

A vibrant, futuristic digital landscape. In the upper right, a satellite orbits against a starry night sky. The background is filled with glowing blue and green circuit patterns. On the left, a tall communication tower stands. In the lower left, a laptop displays a globe. In the center, a red roller coaster track winds through a landscape of clouds. Two small figures stand on the ground, looking up. On the right, a white rocket with a blue nose cone is shown in profile. The overall scene conveys a sense of technological advancement and future exploration.

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*Your Bridge to the Future*

# TFI Broadband/Video/Wireless Forecast Update

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**TFI 2019**

January 24-25, 2019

Marriott Courtyard Downtown  
Austin, Texas

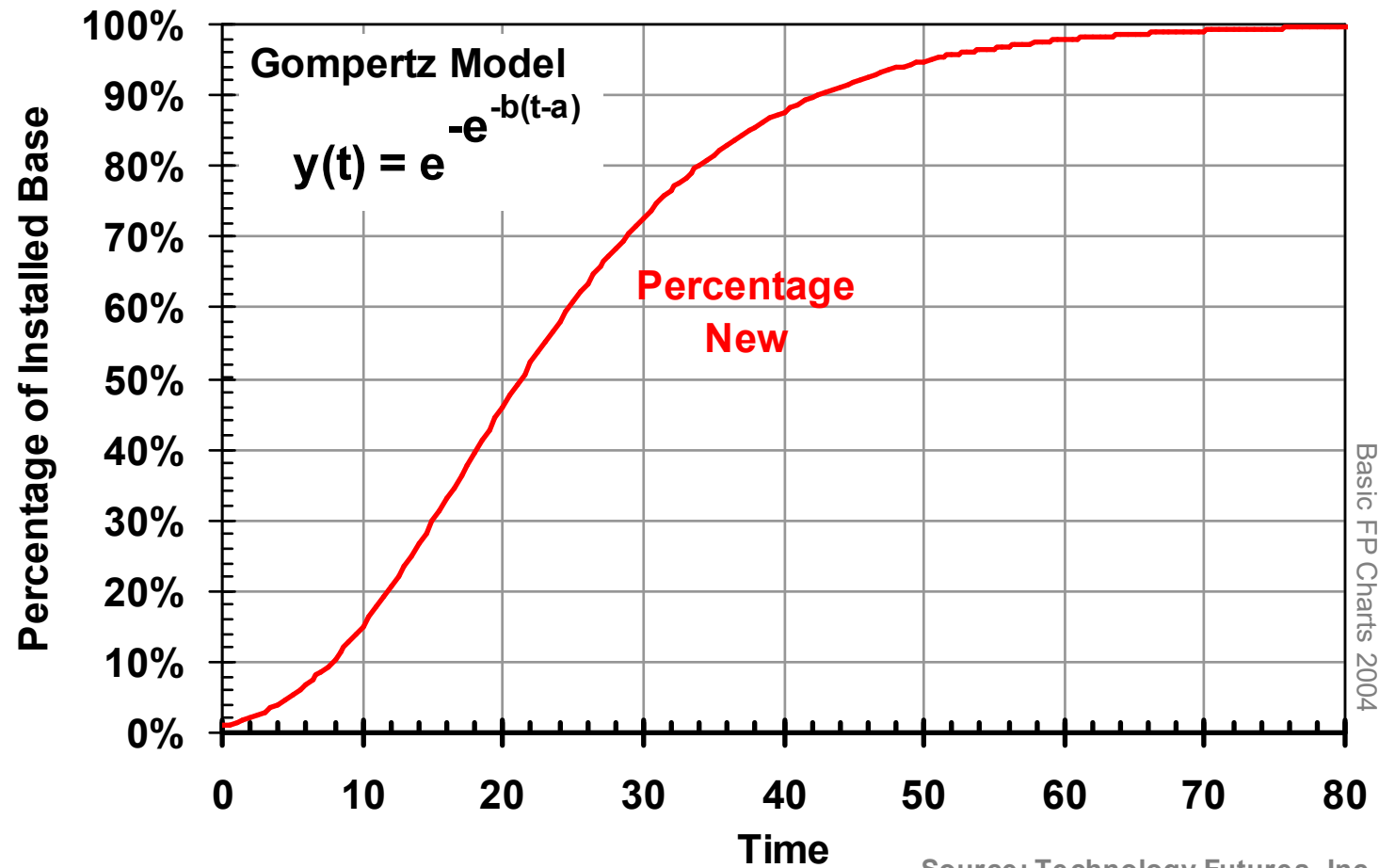
84 Waller St• Austin, Texas 78702  
(512) 258-8898 • [www.tfi.com](http://www.tfi.com)

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# Quick Technology Forecasting Primer on Substitution Analysis

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# The Gompertz Model



Source: Technology Futures, Inc.

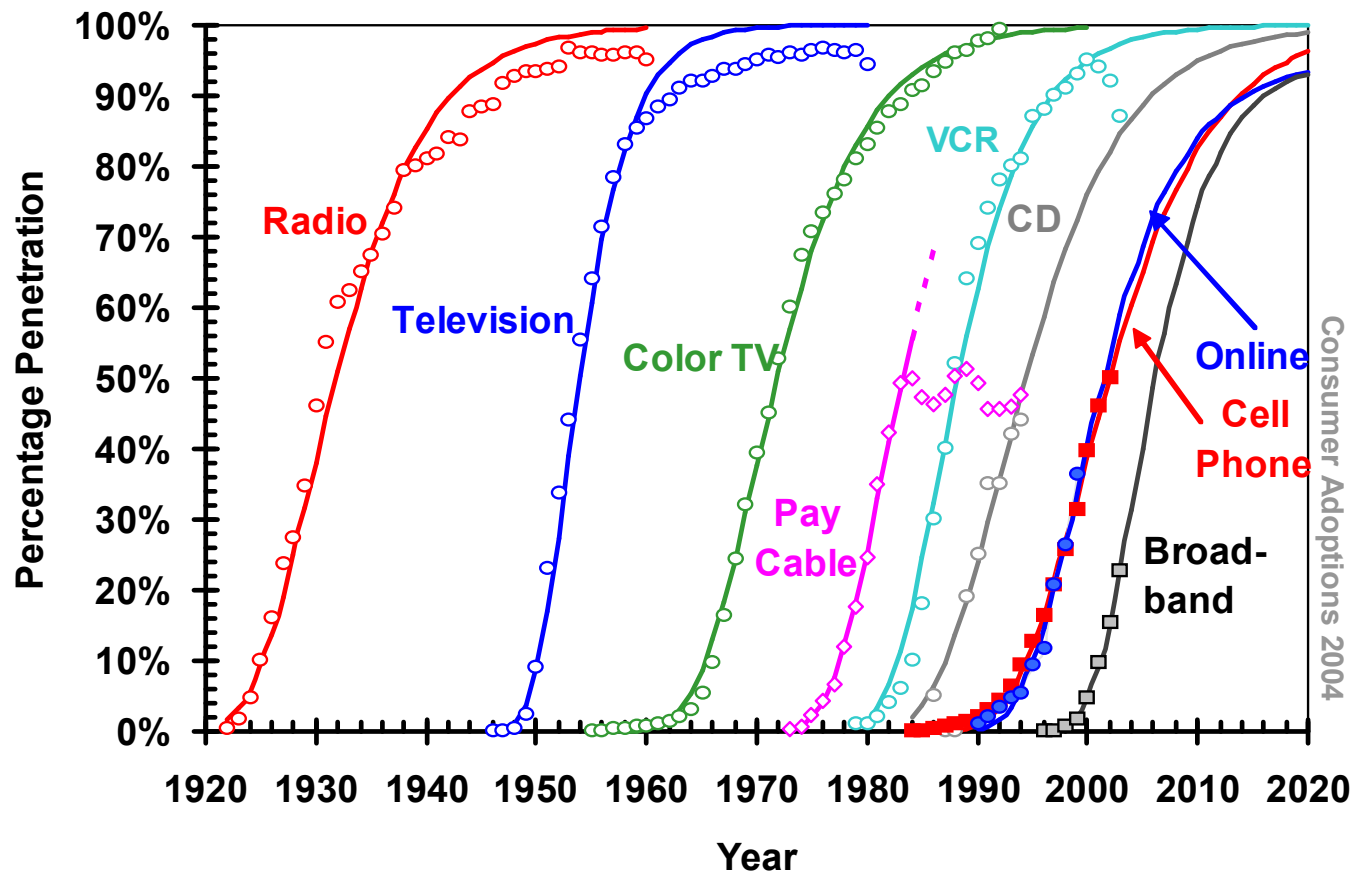
$y(t)$  = Fraction of market taken over by new technology at time “t”

“a” is 37% time; “b” determines rate of substitution

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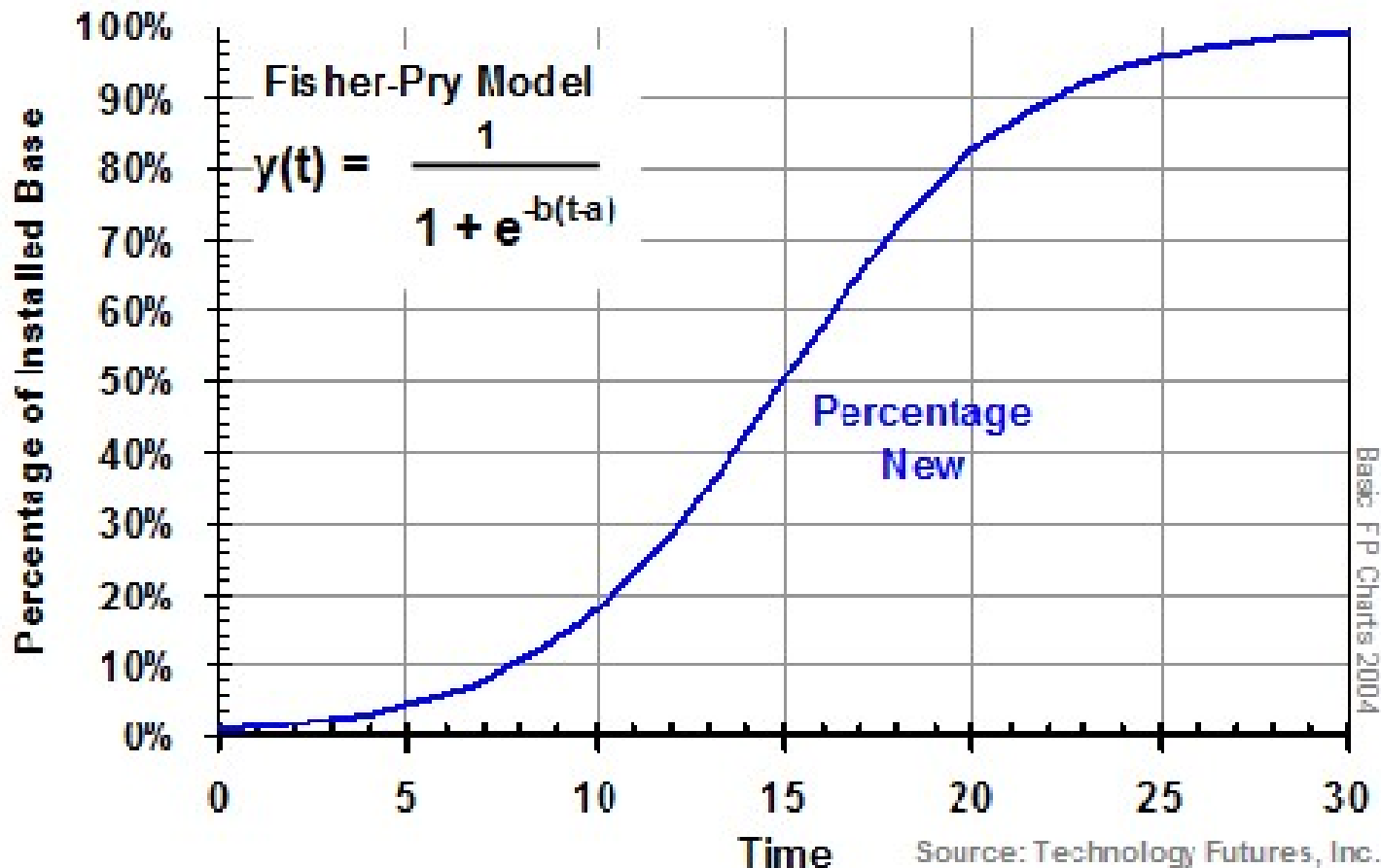
# Examples of Consumer Adoptions (Gompertz Model)



Source: Technology Futures, Inc.

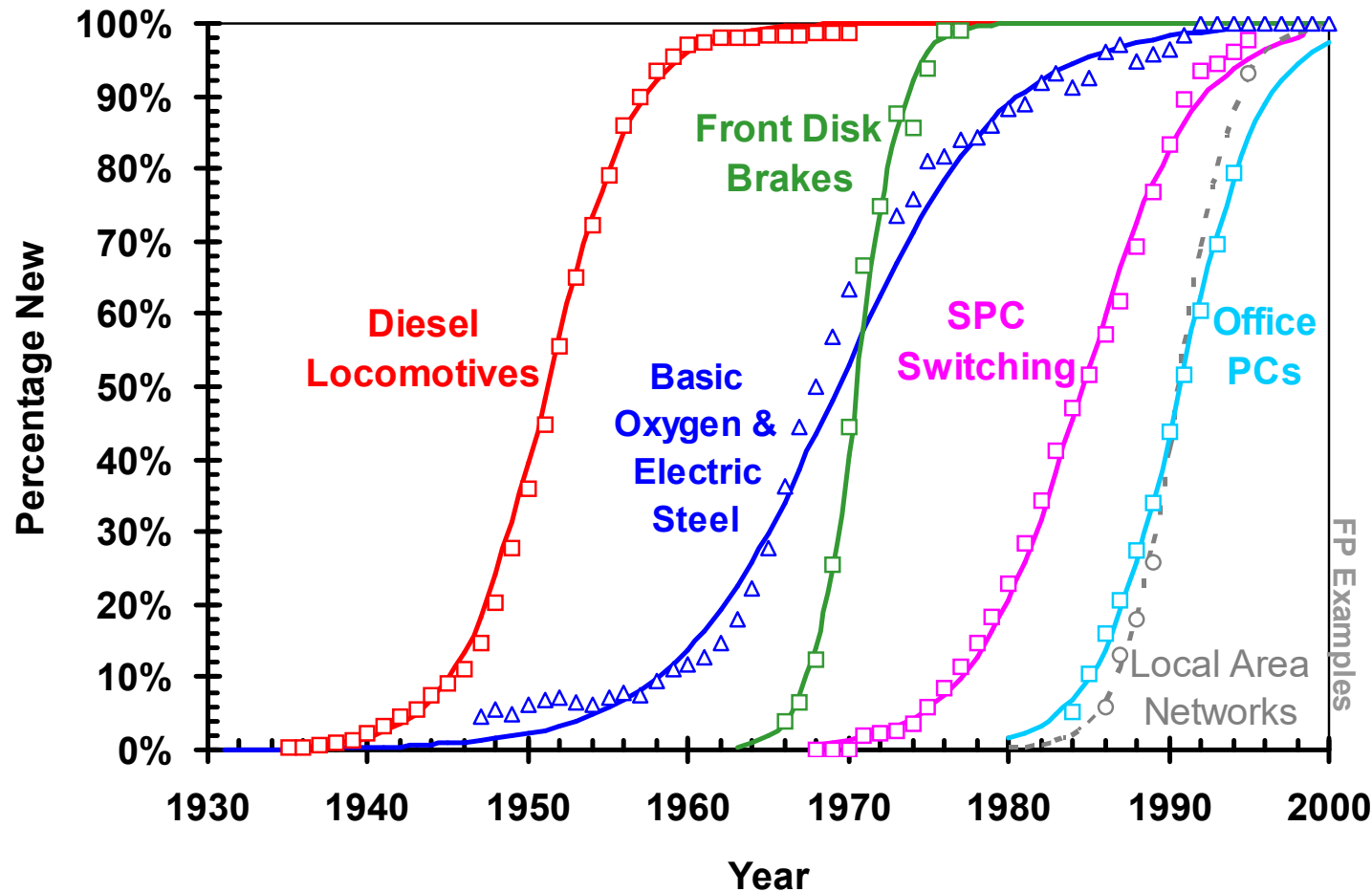
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# The Fisher-Pry Model (aka The Logistic Curve)



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# Fisher-Pry Substitution Examples

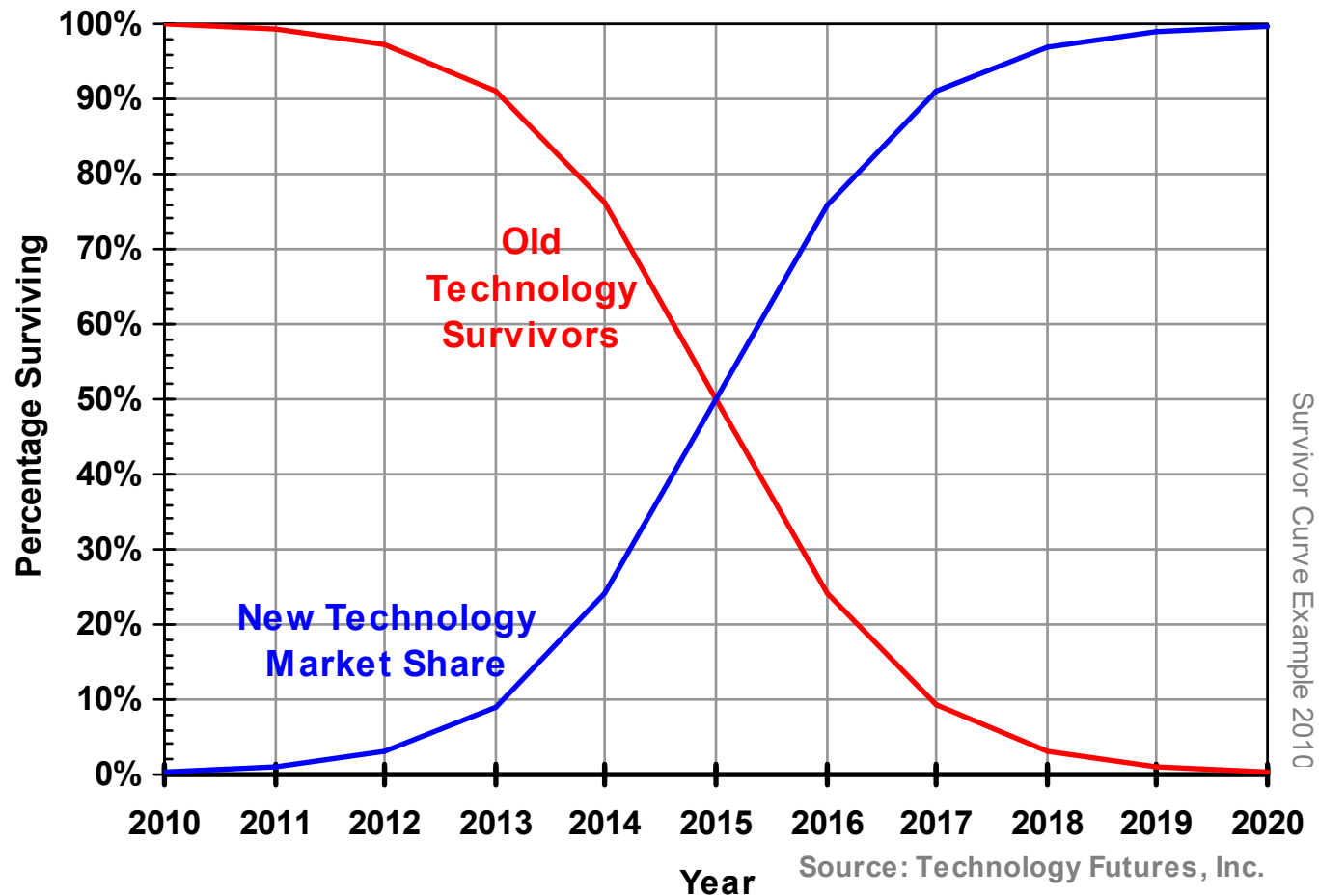


Source: Technology Futures, Inc.

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# Fisher-Pry Substitution Model



$y(t)$  = Fraction of market taken over by new technology at time “t”

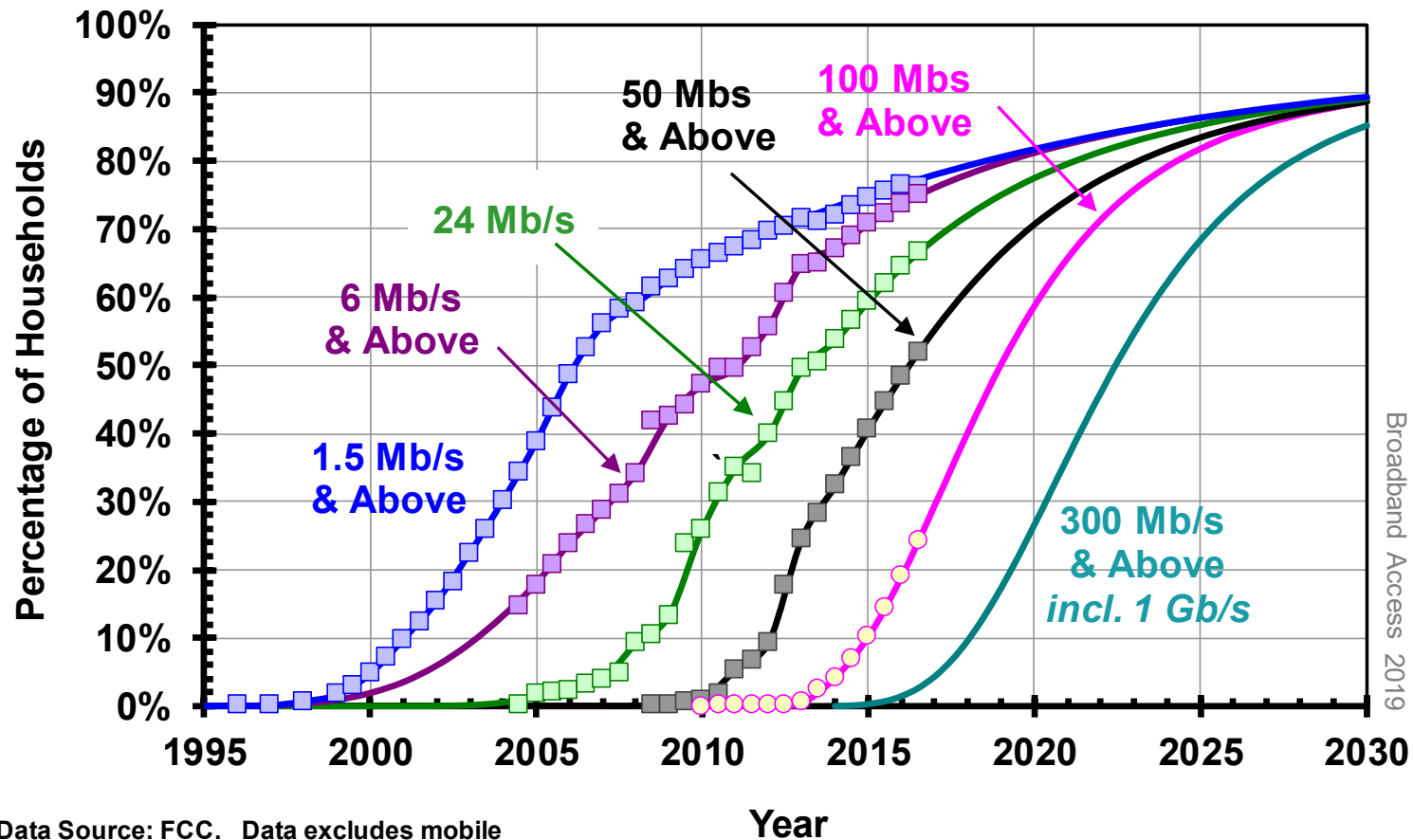
“a” is 50% time; “b” determines rate of substitution

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# Industry Broadband Forecast

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# U.S. Broadband Substitutions



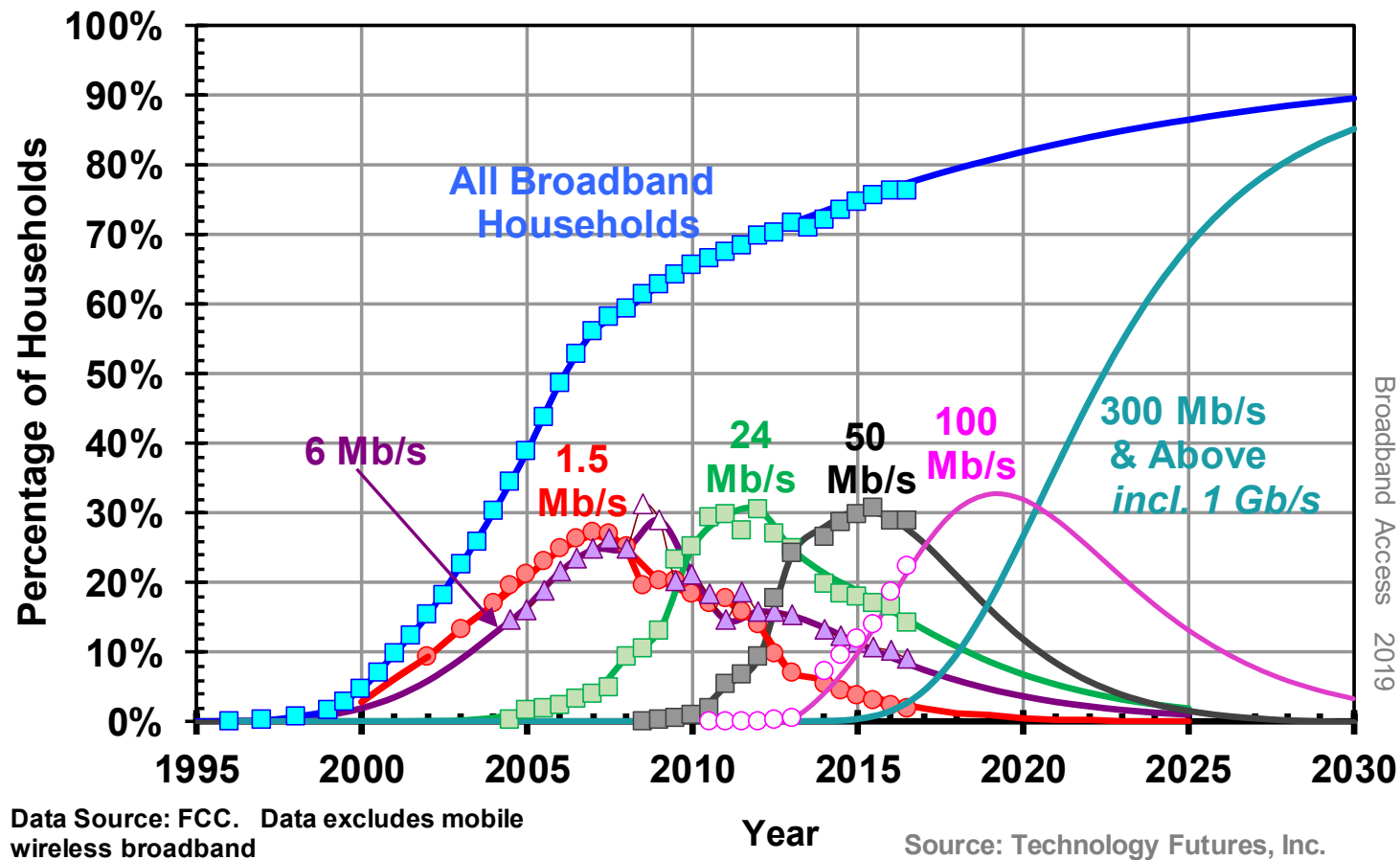
Data Source: FCC. Data excludes mobile wireless broadband

Source: Technology Futures, Inc.

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# U.S. Broadband Lifecycles



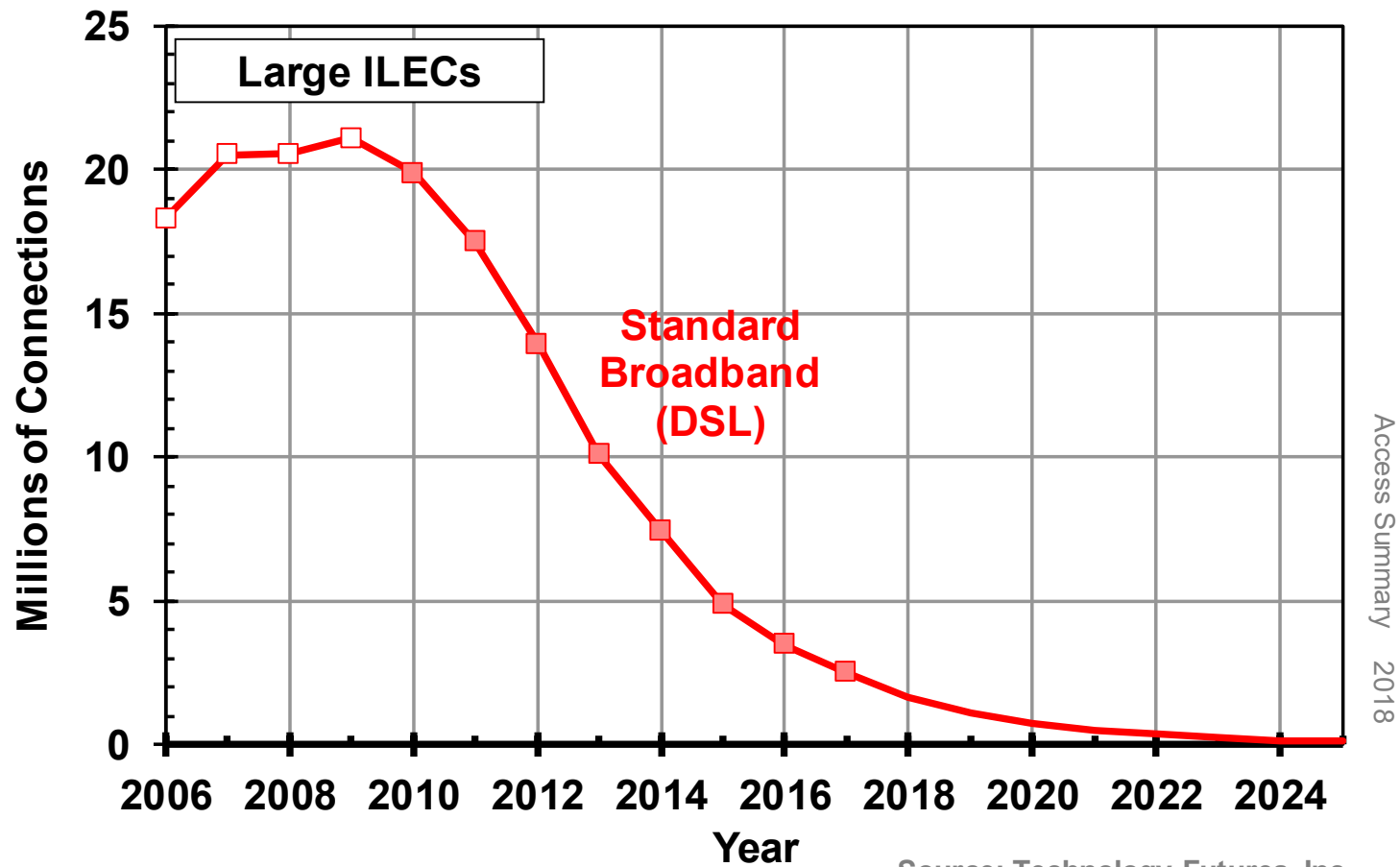
Lifecycle (t) =  
Substitution (t) – Next Substitution (t)

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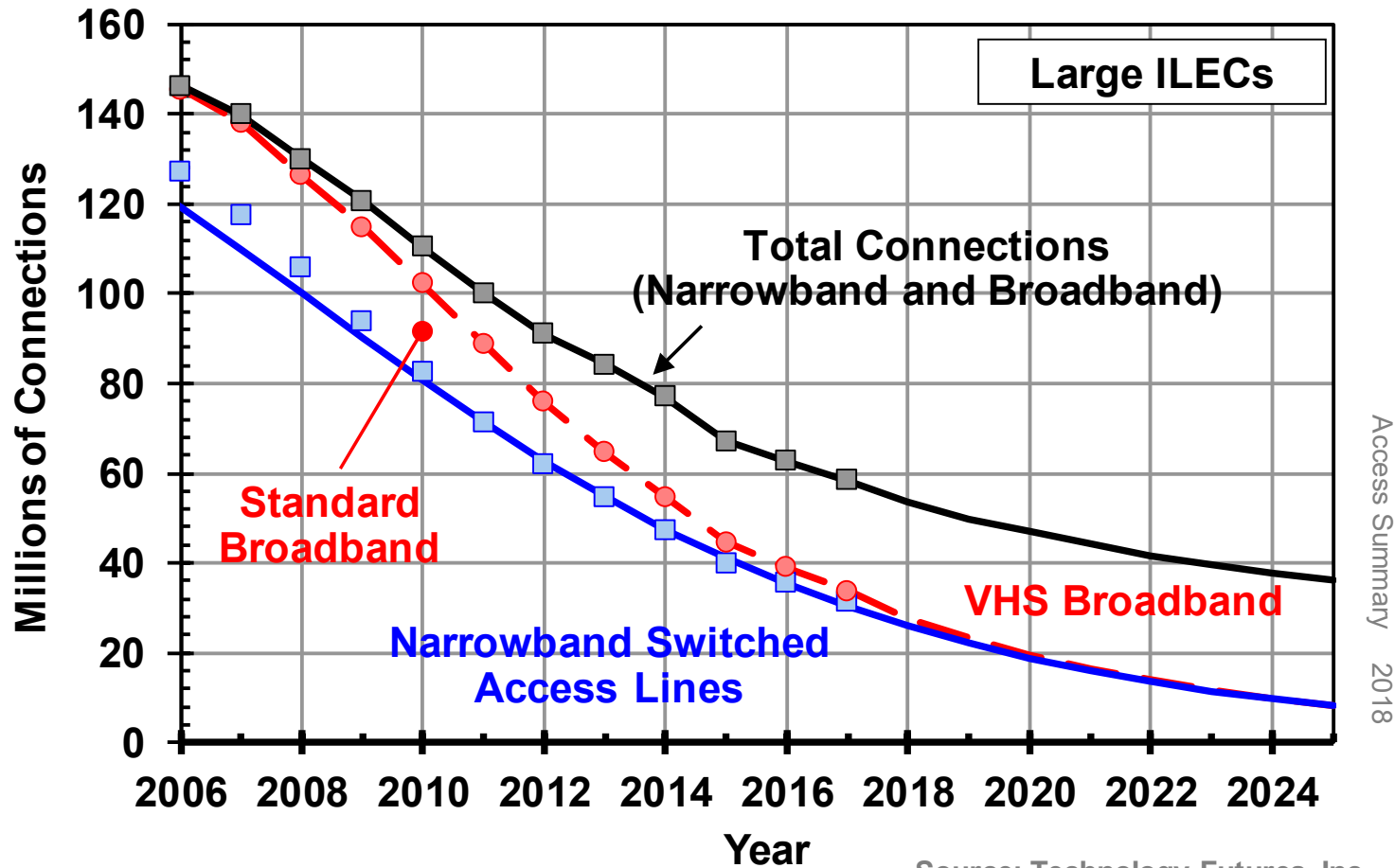
# Impacts on Telcos

# DSL Subscribers– Three Largest Telcos



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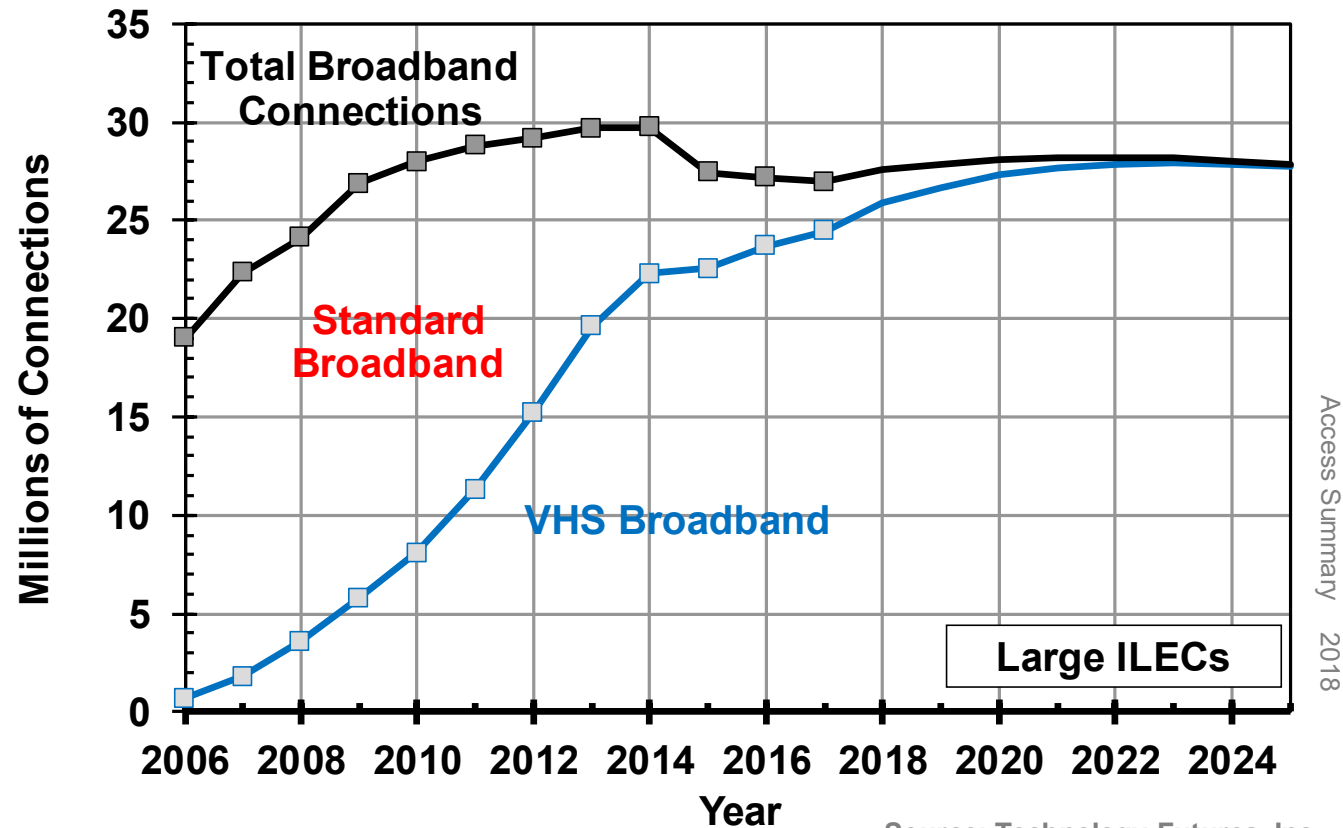
# Total Connections – Three Largest Telcos



Source: Technology Futures, Inc.

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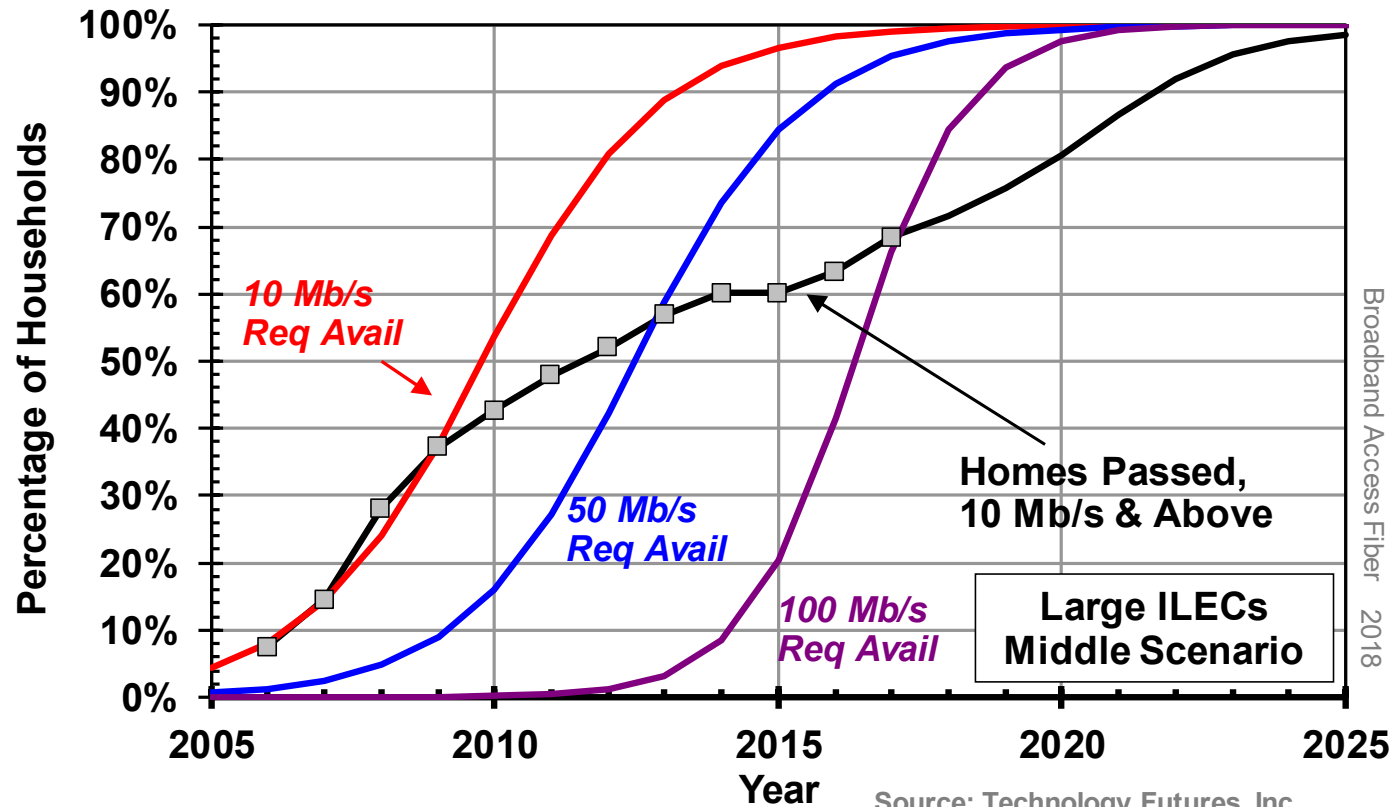
# Broadband Subscribers– Three Largest Telcos



VHS = More than 10 Mb/s

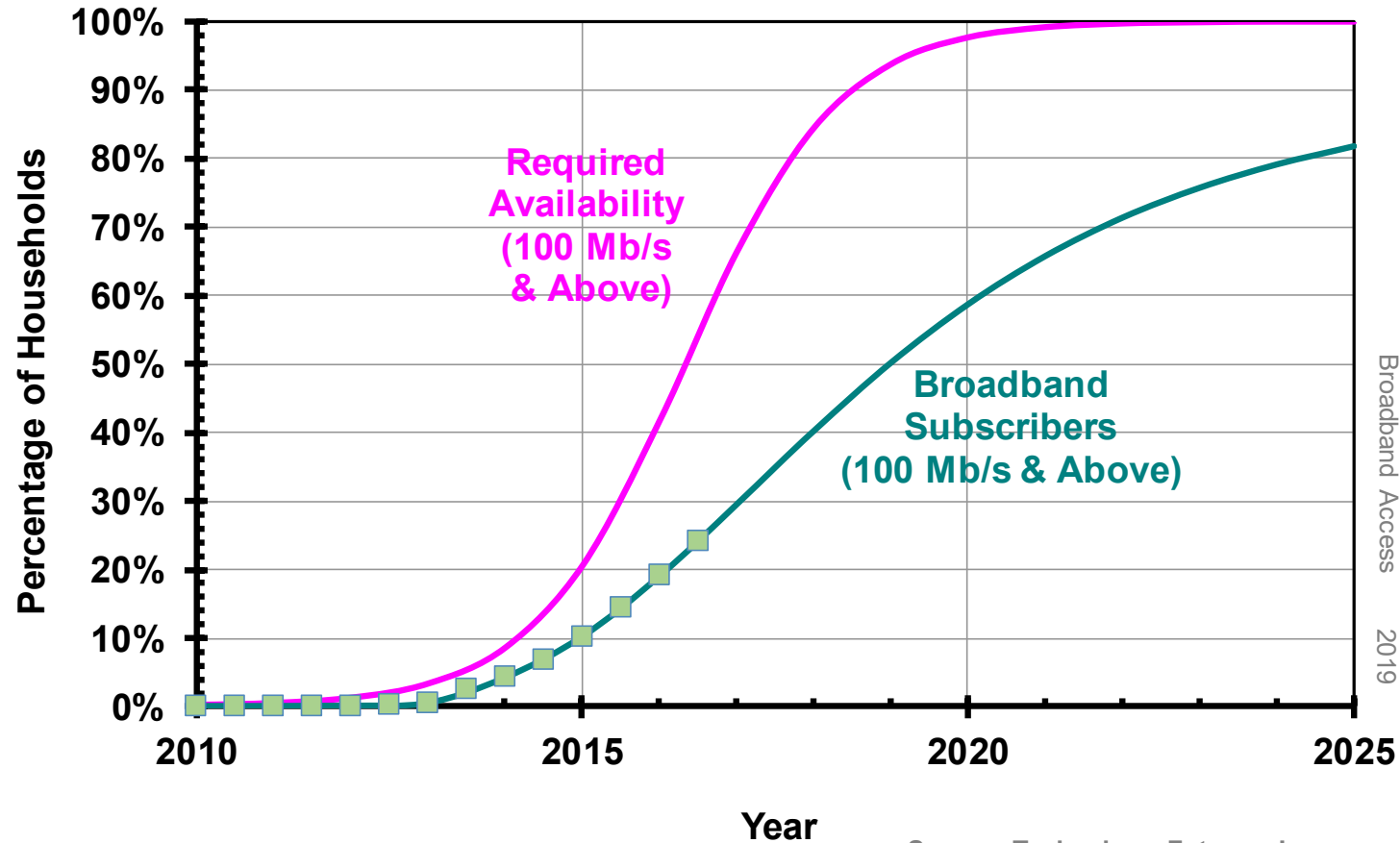
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# Telco VHS Broadband (10 Mb/s & Above) Deployment



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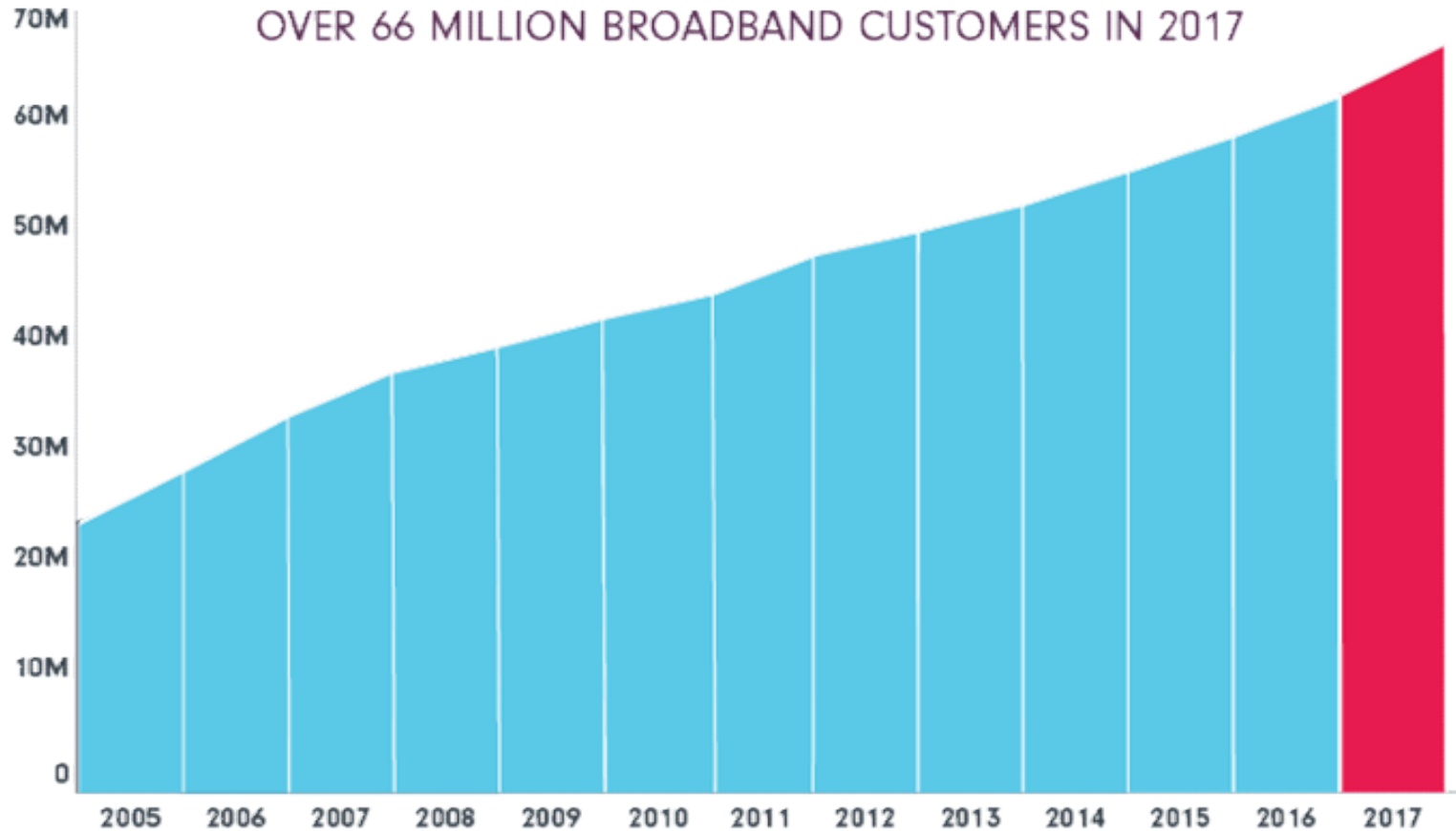
# Availability vs Subscribers, 100 Mb/s & Above



Source: Technology Futures, Inc.

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# Cable Broadband Customers



Source: SNL Kagan

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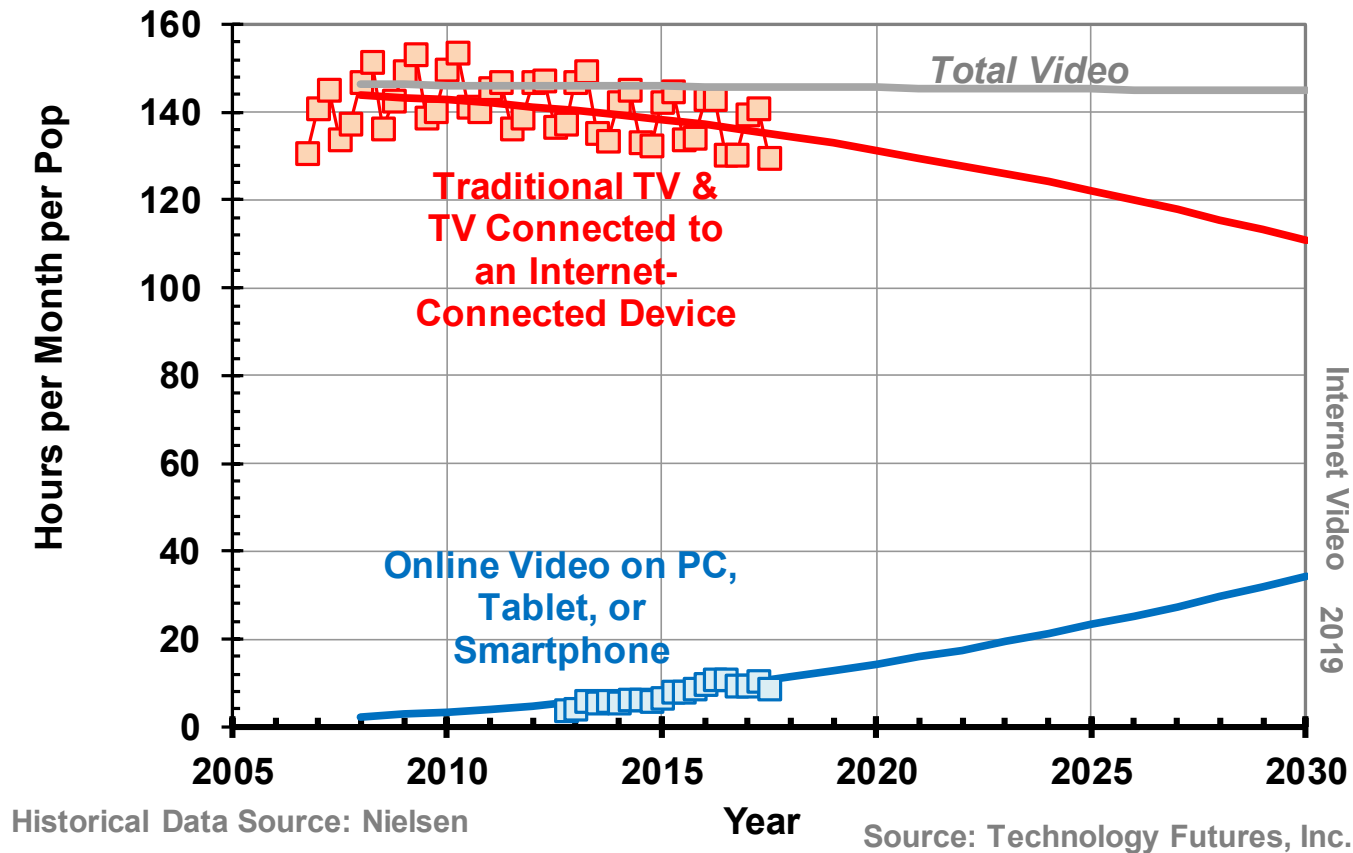
# Broadband Summary

- Broadband speeds continue to increase, 100 Mb/s standard. 300+ optimal.
- Telcos and Cable companies must invest, especially in fiber, to keep up
- Competition from 5G Wireless Imminent
- Telco copper is doomed. Has been for years.

# Online Video Forecasts

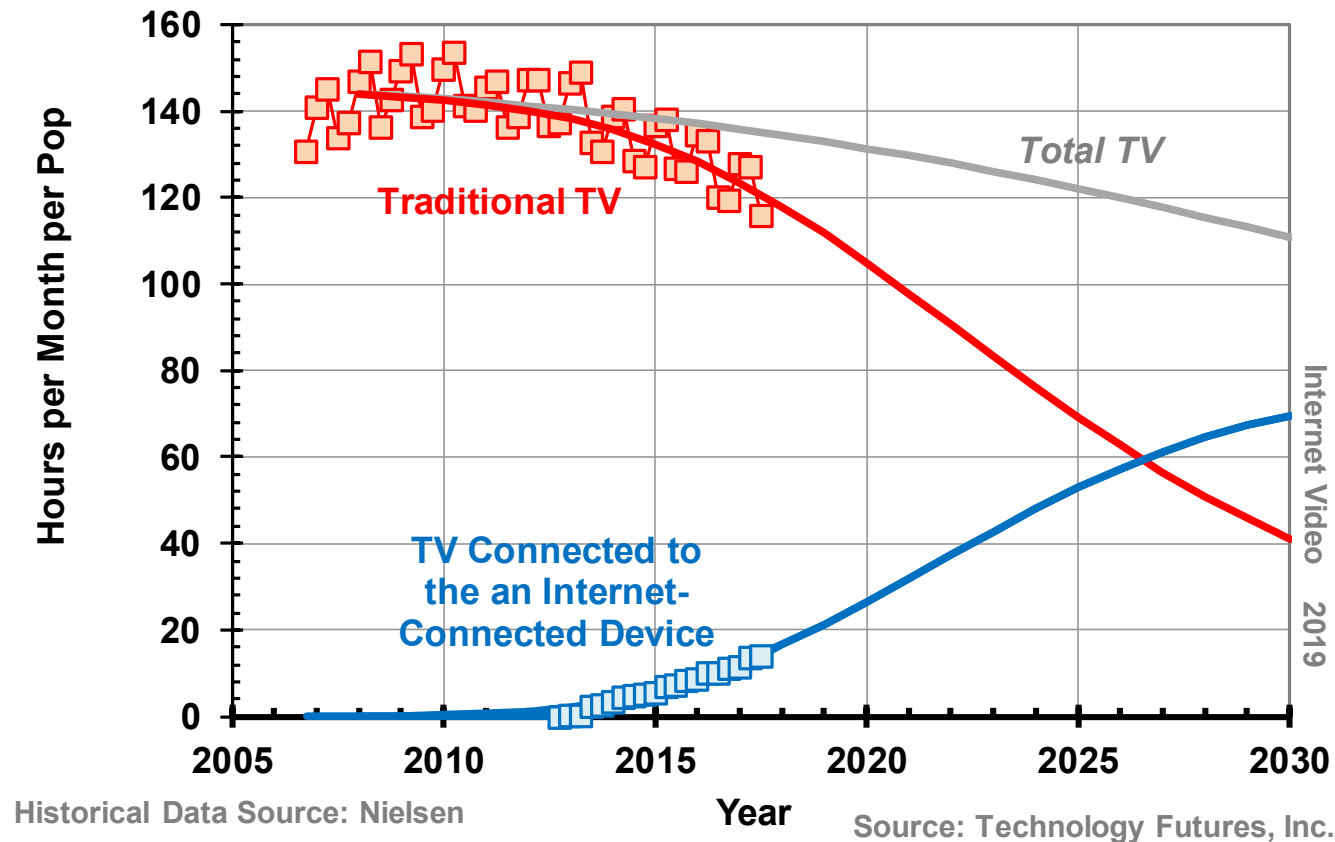
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# Online Video Devices vs Television Viewing, Hours per Month per Pop



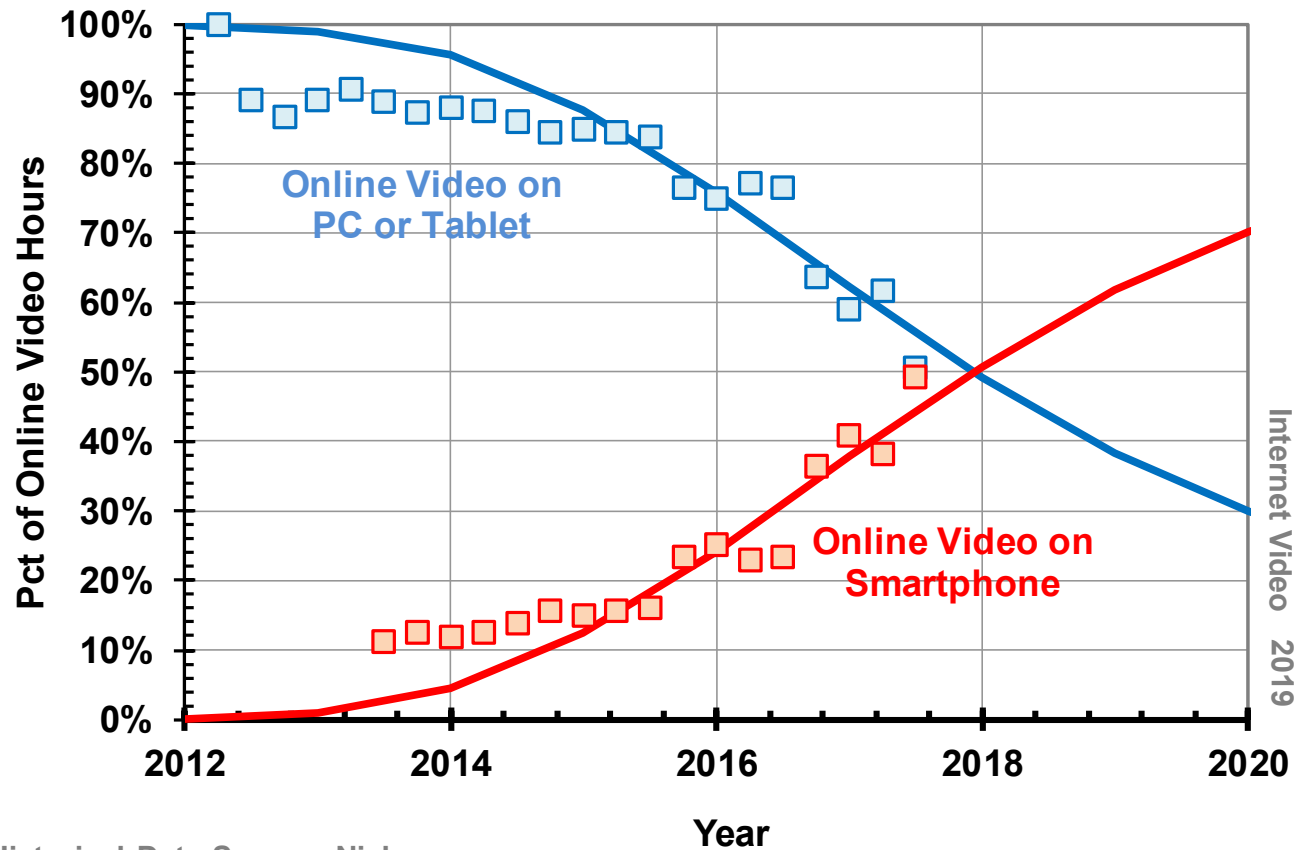
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# Traditional TV vs TV Connected to an Internet-Connected Device – Hrs/Mo/Pop



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# Smartphones vs PCs & Tablets, Percent of Online Video Hours

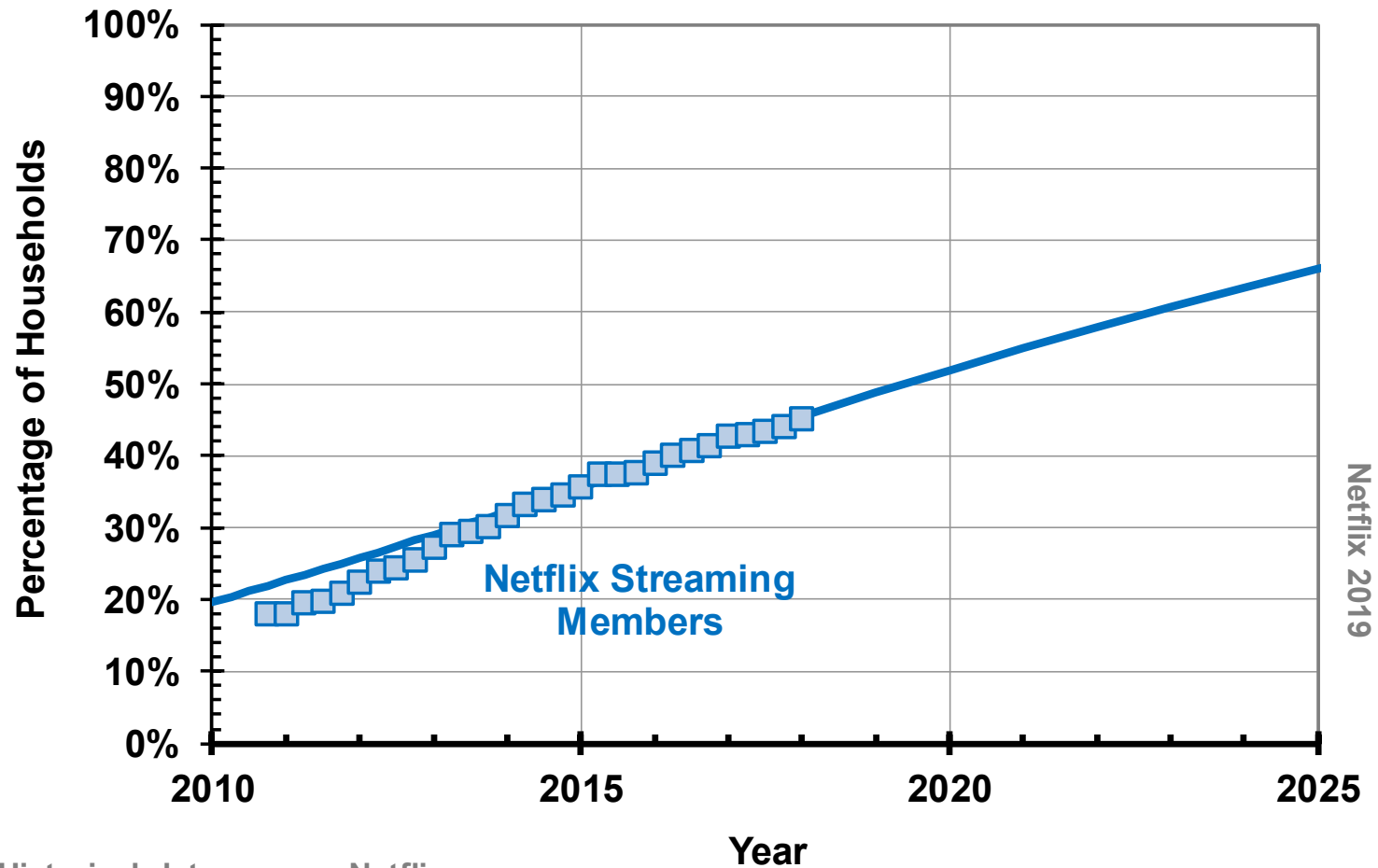


Historical Data Source: Nielsen

Source: Technology Futures, Inc.

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# Netflix Streaming Members, Domestic

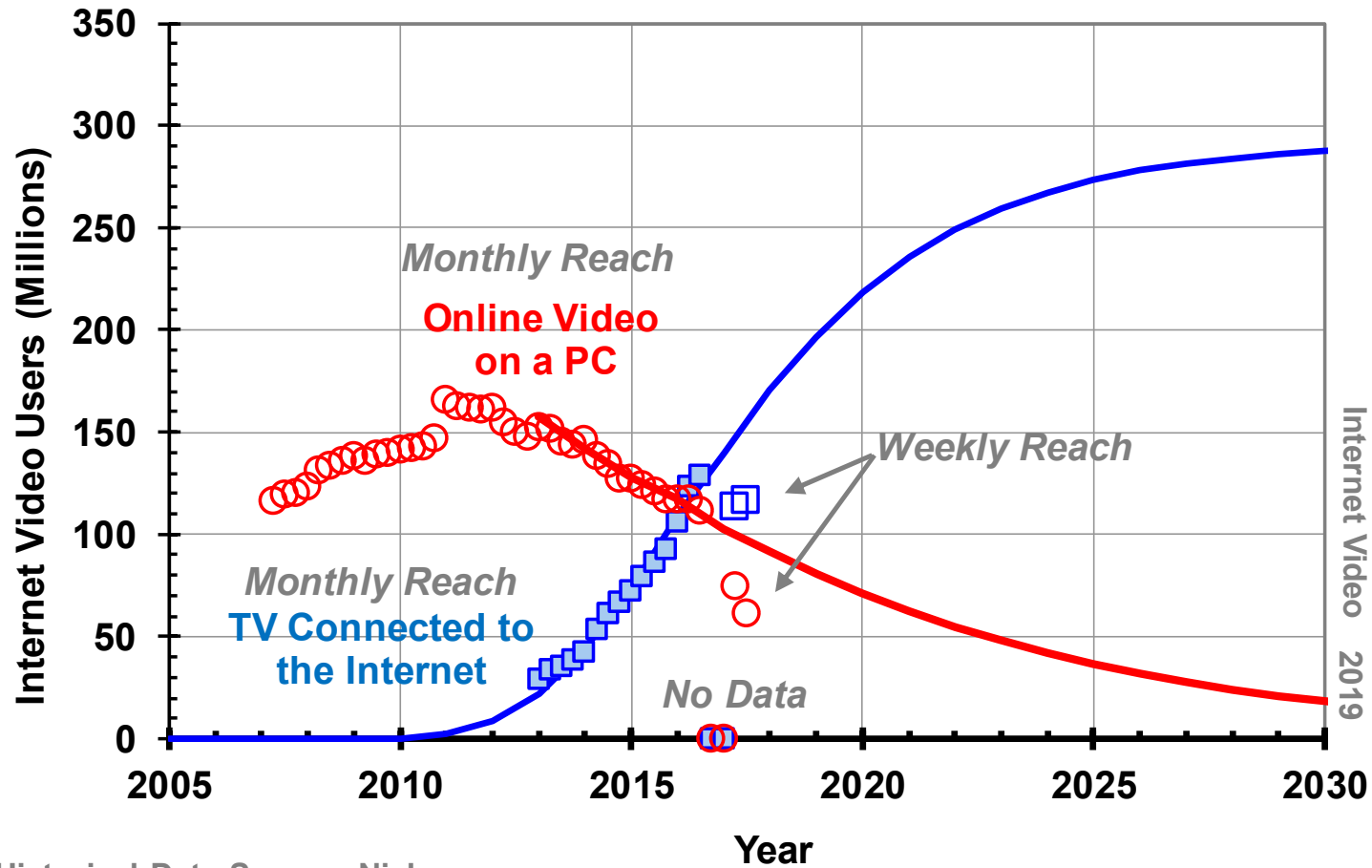


Historical data source: Netflix

Source: Technology Futures, Inc.

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# Online Video Users



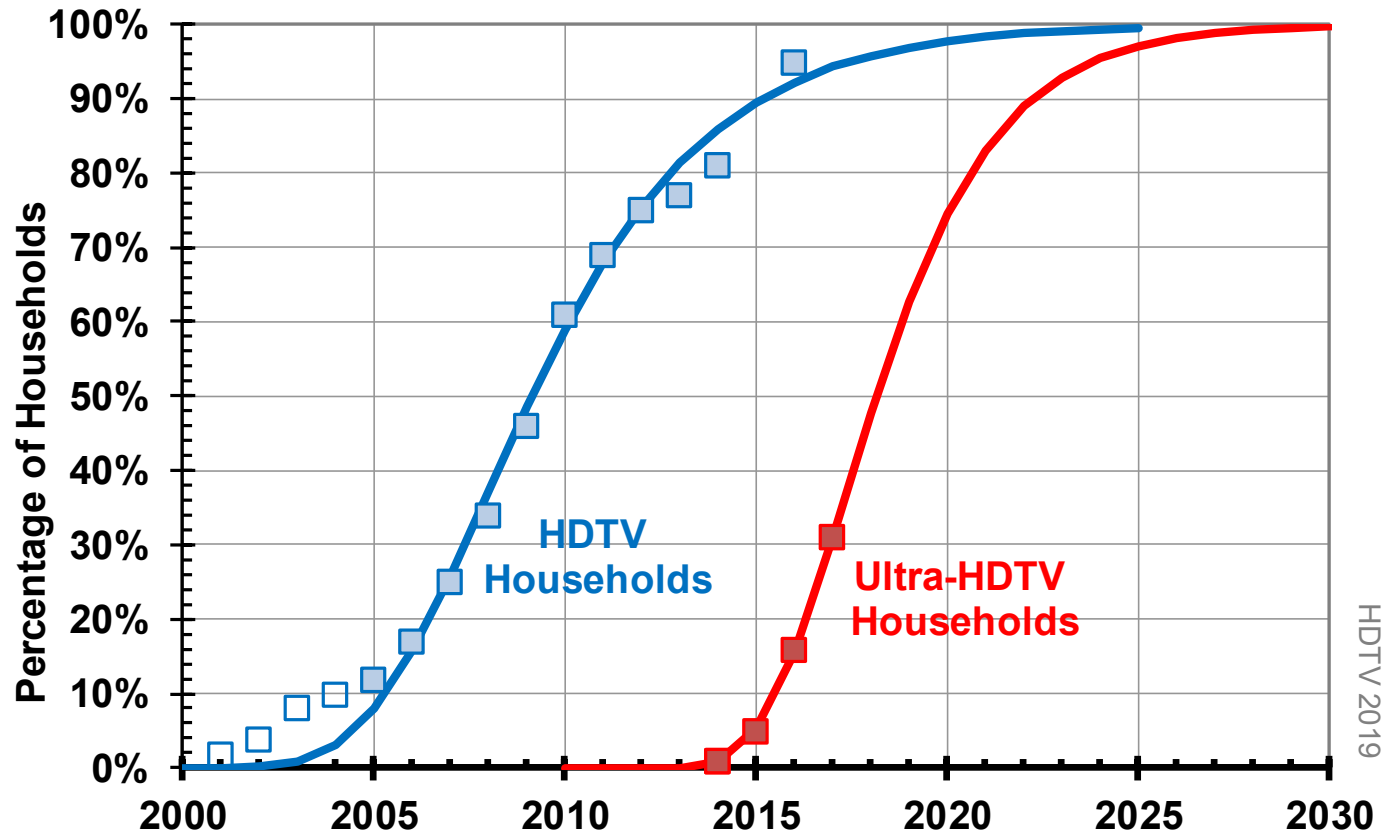
Historical Data Source: Nielsen

Source: Technology Futures, Inc.

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# Ultra-HD Households (aka 4K)



Historical data sources: HDTV - 2001-2004  
Misc, 2005- Leichtman Research;  
UHDTV 2014-2015 Strategy Analytics  
UHDTV 2016- Consumer Technology Assc.

Year

Source: Technology Futures, Inc.

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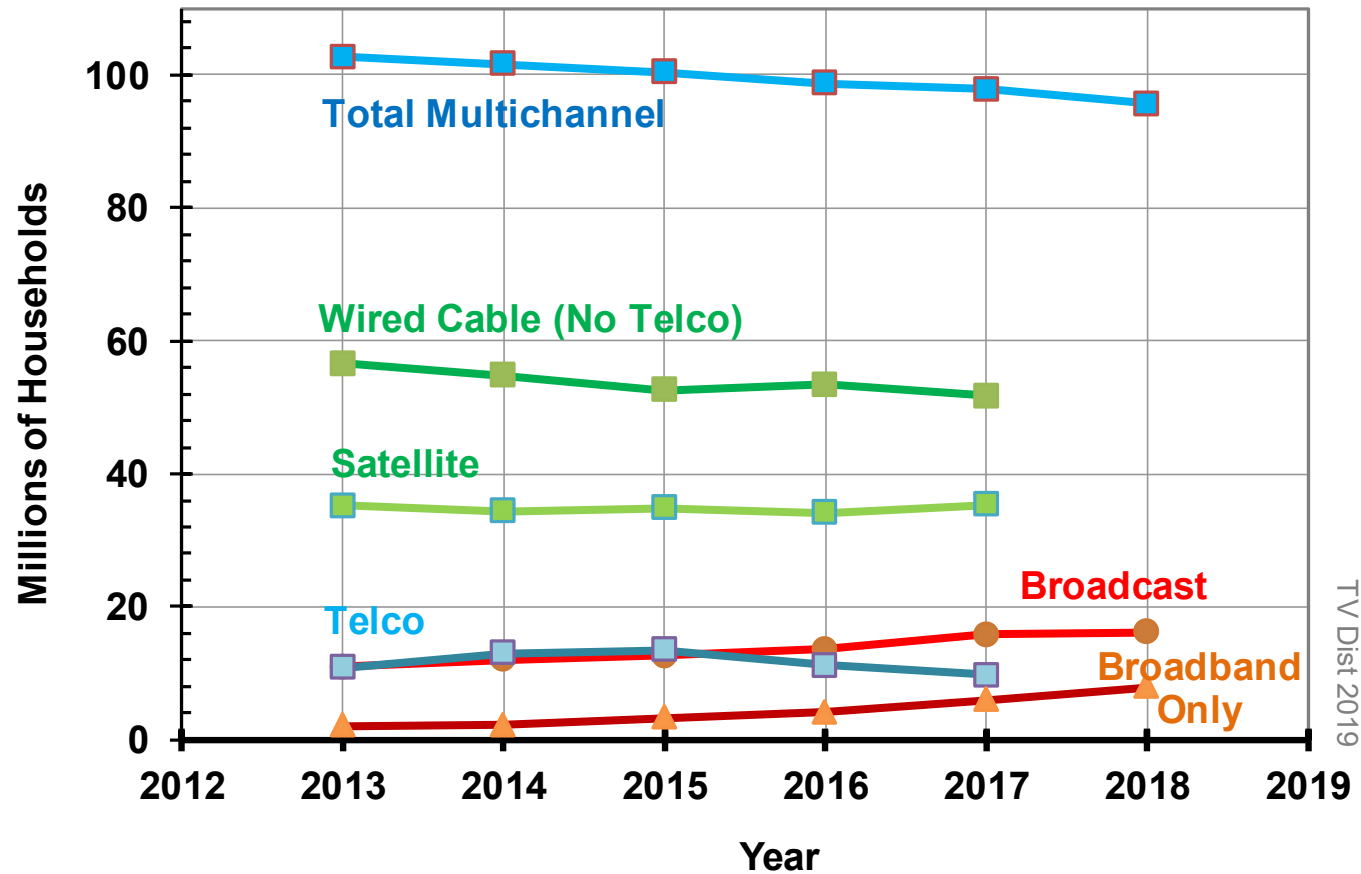
**Netflix SD Stream = ~ 2 Mb/s**

**Netflix HD Stream = ~ 4 Mb/s**

**Netflix 4K Stream = ~ 18 Mb/s**

# Impacts on Cable Companies

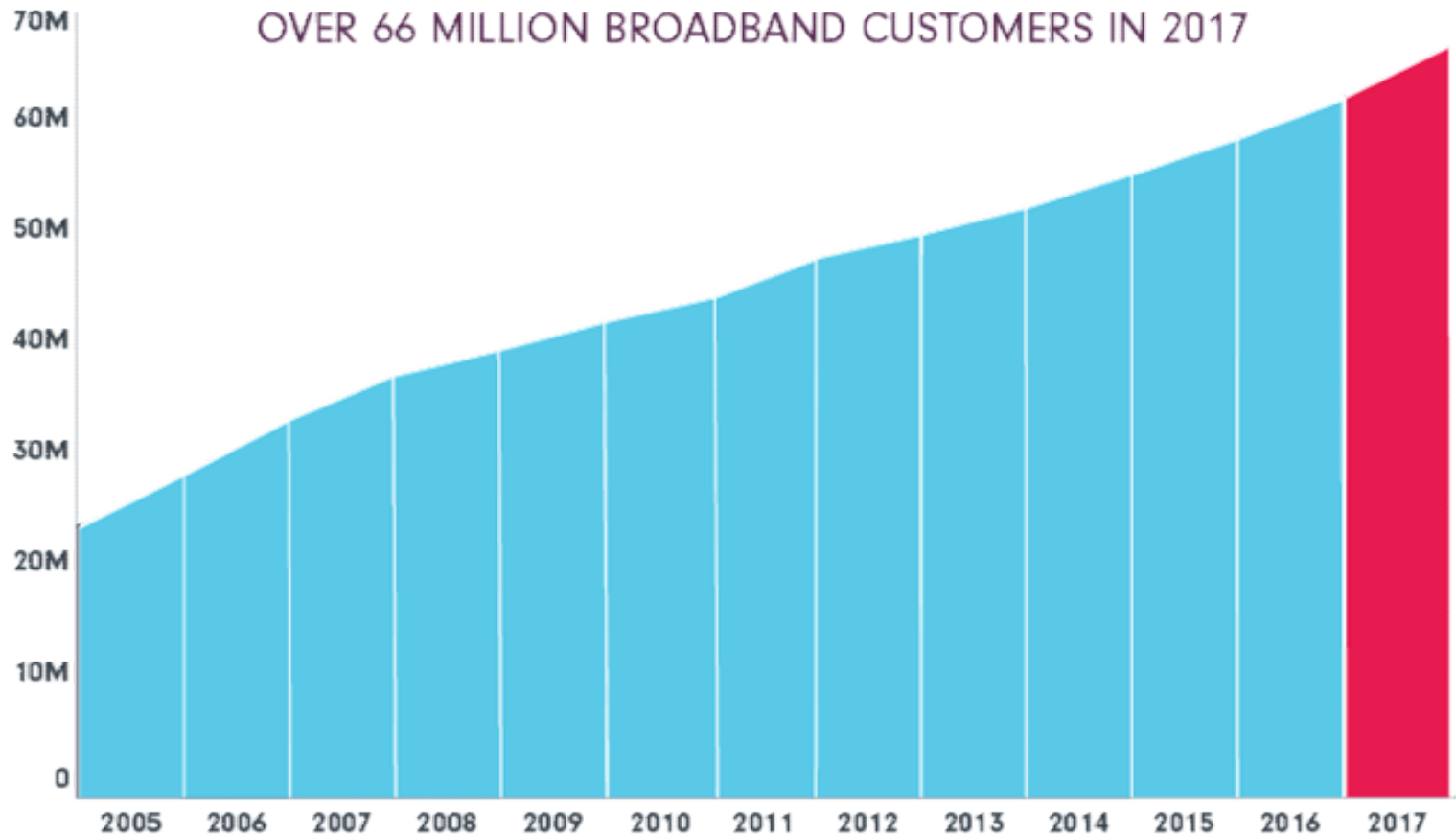
# Television Distribution Sources



Historical Data Source: Nielsen

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# Cable Broadband Customers



Source: SNL Kagan

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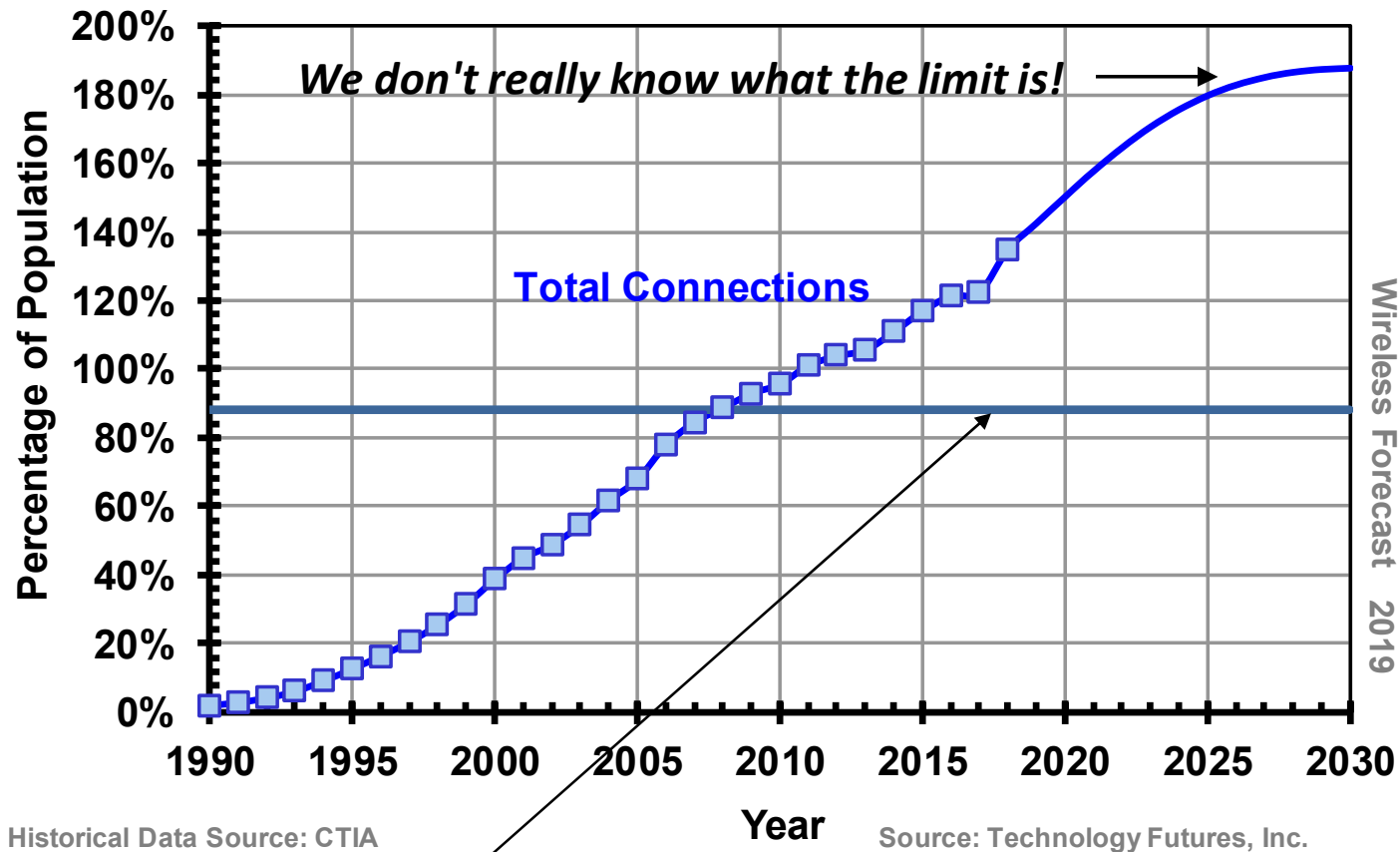
# Video Summary

- Cable companies face continued losses in multichannel TV subscriptions
- Cable companies must continue to provide multichannel and enhance broadband service simultaneously
- Competition from 5G Wireless is imminent
- Cable companies must increase investment in fiber, but without commensurate increase in revenue

# Industry Wireless Forecast

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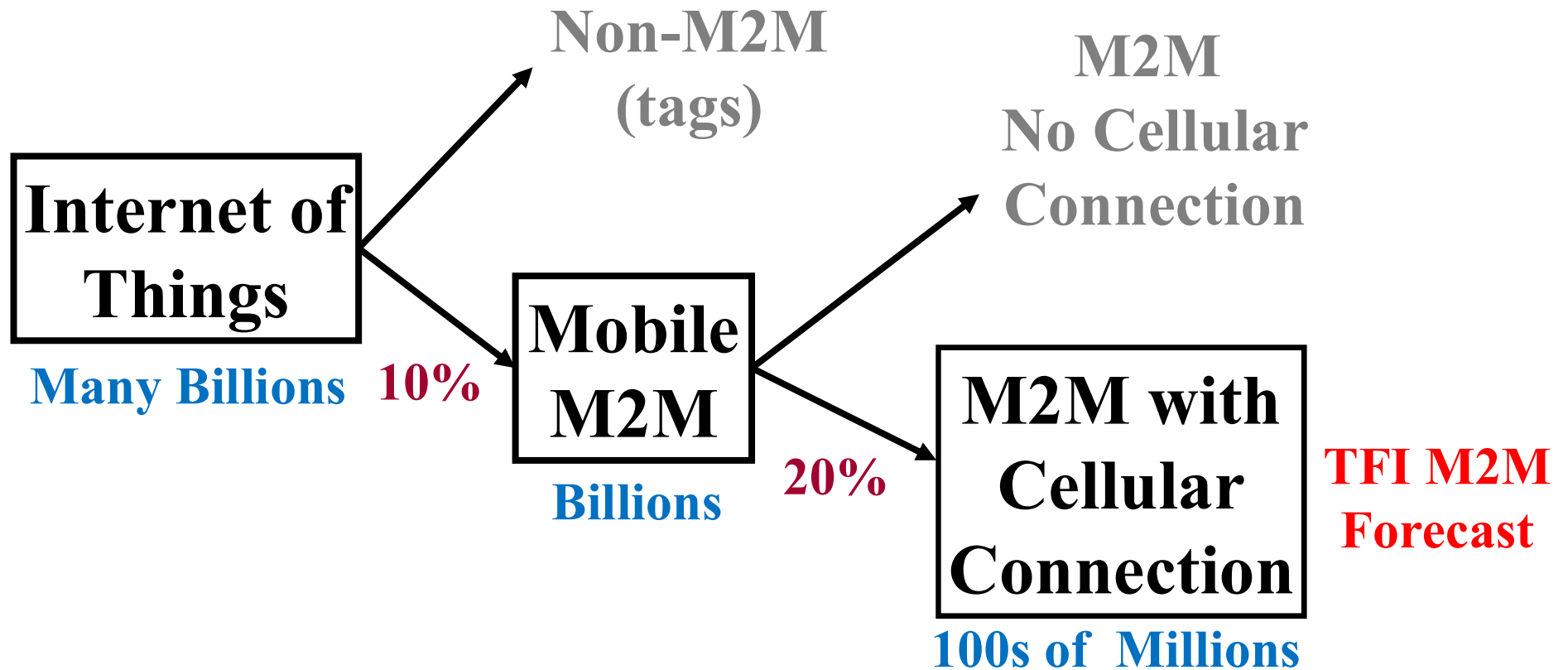
# U.S. Cellular Connections



At YE 2018, 88% of population had cellphones so everything over this line are additional penetration after 2018, additional devices, or M2M

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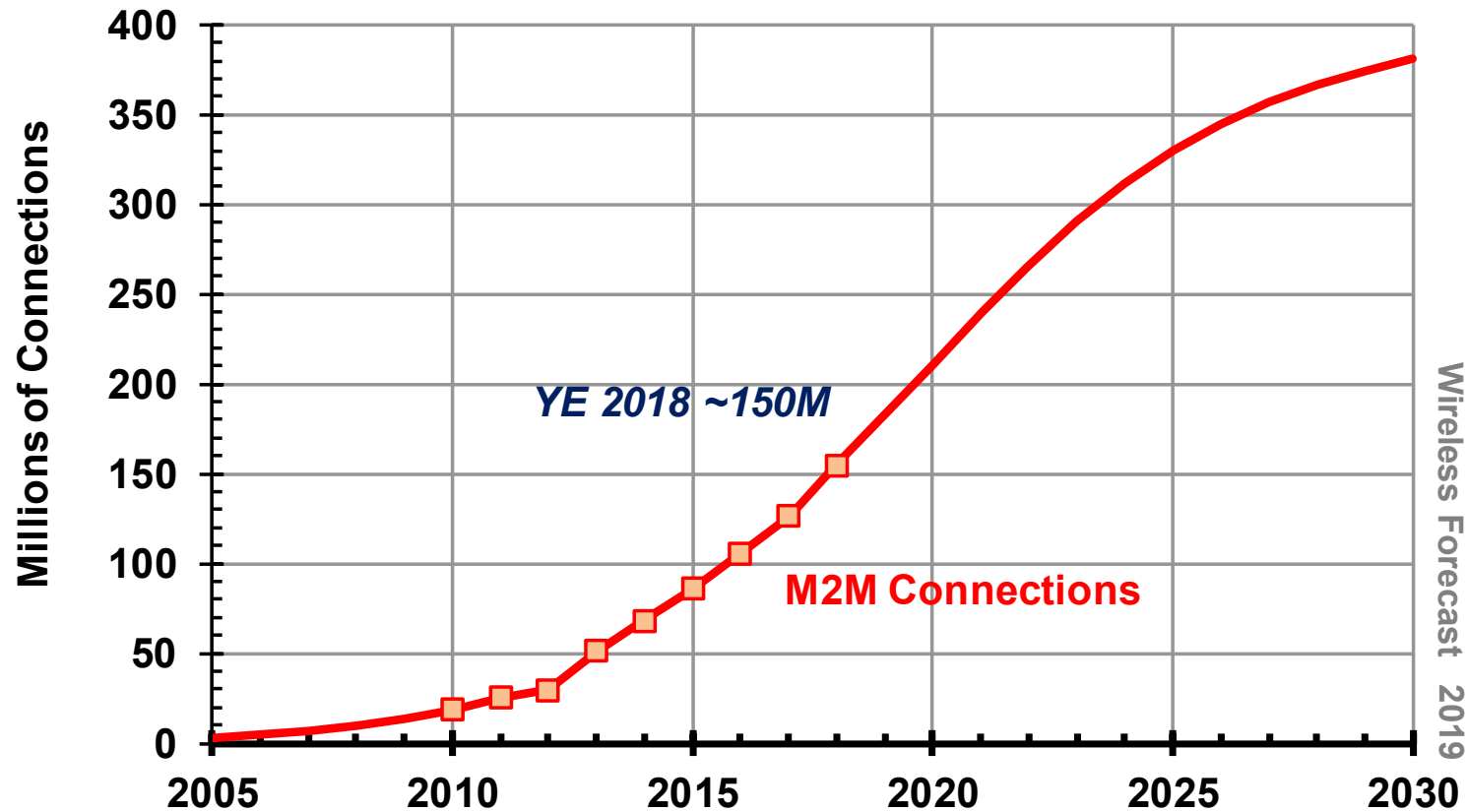
# The IoT will include many items unconnected to the cellular network



*Based on GSMA estimates*

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# 2019 TFI M2M Forecast

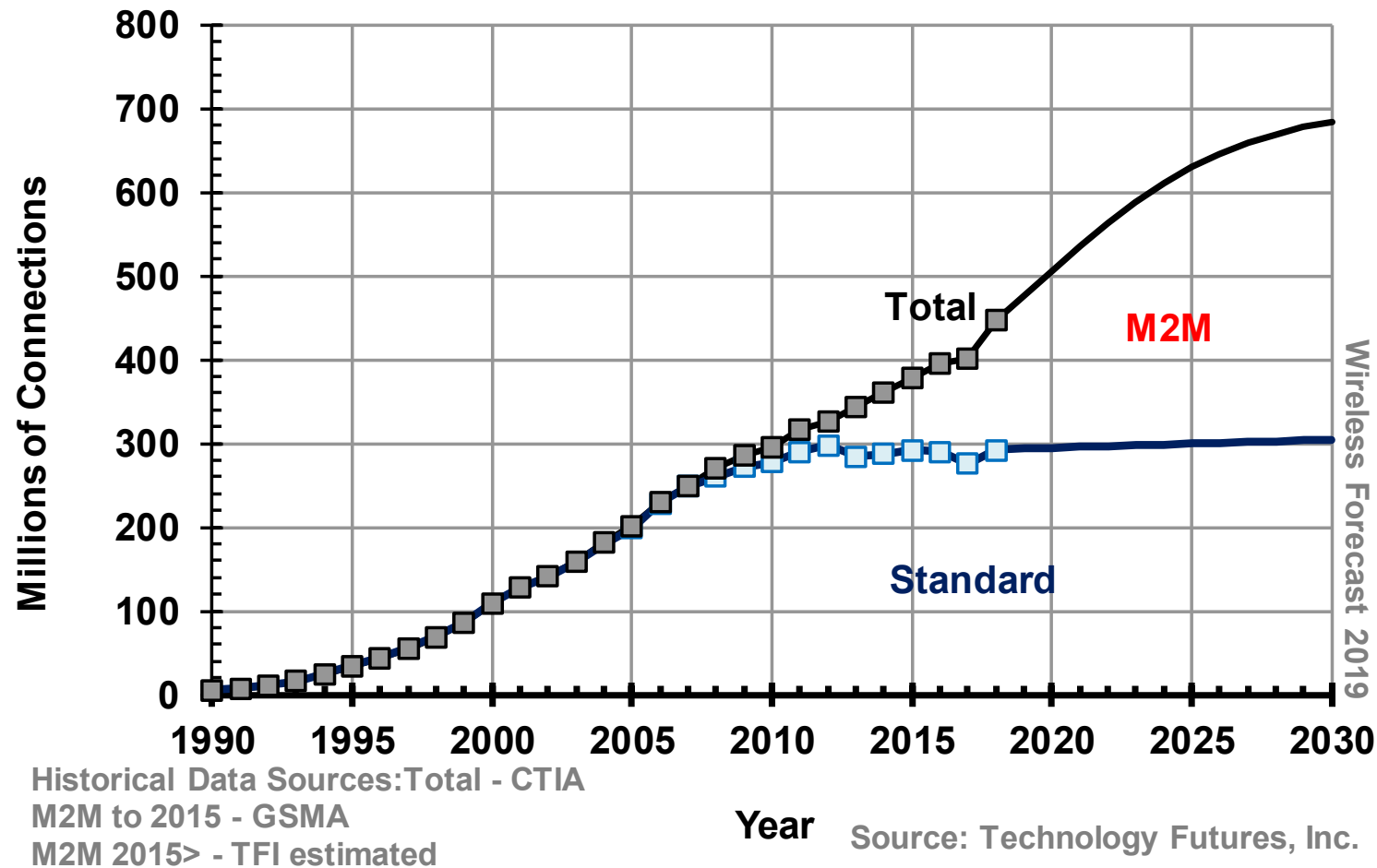


Historical Data Sources:  
M2M to 2015 - GSMA  
M2M 2015> - TFI estimated

Year Source: Technology Futures, Inc.

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# 2019 TFI Wireless Connection Forecast



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# M2M vs Standard Connections

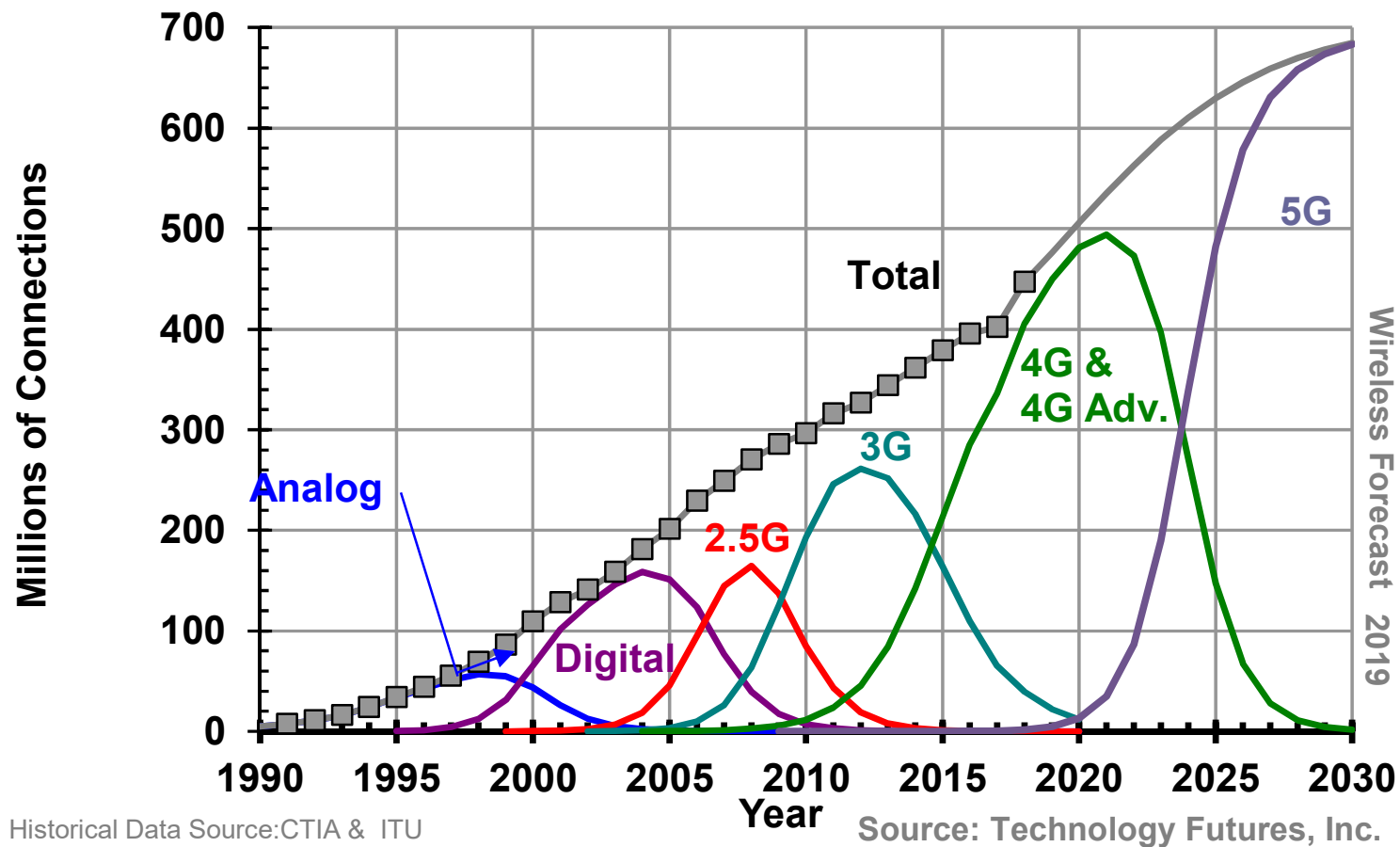
- M2M has vast range of bandwidth requirements.
- M2M often needs different geographic coverage.
- M2M needs low cost, low power solutions.
- 5G will be designed for M2M from ground up.

# Drivers for New Generations

- Mobile data traffic is growing much more rapidly than connections
- M2M connections are growing faster than standard connections
- Greatly improving cost/performance of newer technology

5G is the right technology at the right time

# 2019 TFI Wireless Generations Forecast



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