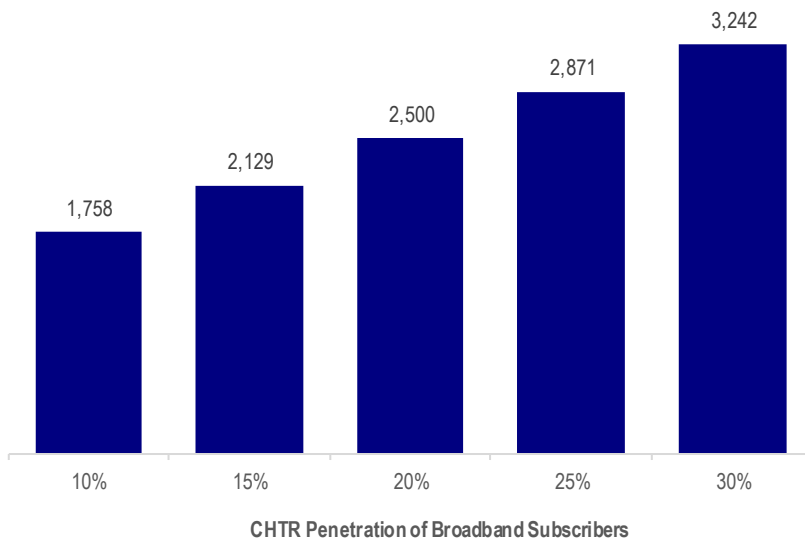
We estimate that Cable companies would capture at least 14% of the market in their footprint five years out (20% penetration of their customers). Ignoring the impact that a new entrant might have on industry pricing, and assuming that Verizon would have lost share to Charter in proportion to their market share, Verizon would stand to lose \$2.5BN in annual EBITDA to Charter alone. We would value this at \$12.3BN annually. It is more difficult to size the benefit they would derive from preventing the Cable companies from being able to leverage Cable infrastructure nationwide as they enter wireless, so we ignore this benefit for now.

In the analysis below, we have not assumed an offset from wholesale revenues that Verizon would derive from the MVNO because we don't believe the MVNO is a long term strategy - by the time they get to 14% of the market Cable will have moved off the MVNO. To the extent that this is overly punitive, we think it is offset by the additional risks that Verizon loses more than their proportionate share to Cable and that industry pricing and the multiple wireless assets trade at get pressured by Cable entry.



### Exhibit 47: EBITDA at Stake in Charter Footprint

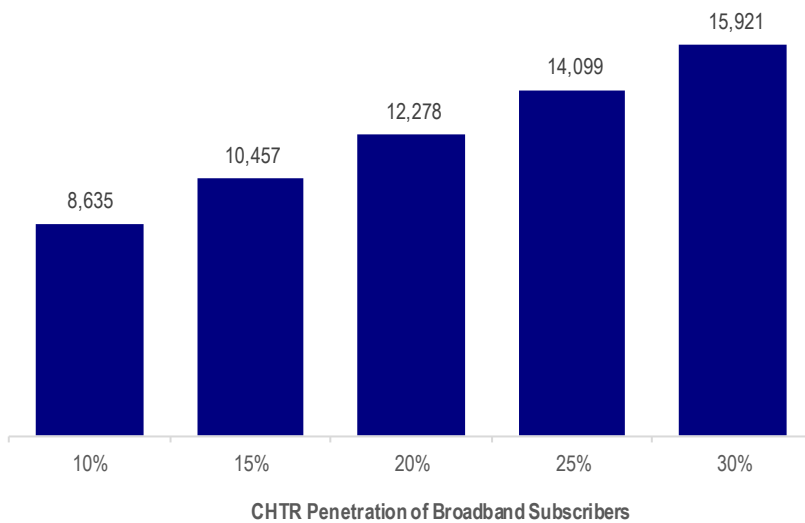
USD, millions



Source: New Street Research, Company Data

### Exhibit 48: Valuing Elimination of a Competitor

USD, millions



Source: New Street Research, Company Data

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**Rating history**

Ratings	% Buy	%Neutral	% Sell
VZ	0.0%	100.0%	0.0%
CHTR	100.0%	0.0%	0.0%
% all stocks undercover	59.1%	40.9%	0.0%

Full 12-month historical recommendation changes are available on request

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