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TFI 2025

20 YEARS!!!

THANKS FOR THE MEMORIES!

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AND MANY MORE TO COME !

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The TFI Technology Conference

Cerebral Geniuses Solving the Tough Problems



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20th Annual TFI Technology Conference

- Welcome Back to Austin! ~30 In-Person
- Welcome Online Attendees! ~50 Online
- Welcome Back to Hyatt Place!
- Thank you Sponsors!



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Lay of the Land & Rules of the Road

- Conference room layout
- Chat and Q&A
- Screenshare and Video Feed
- Stay on schedule
- Audio is crucial - Use microphones!!!
- Have fun and be patient! 😊

TFI 2025 Onsite Team

Larry Vanston

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TFI 2025 Keynotes



Broadband Keynote *The Crash of 2033*

Alex Davies, Senior Analyst, TV & Wireless Group
Rethink Technology Research



Wireless Keynote

The Latest on 5G and the Outlook for 6G

Iain Gillott, President
iGR



Policy Keynote

Fireside Chat on Rural Broadband and Other Trends

Joan Engebretson, Editor-at-Large
Telecompetitor

Alfonso Porras, Associate VP, Valuation
CostQuest Associates (Host)

TFI 2025 Feature Presentations



Valuations of Data Centers: Current Trends & Issues

Ruben Miranda

Managing Director, Property Tax
Kroll



BEAD Update: Results of the first grant program in Louisiana

Jim Stegeman

President
CostQuest Associates

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TFI 2025 Broadband and Wireless Industry Panel



Jeffrey Binkley
Principal
Ryan
(Moderator)



John Reed
Sr. Director, Property Tax
Charter



Gary Hunter,
AVP, Tax
AT&T



Brandt Palmer
Sr. Manager, Property
Tax
T-Mobile

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2025 Annual Updates

TFI Industry Forecast Overview



Lawrence Vanston, Ph.D.
President,
Technology Futures, Inc.



Ray Hodges
Senior Consultant,
Technology Futures, Inc.

U.S. Economic Outlook



Michael A. Sadler, Ph.D.
Independent Economist and
Consultant

Communications Technology Update



August (Augie) Grant, Ph.D.
Professor Emeritus,
University of South Carolina

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Special Optional Session

Energize your Leadership with Intentional Travel



Carrie Vanston,
CEO
Leadership Mindset Success

**Leadership
Mindset
Success ✓**

leadership-mindset-success.com

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John Vanston Founder, TFI 1928-2024



TFI 2018 -- TFI's 40th Anniversary





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tfi-ctfg.com

***Conference
Info and
Updates Here***

**Communication Technology
Update and Fundamentals**

tfi-ctu.com



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TFI Technology Forecast Overview

Lawrence Vanston, Ph.D. President,
Ray Hodges, Senior Associate

Technology Futures, Inc.

lvanson@tfi.com
rhodges@tfi.com

**TFI Technology
Conference 2025**

January 23-24, 2035
Austin, Texas
and Online

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Technology Forecasting

- Performance Improvement
- Cost Improvement
- Adoption of New Technology
- Replacement of Old Technology
- Impacts of these changes

**Perfect for estimating lives & values
of large capital investments**

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Technology Forecasting Methods

- Fundamental Models of Technology Change
 - Technology Adoption and Substitution Curves
 - Performance Improvement Curves
- Analogies
- Drivers and Constraints
- Expert Opinion
- Many others!

Technology Forecasting Lessons

- Nothing happens overnight
- Fundamental technology trends are relentless
- Betting against fundamental technology trends is futile
- Fundamental technology trends destroy value in old technology

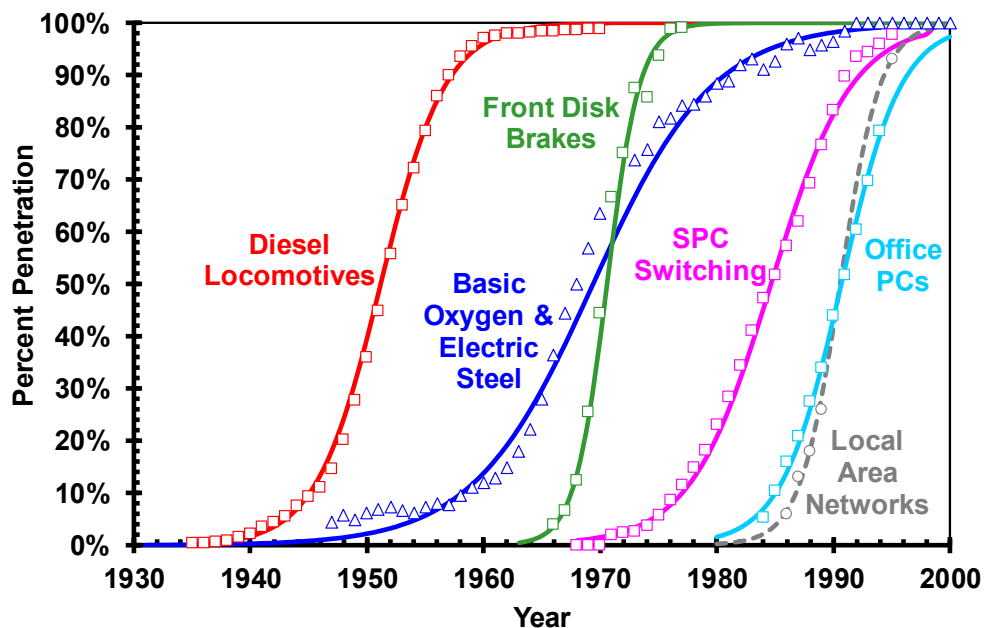
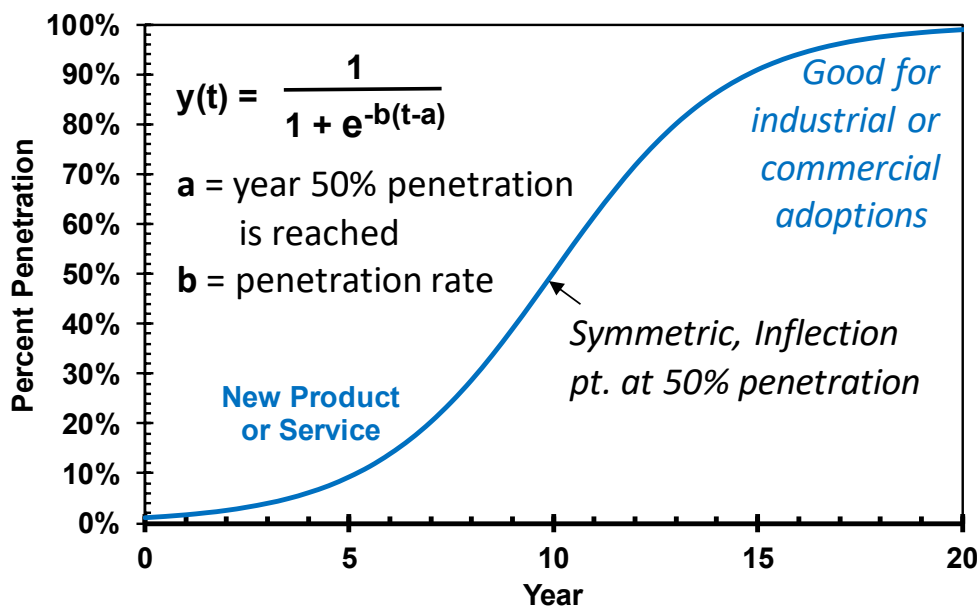
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Introduction to Technology Forecasting Models

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Fisher-Pry Substitution Model (aka Logistic Model)

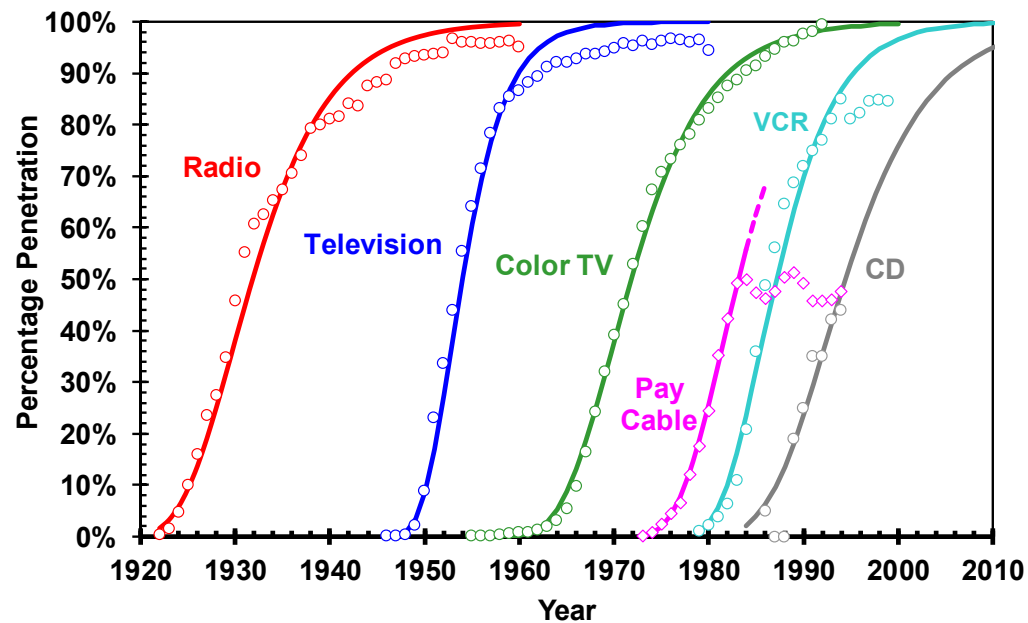
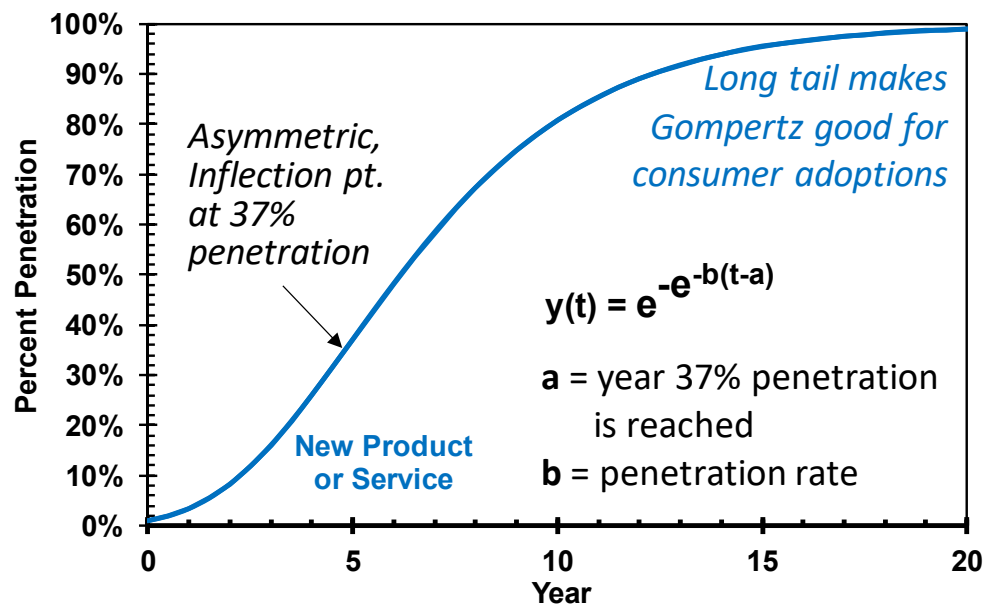


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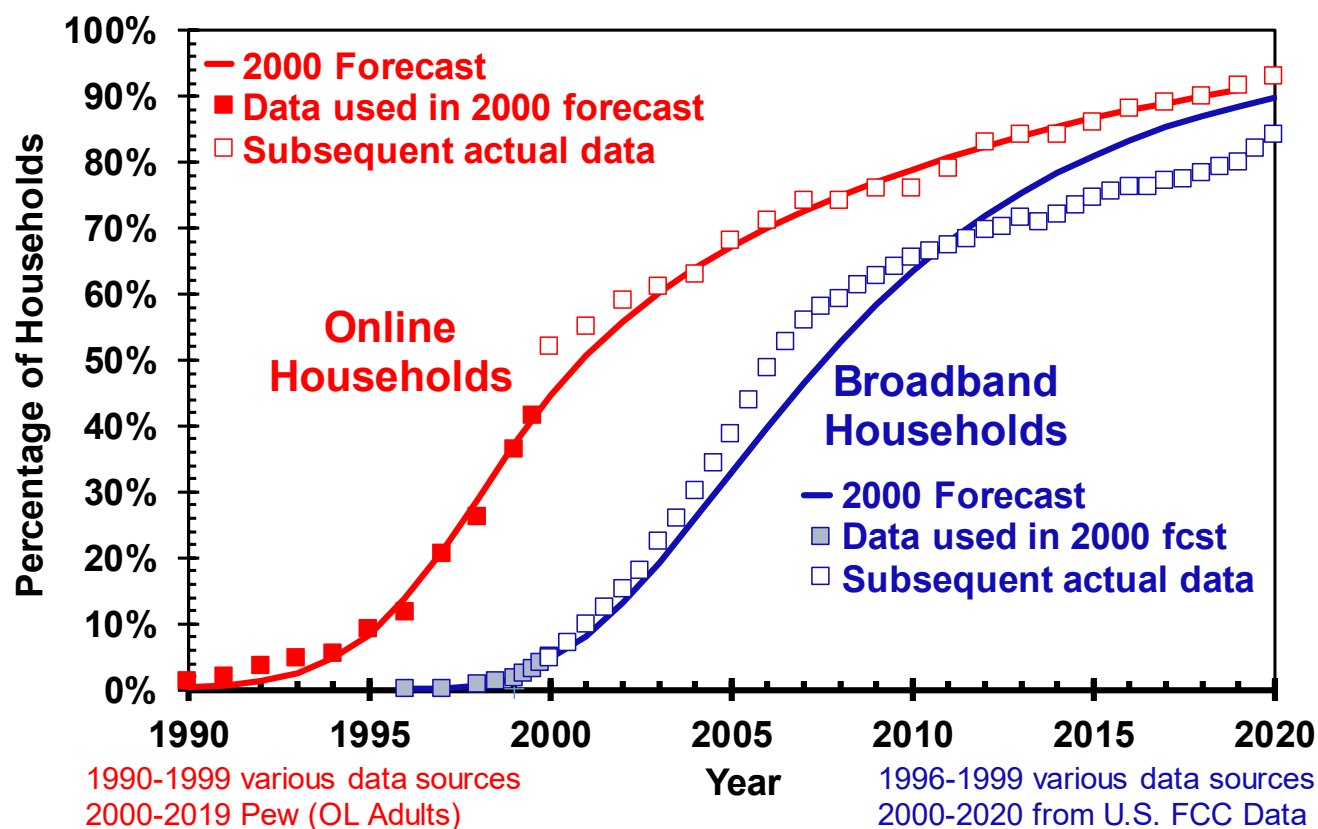
The Gompertz Model



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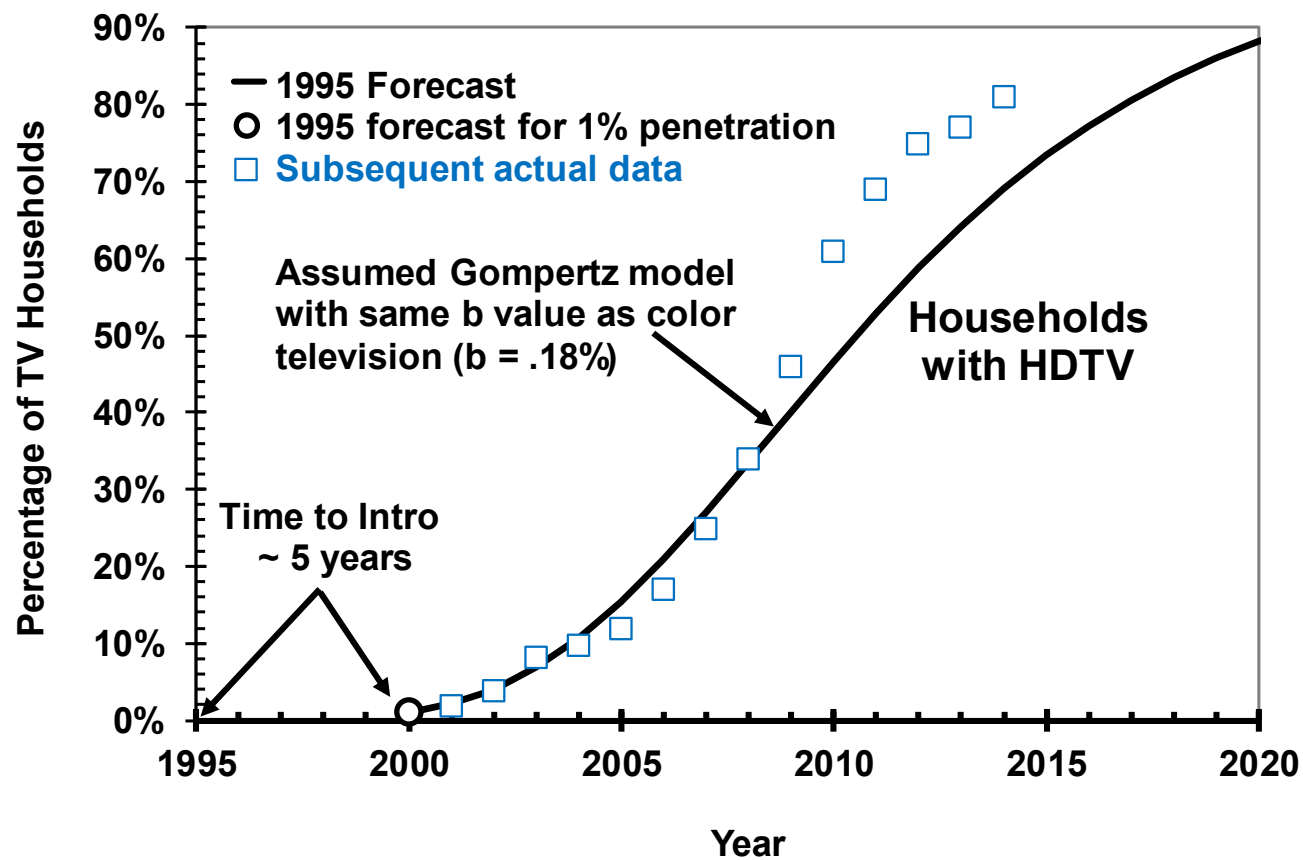
Early TFI Broadband Forecast (2000)



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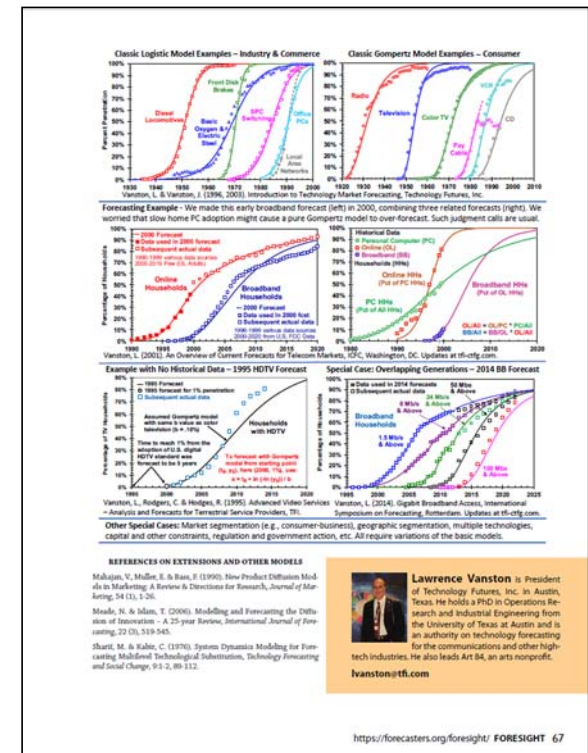
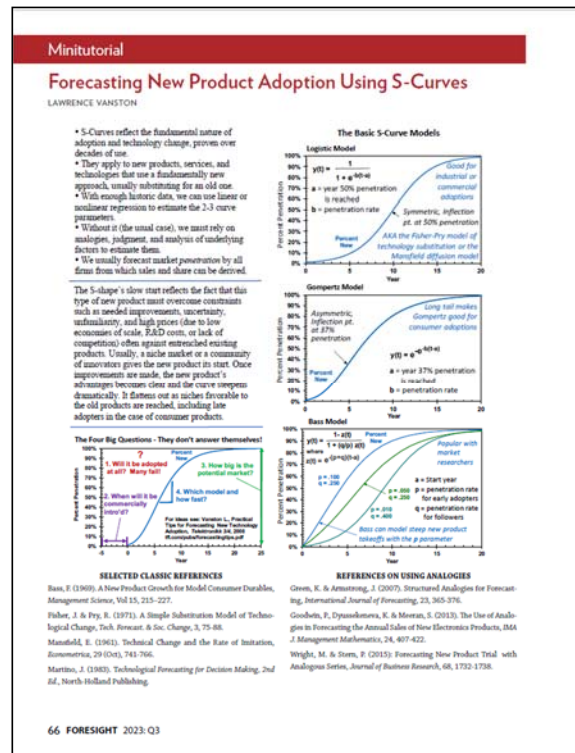
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Early TFI HDTV Forecast (1995)



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- ***Minitutorial: Forecasting New Product Adoption Using S-Curves,*** Lawrence Vanston, Foresight:., Q3:2023, pp. 66-67.
- <https://tfi-ctfg.com/technology-forecasting-resources/>

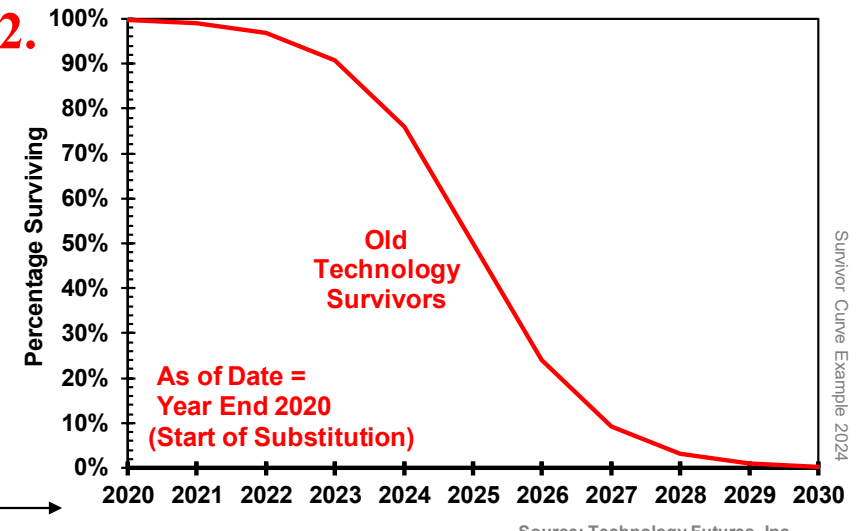
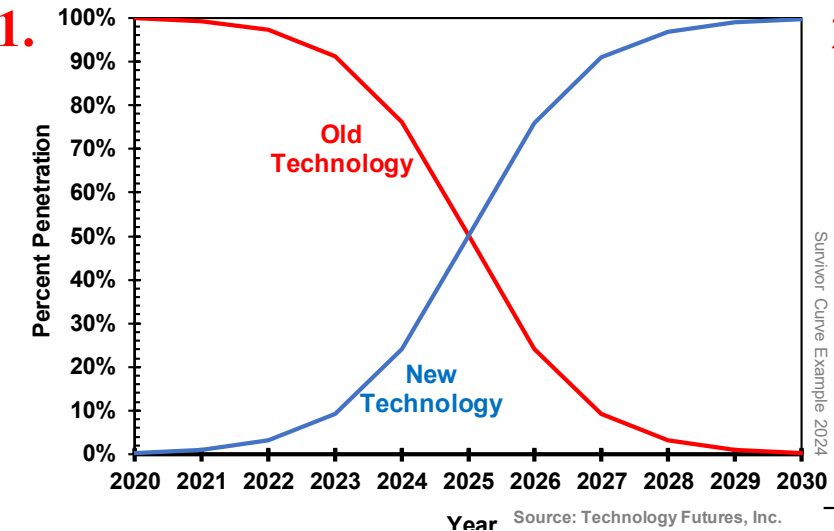


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Application to Valuation

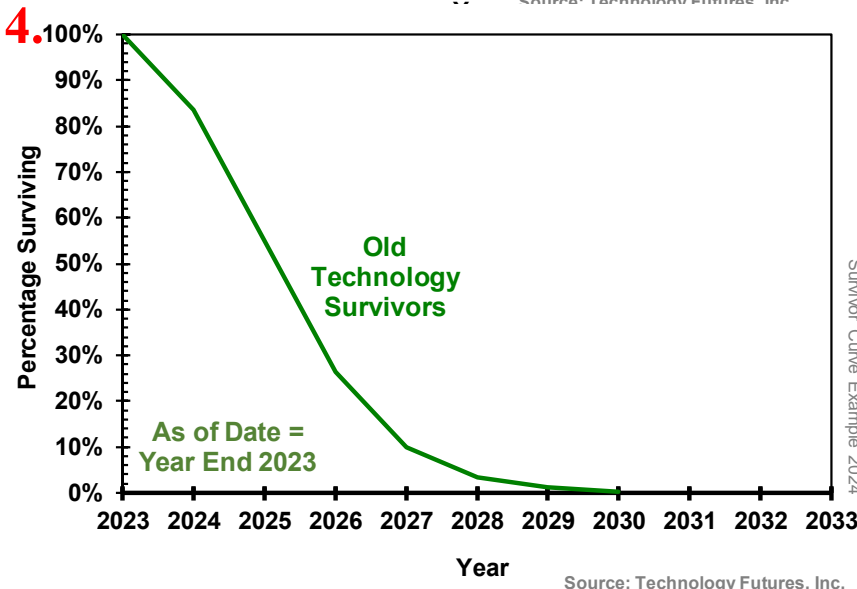
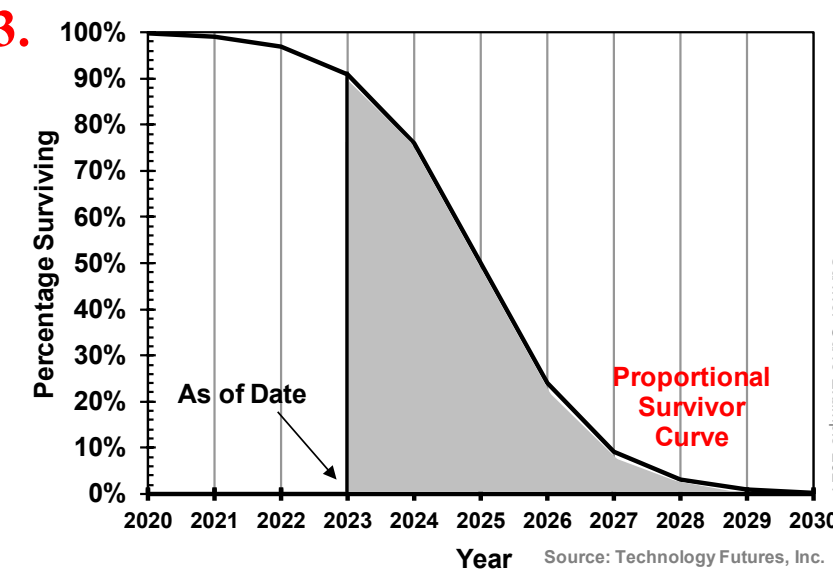
Simplified Example

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5.

Year End	Survs
2023	100%
2024	84%
2025	55%
2026	26%
2027	10%
2028	3%
2029	1%
2030	0%
Sum =	2.8
1/2 yr	-0.5
RL =	2.3



6.

$$\text{Pct Good} = \frac{\text{RL}}{\text{Age} + \text{RL}}$$

Year	Age	Pct Good
2023	0.5	82%
2022	1.5	61%
2021	2.5	48%
2020	3.5	40%
2019	4.5	34%
2018	5.5	29%
2017	6.5	26%
2016	7.5	23%

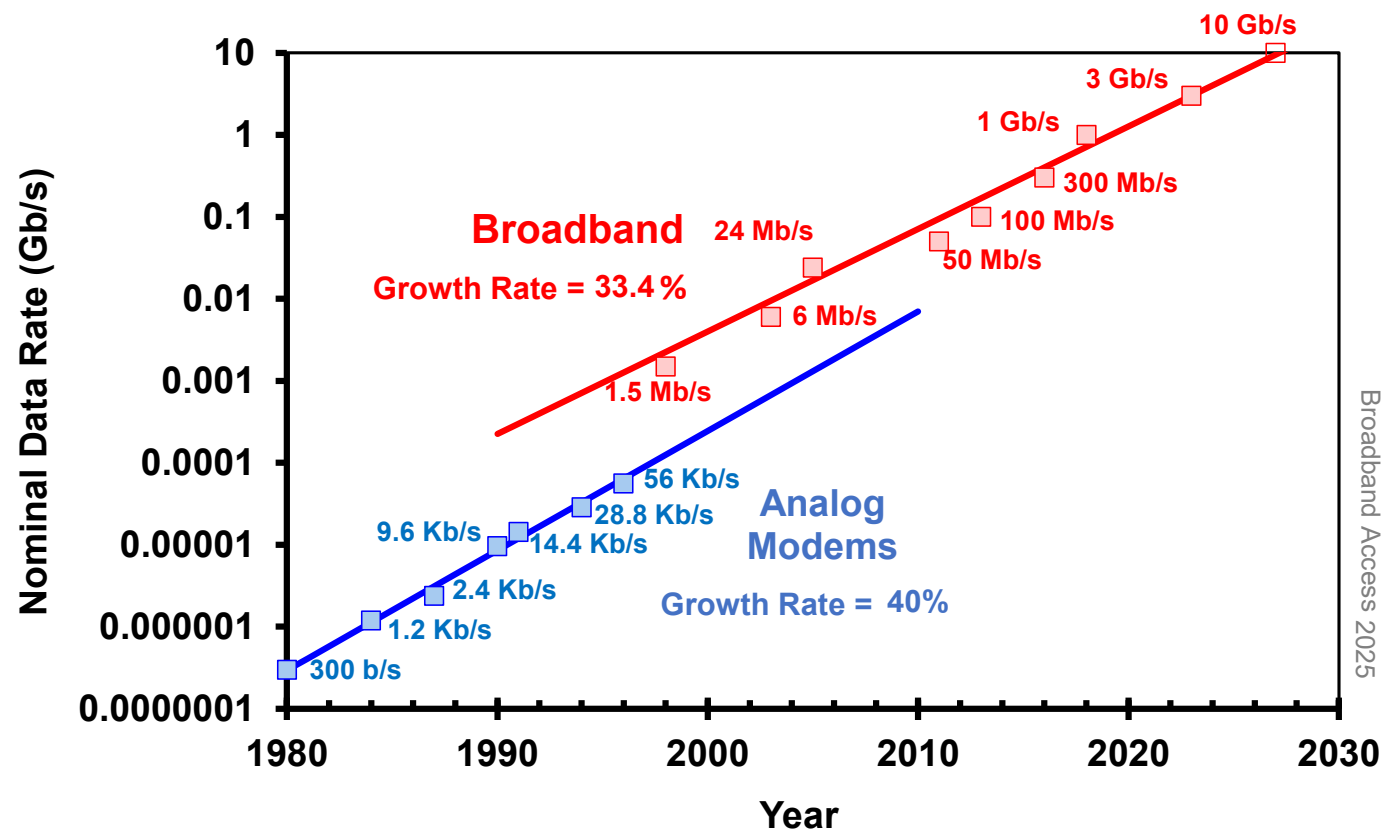
TFI Forecasts 2025

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Broadband Performance Trends

Broadband Performance Milestones



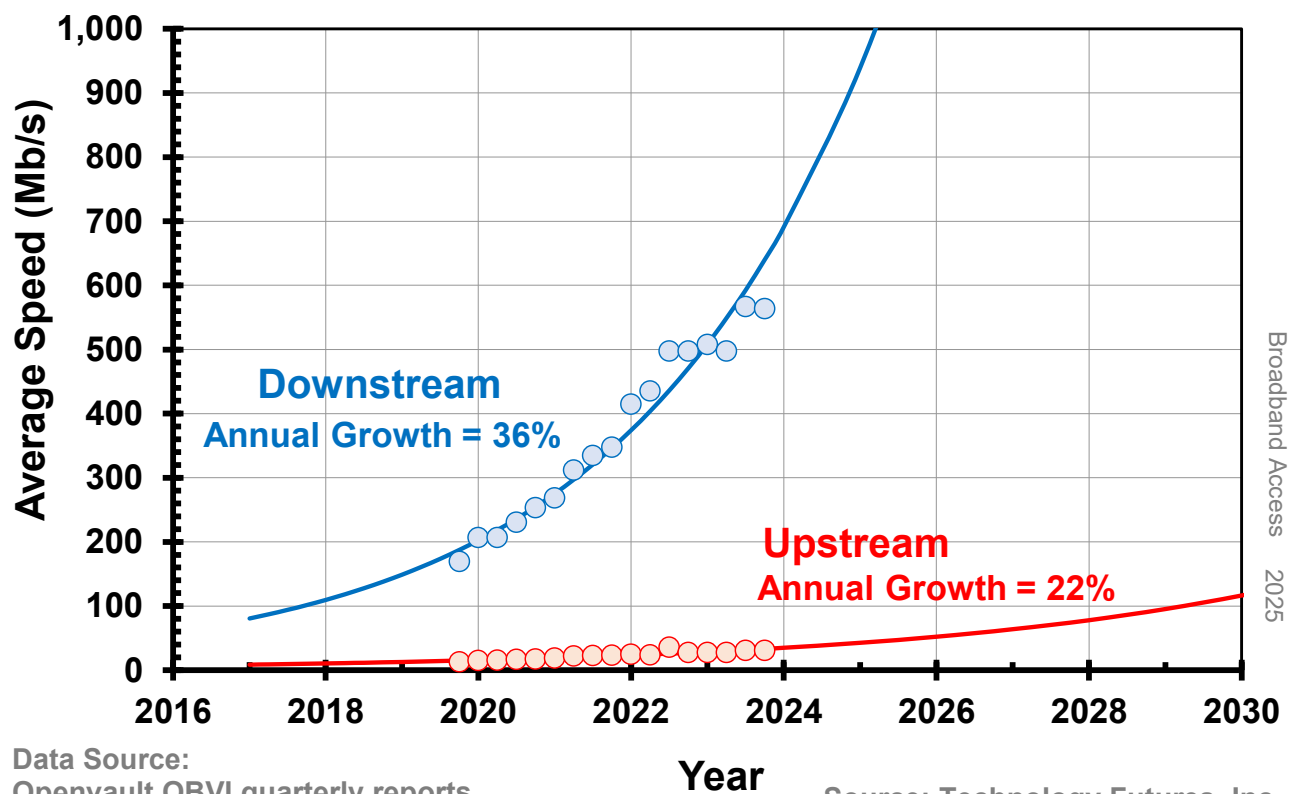
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Average Broadband Speed Trend

Openvault OBVI Data



Data Source:
Openvault OBVI quarterly reports

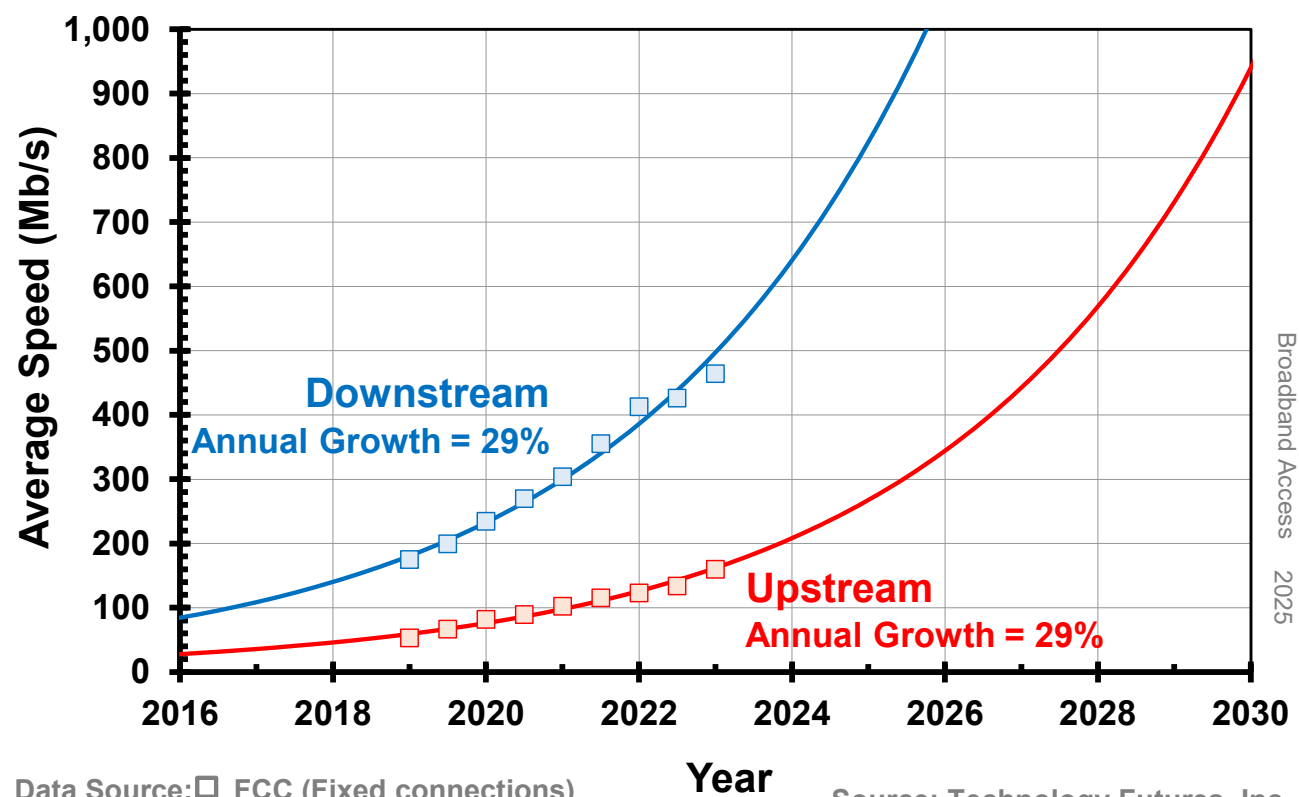
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Average Broadband Speed Trend

FCC Data



Data Source: ☐ FCC (Fixed connections)

Source: Technology Futures, Inc.

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How Long Will Broadband Speeds Increase?

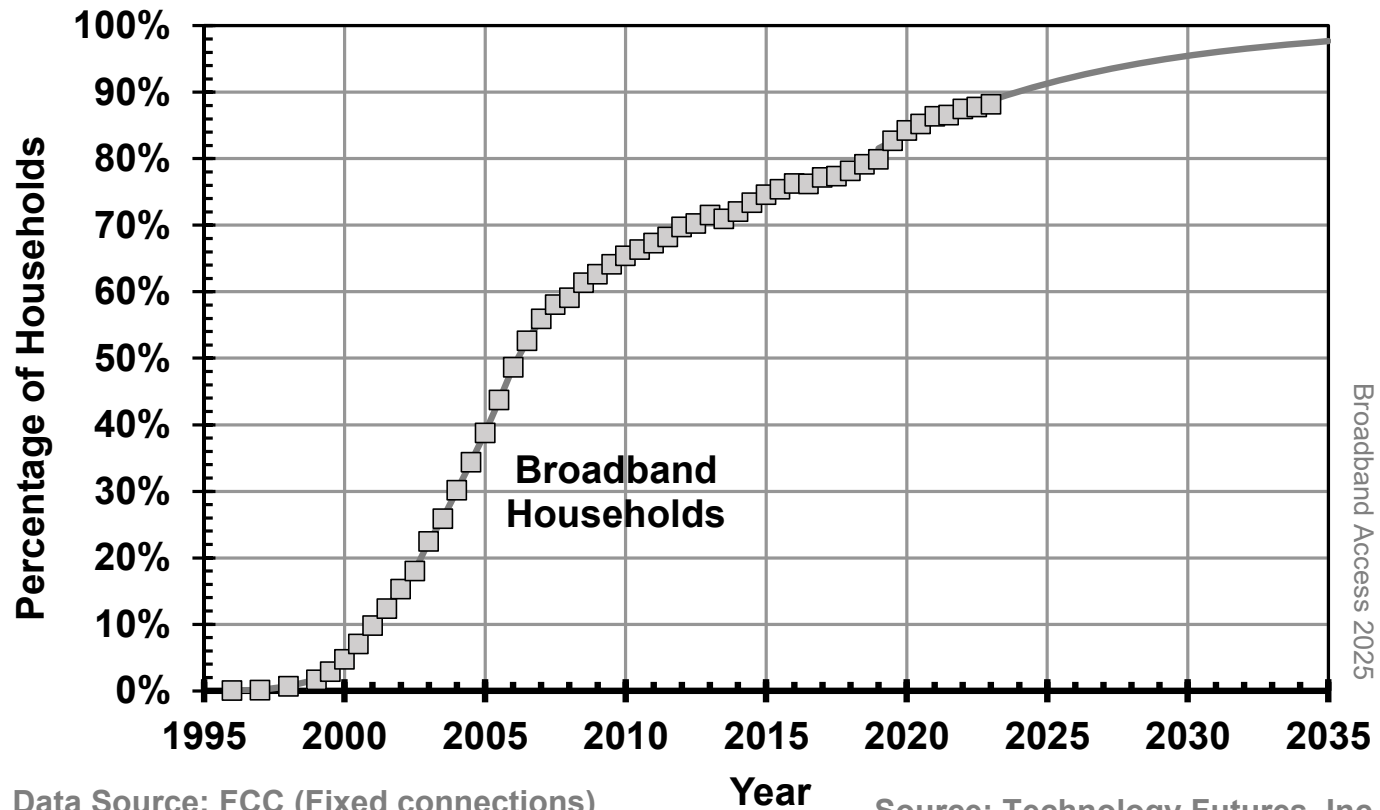
Key Technology Forecasting Principle:

- Performance improvement will continue as long as it's:
 - Technically feasible AND
 - Useful
- The rate may change if the technology approach changes.
- 10 Gb/s for sure – after that, who knows?

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Broadband Speed Tier Forecasts

U.S. Broadband Households – 2025 TFI Forecast



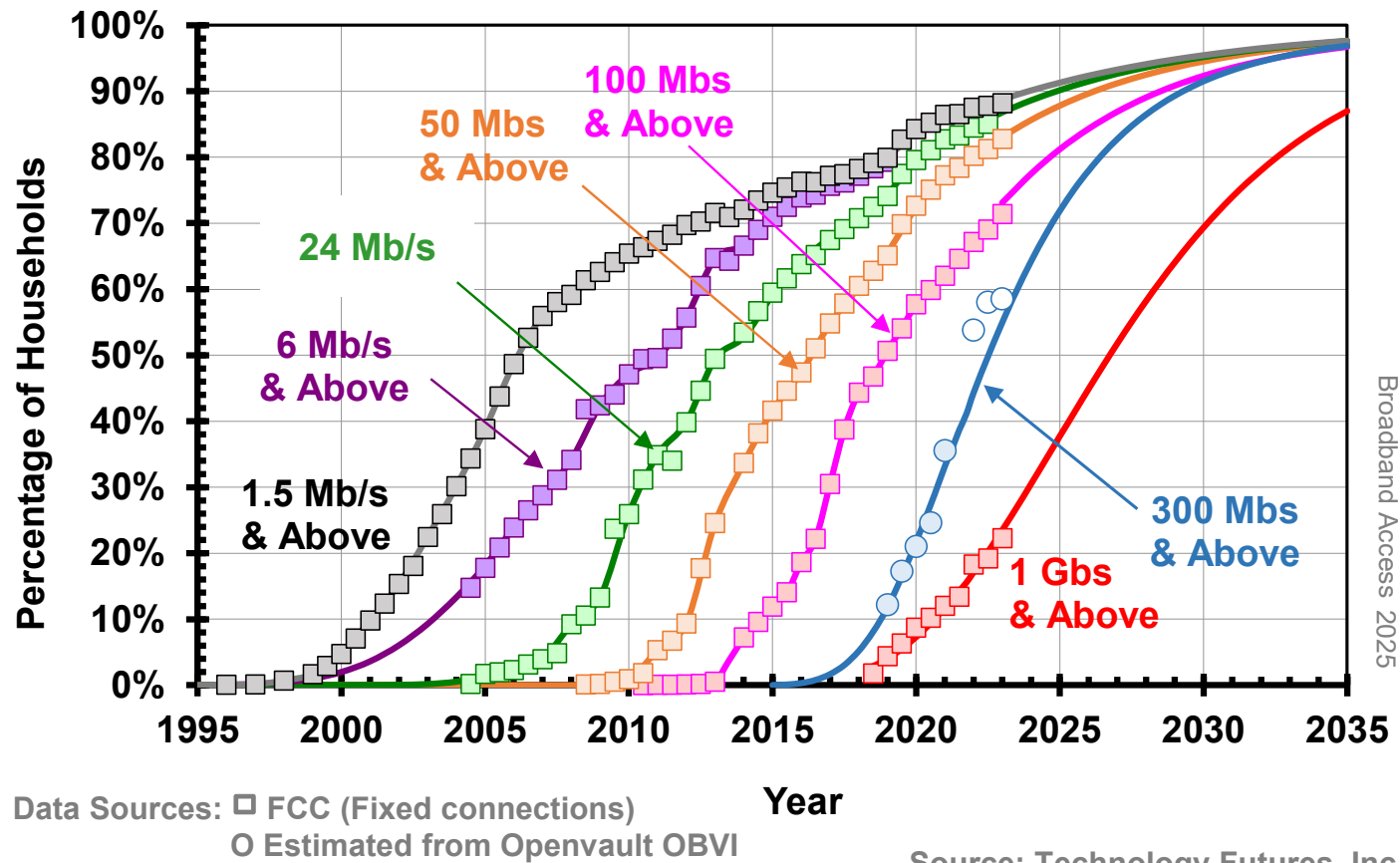
Data Source: FCC (Fixed connections)

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U.S. Broadband Households – 2025 TFI Forecast



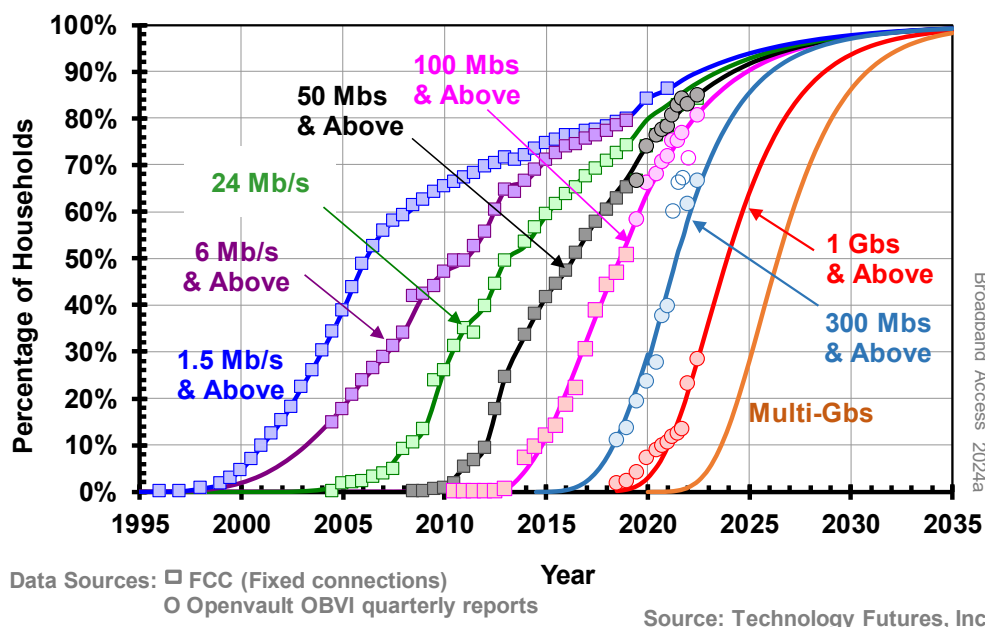
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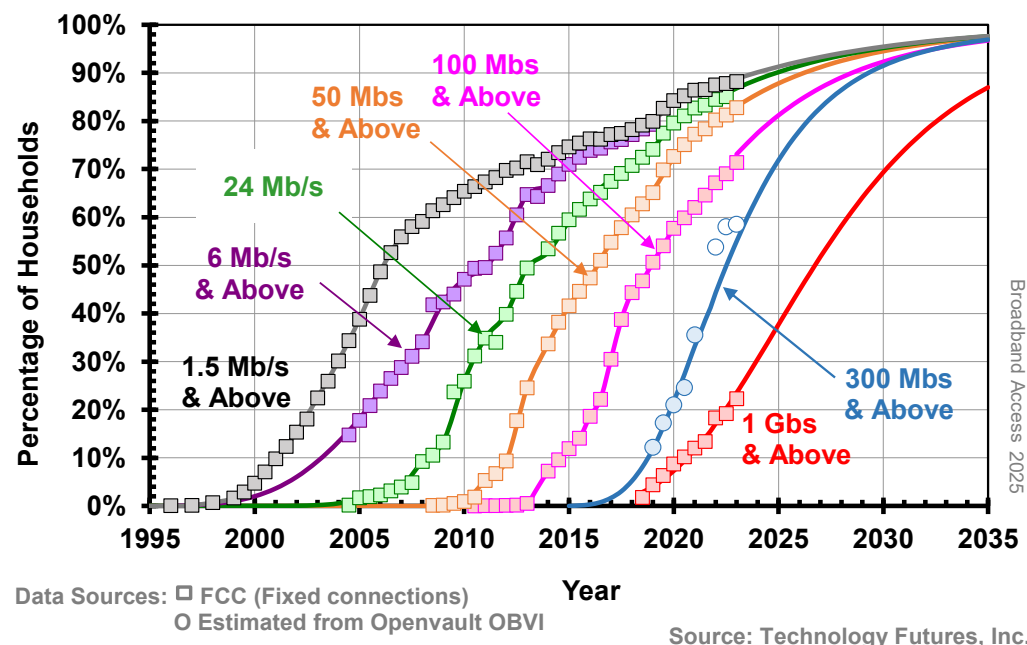
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U.S. Broadband Households – Forecast Comparison

2024 Forecast



2025 Forecast

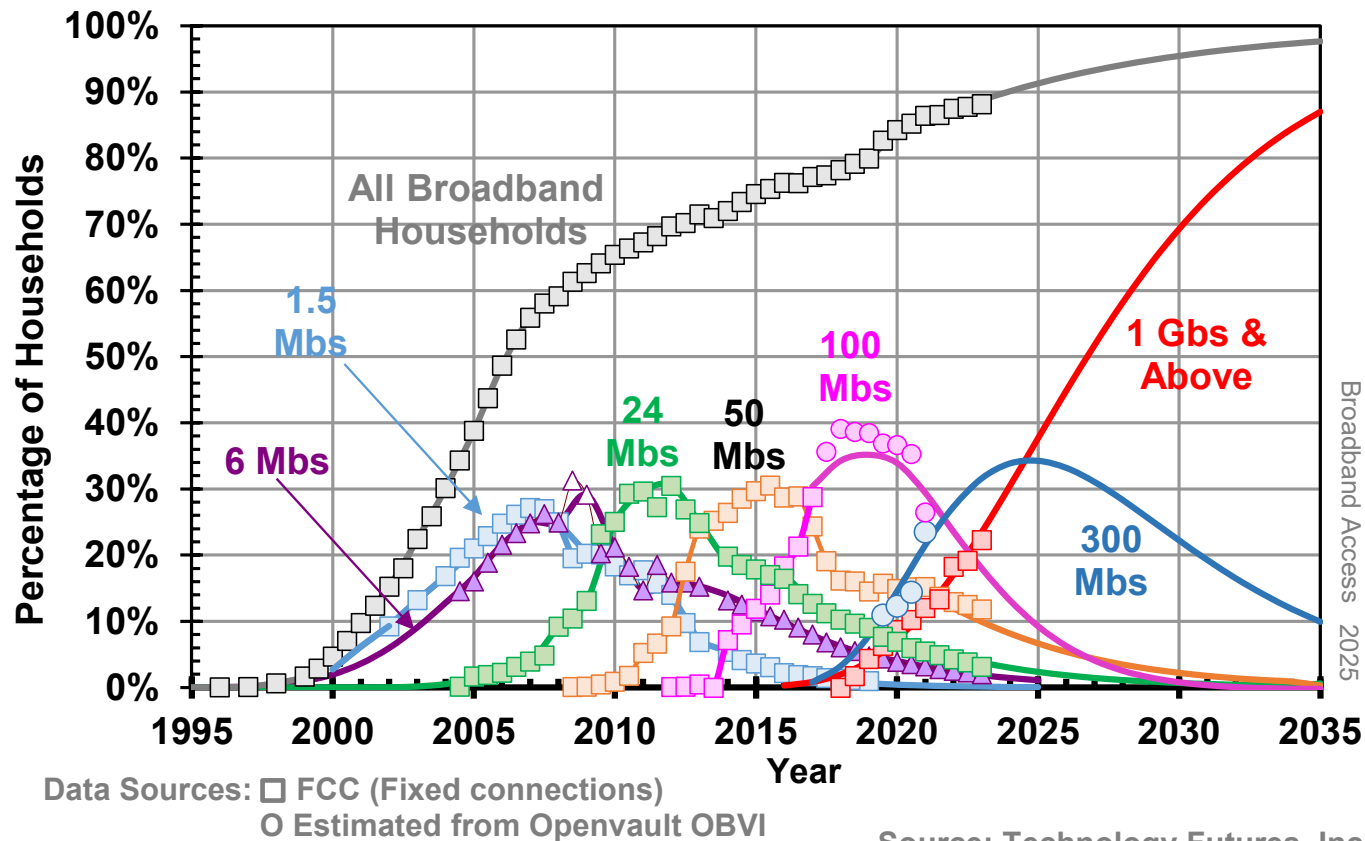


Key Difference: 2025 Forecast is based on recently-released FCC data while 2024 Forecast was based on Openvauld ODVI data.

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U.S. Broadband Households – 2025 TFI Forecast

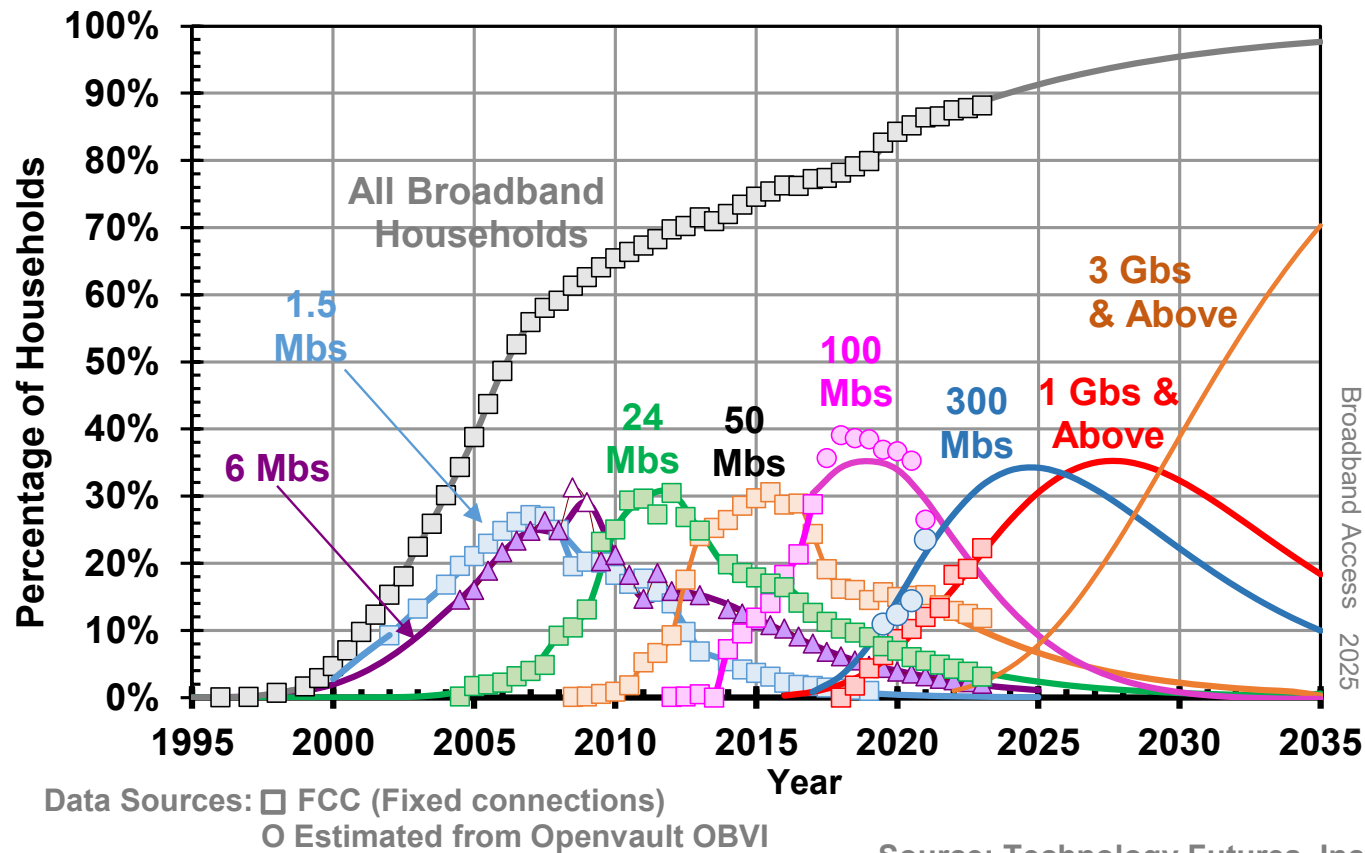


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Lifecycle (t) = Substitution (t) – Next Substitution (t)

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U.S. Broadband Households – 2025 TFI Forecast



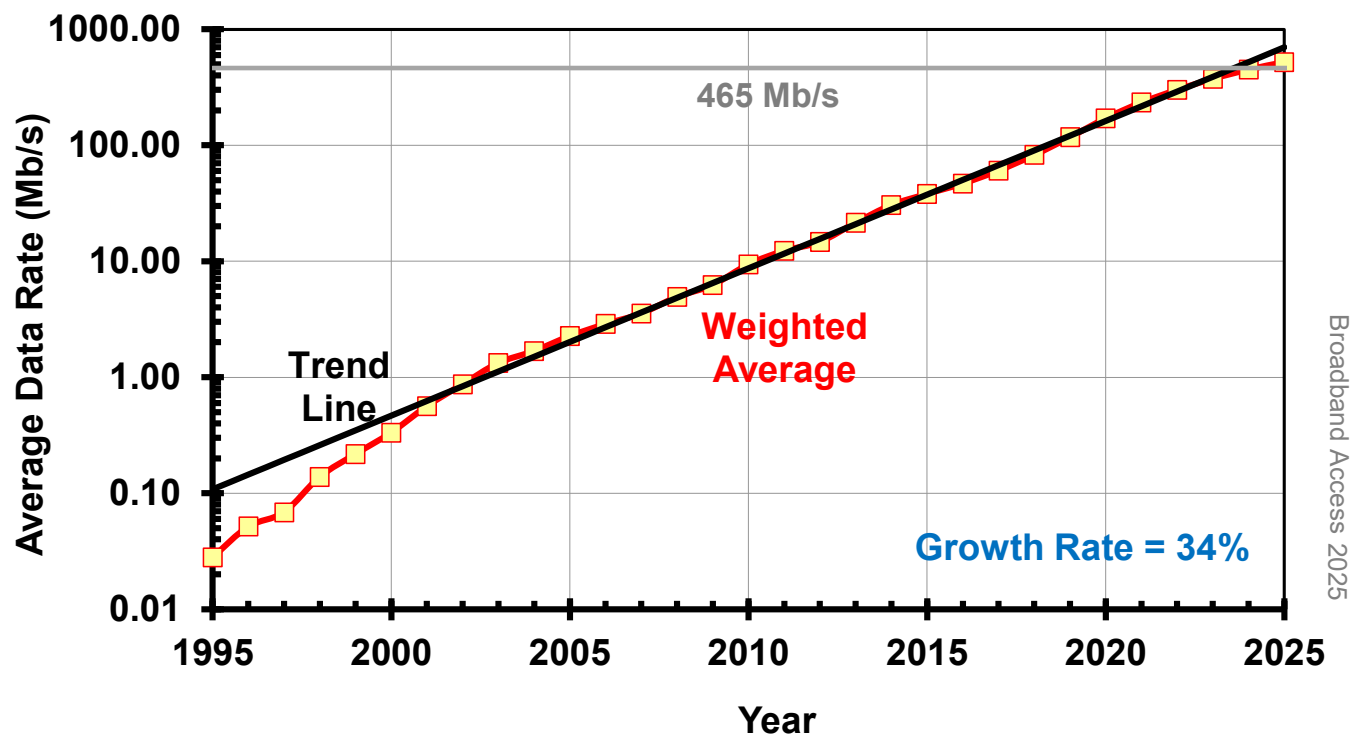
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Lifecycle (t) = Substitution (t) – Next Substitution (t)

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Average Broadband Speed Trend

TFI Forecasts/FCC Speed Tier Data

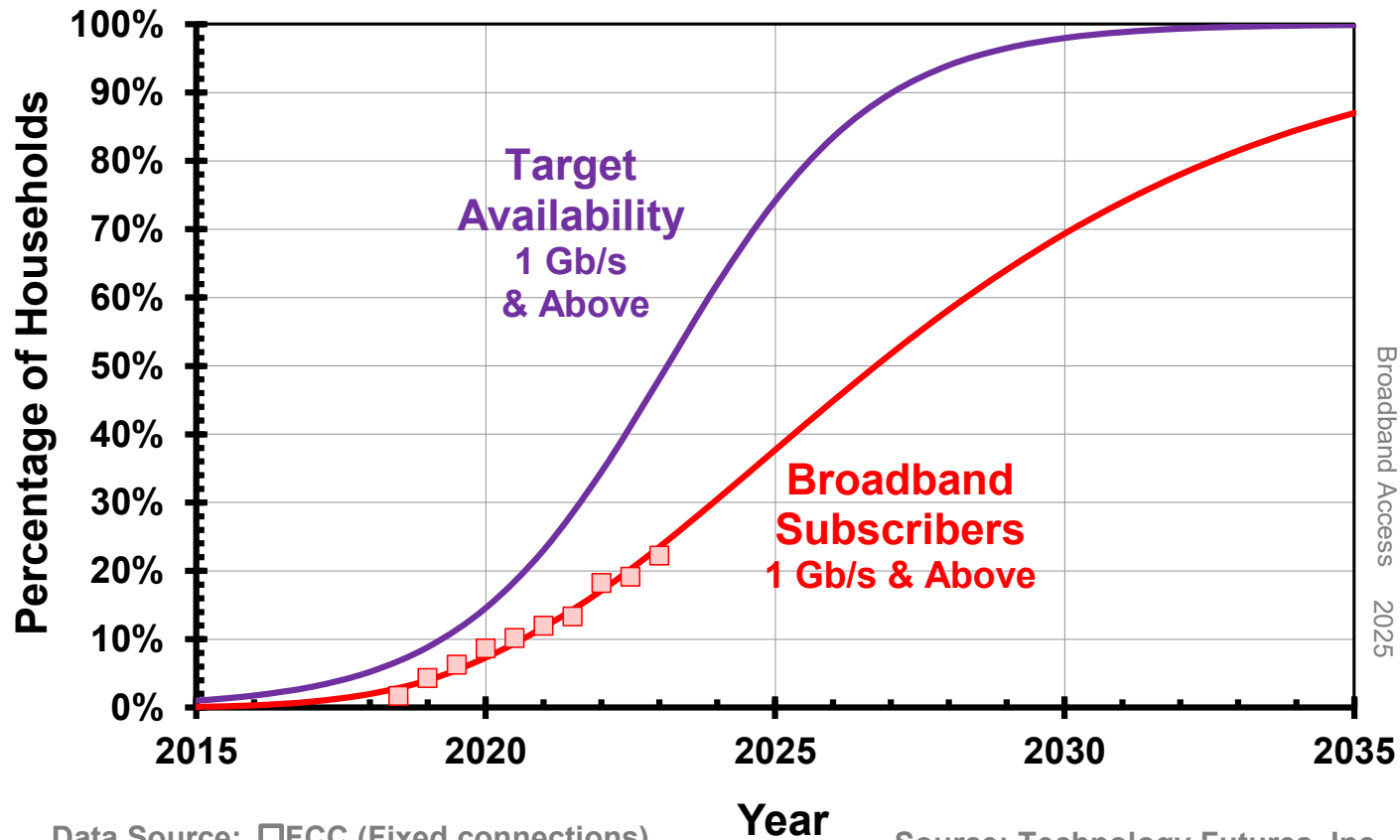


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Availability vs Subscribers, 1 Gb/s & Above



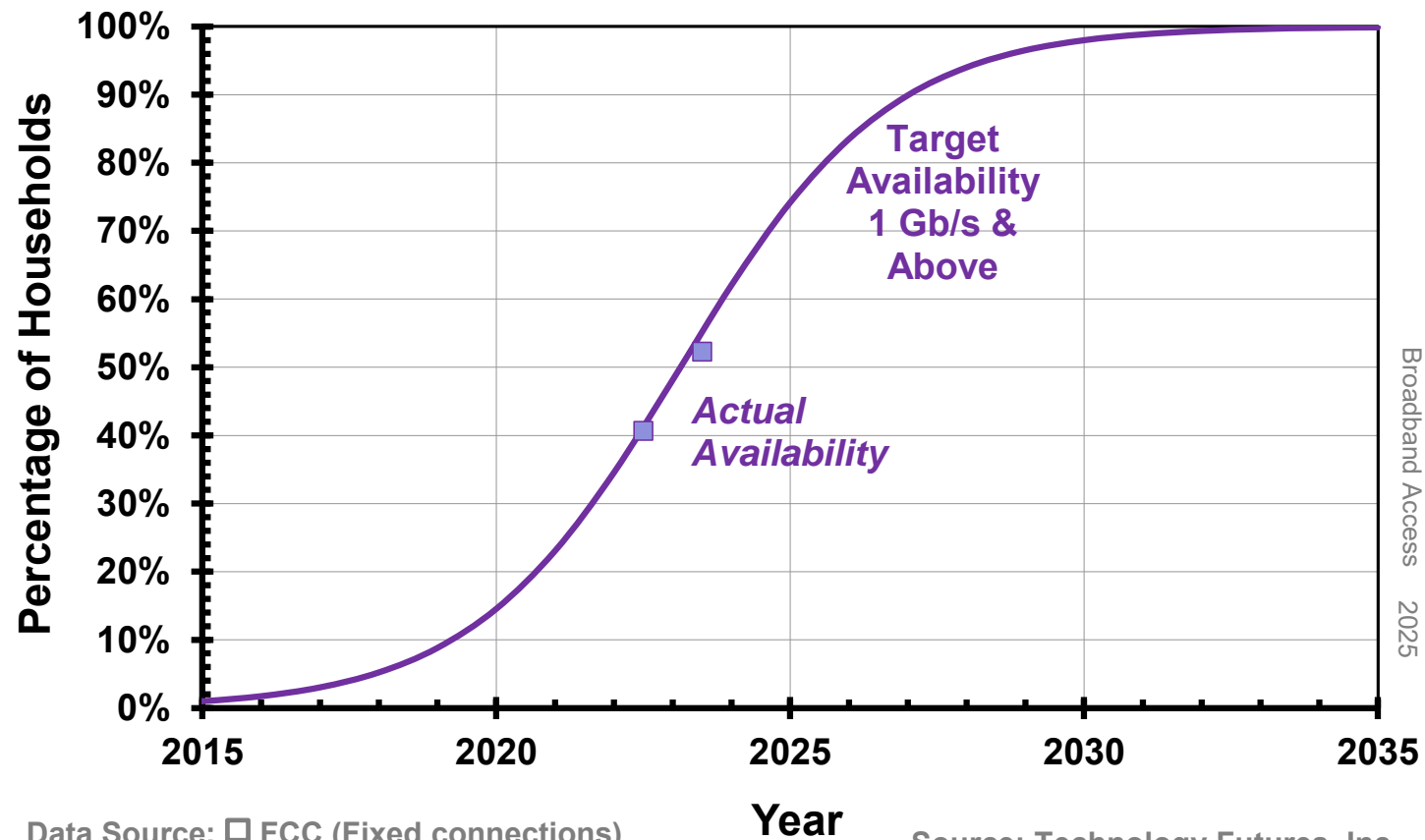
Data Source: ☐ FCC (Fixed connections)

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Availability vs Subscribers, 1 Gb/s & Above



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Actual Availability

Mid 2024

Speed (Down/Up)	Fiber	Cable	Cable /Fiber	Fixed Wireless	Copper	All Terrastral
25M / 3M	46%	83%	90%	69%	20%	96%
100 / 20M	46%	82%	90%	47%	4%	96%
250M / 20M	46%	81%	89%	11%	0%	90%
1G /100M	37%	22%	51%	2%	0%	52%

FCC National Broadband Map

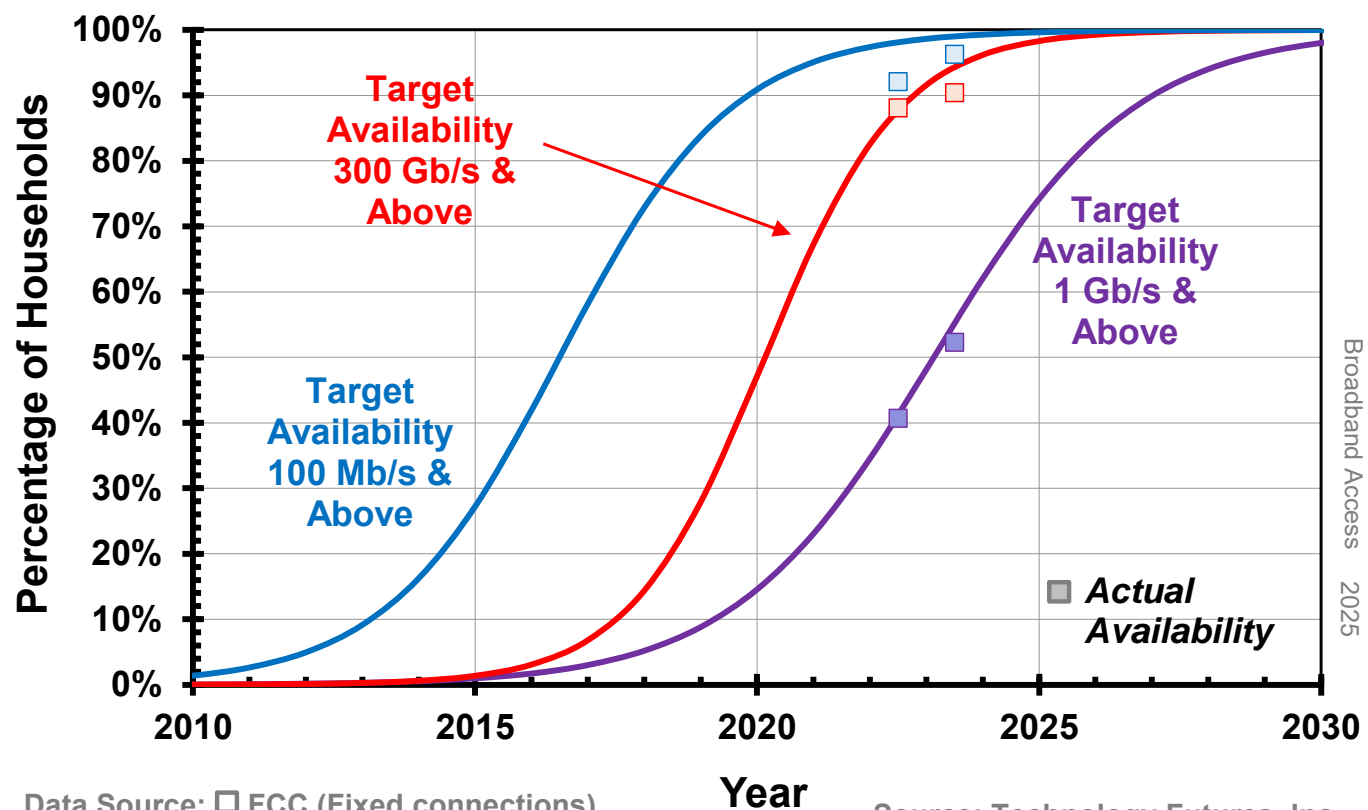
[https://broadbandmap.fcc.gov/
area-summary/fixed](https://broadbandmap.fcc.gov/area-summary/fixed)

Accessed 1/21/2024

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Target Availability vs Actual Availability



Data Source: □ FCC (Fixed connections)

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Broadband Summary

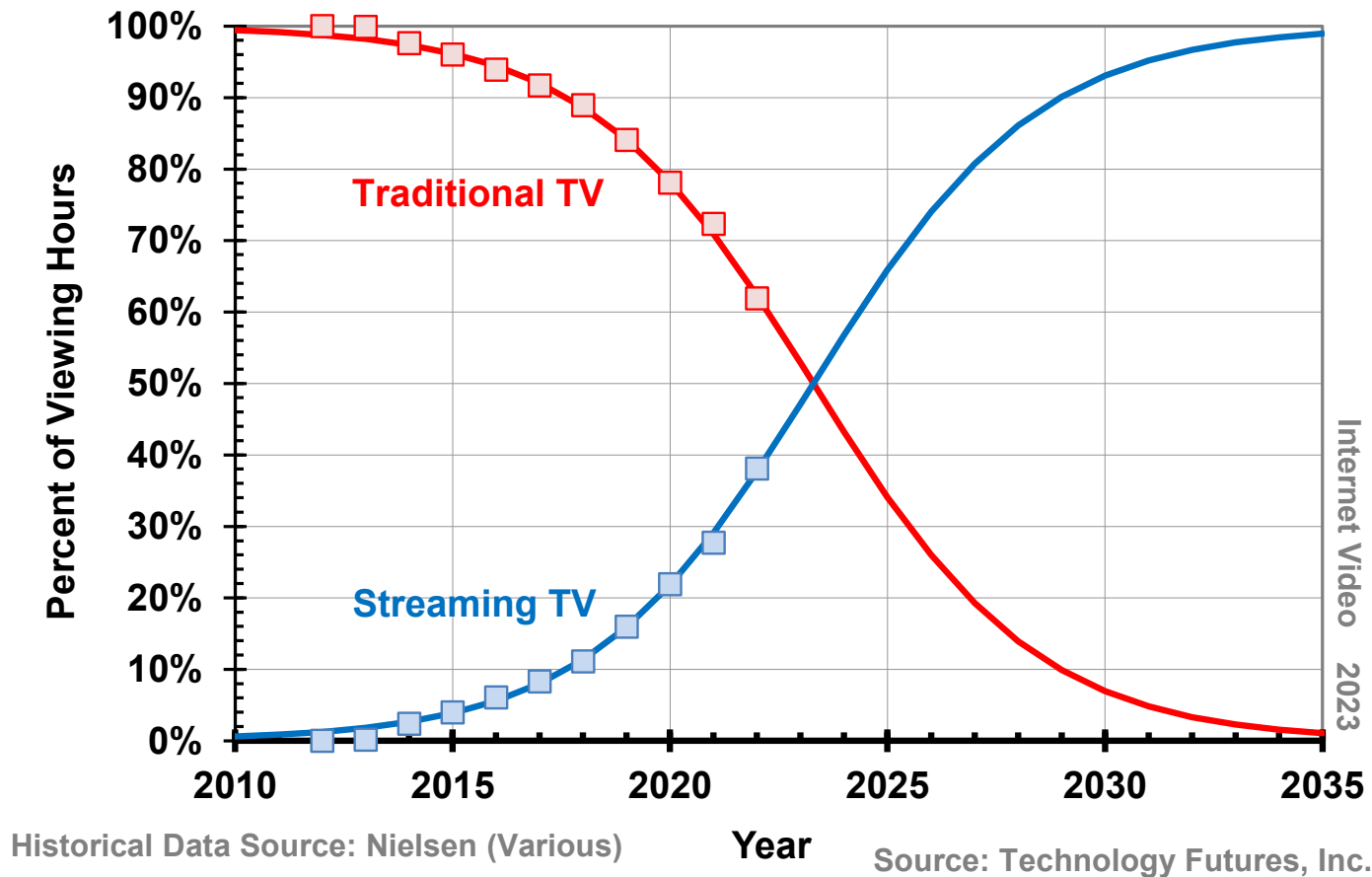
- Broadband speeds continue to increase, 300 Mb/s standard. 1 Gb/s optimal. Future: Multi Gb/s
- Relentless bandwidth demand means deploying fiber and upgrading / replacing equipment constantly.
- Competition from wireless, especially 5G
- Telco copper is doomed. Has been for years.

Online Video Forecasts

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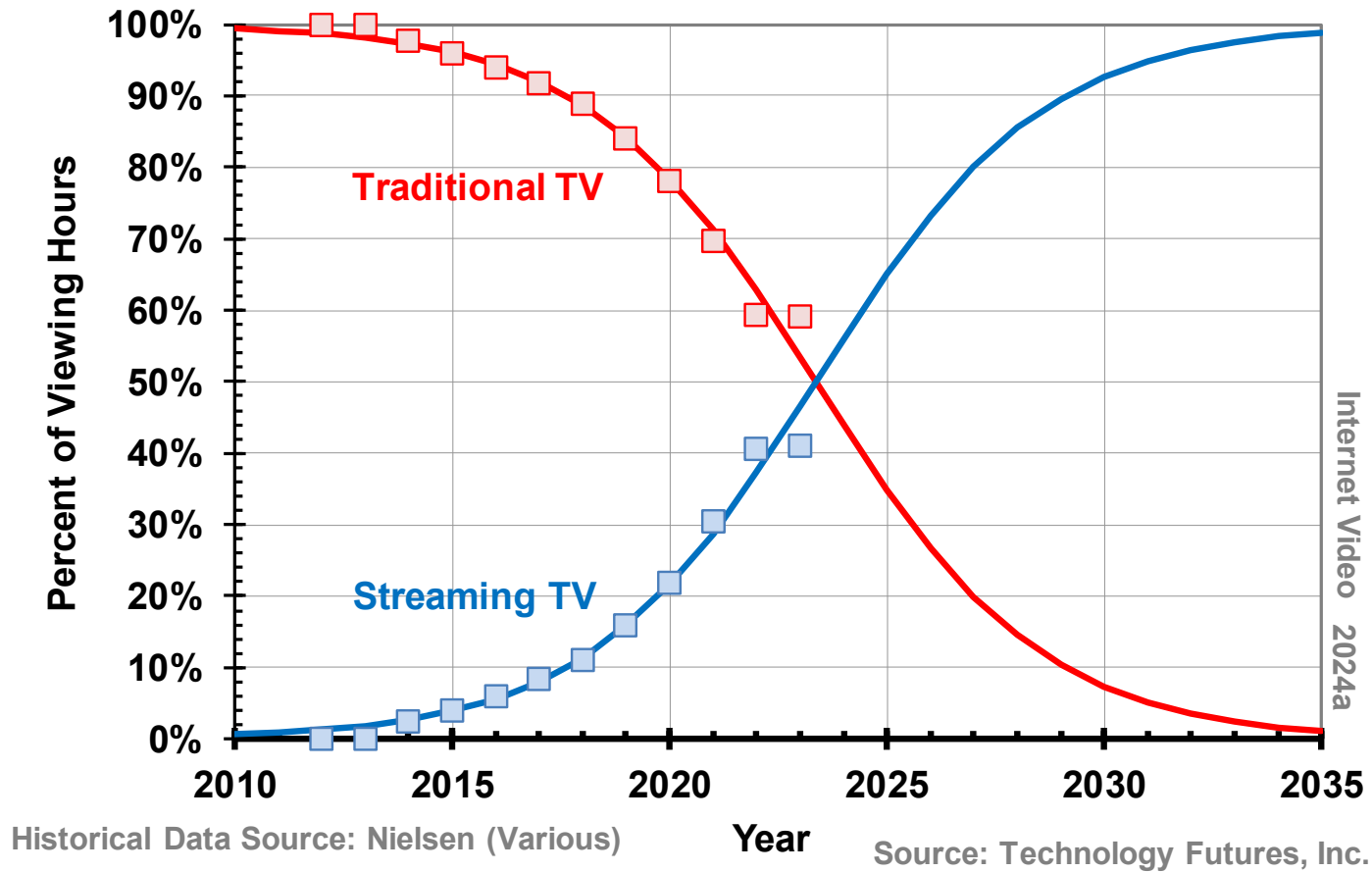
Traditional TV vs Streaming TV – 2023 TFI Forecast



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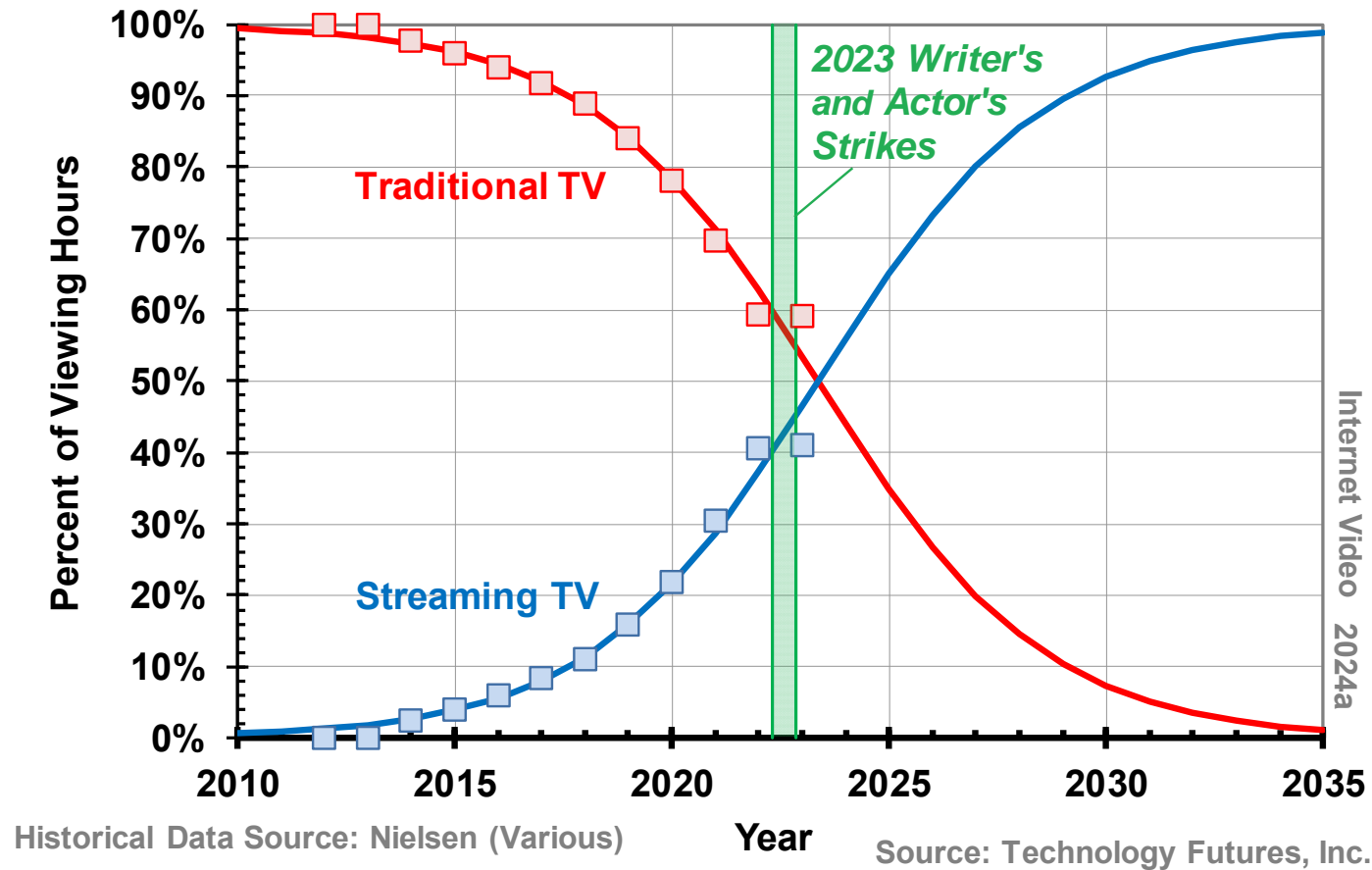
Traditional TV vs Streaming TV – 2024 TFI Forecast



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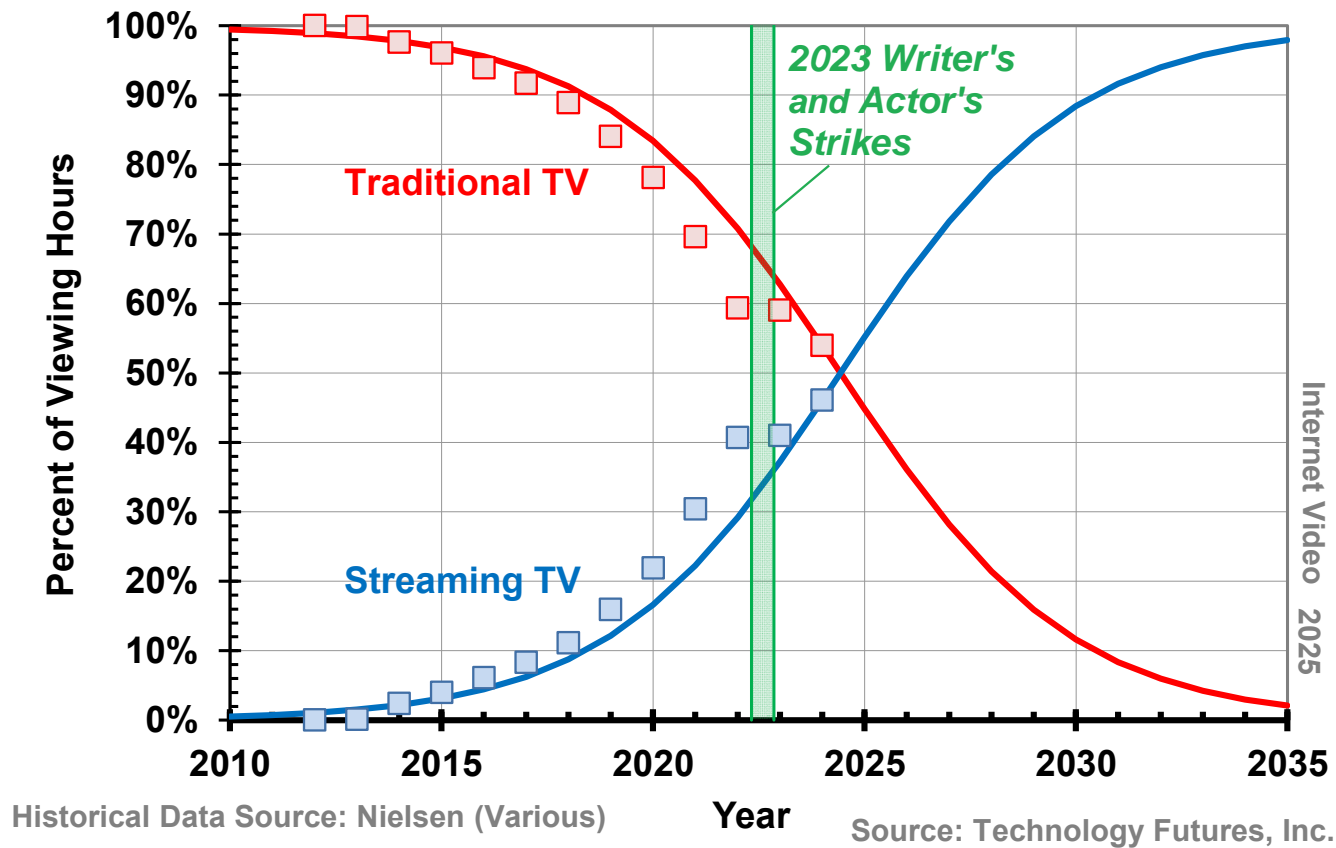
Traditional TV vs Streaming TV – 2024 TFI Forecast



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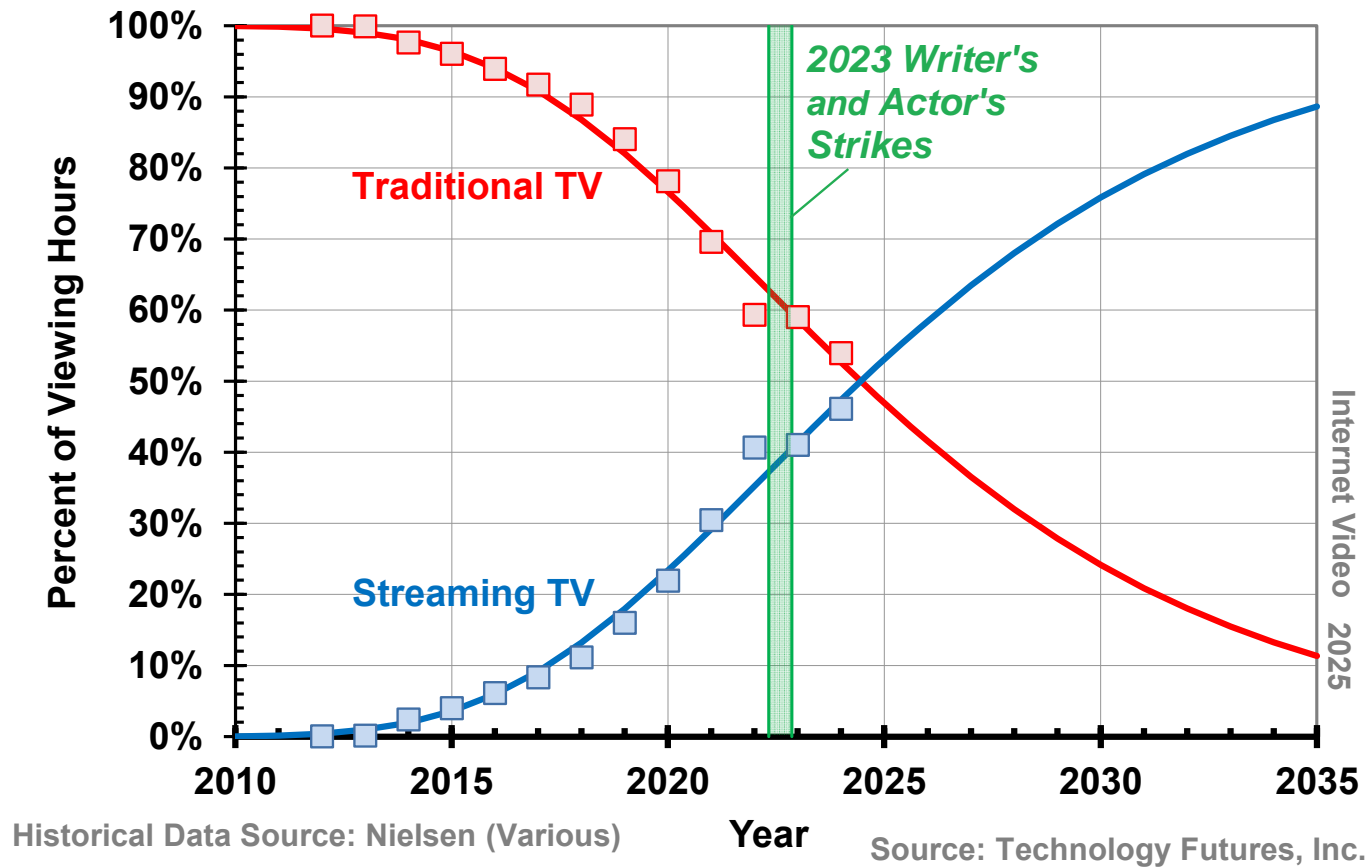
Traditional TV vs Streaming TV – 2025 TFI Forecast Scenario A (Delayed Fisher-Pry Model)



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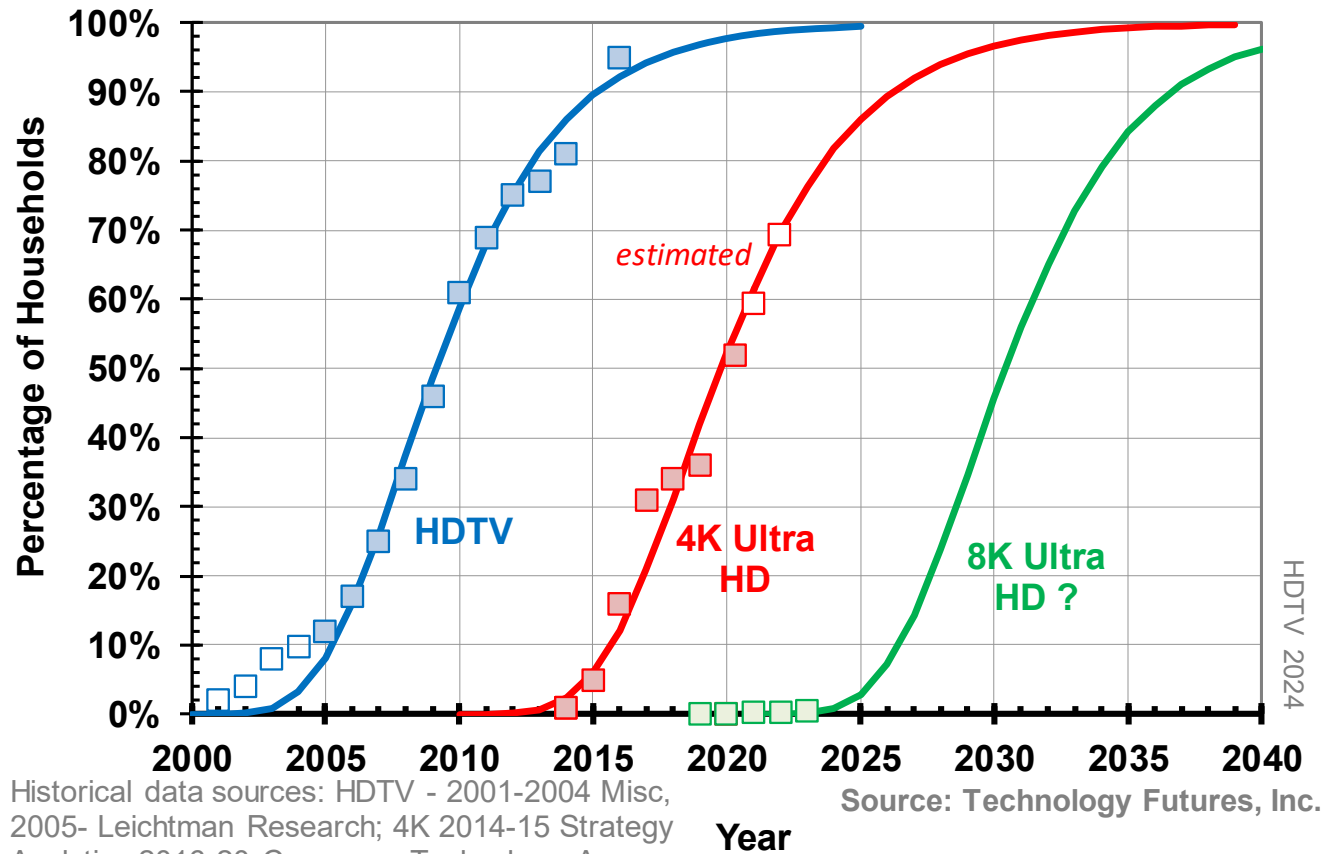
Traditional TV vs Streaming TV – 2025 TFI Forecast Scenario B (Gompertz Model)



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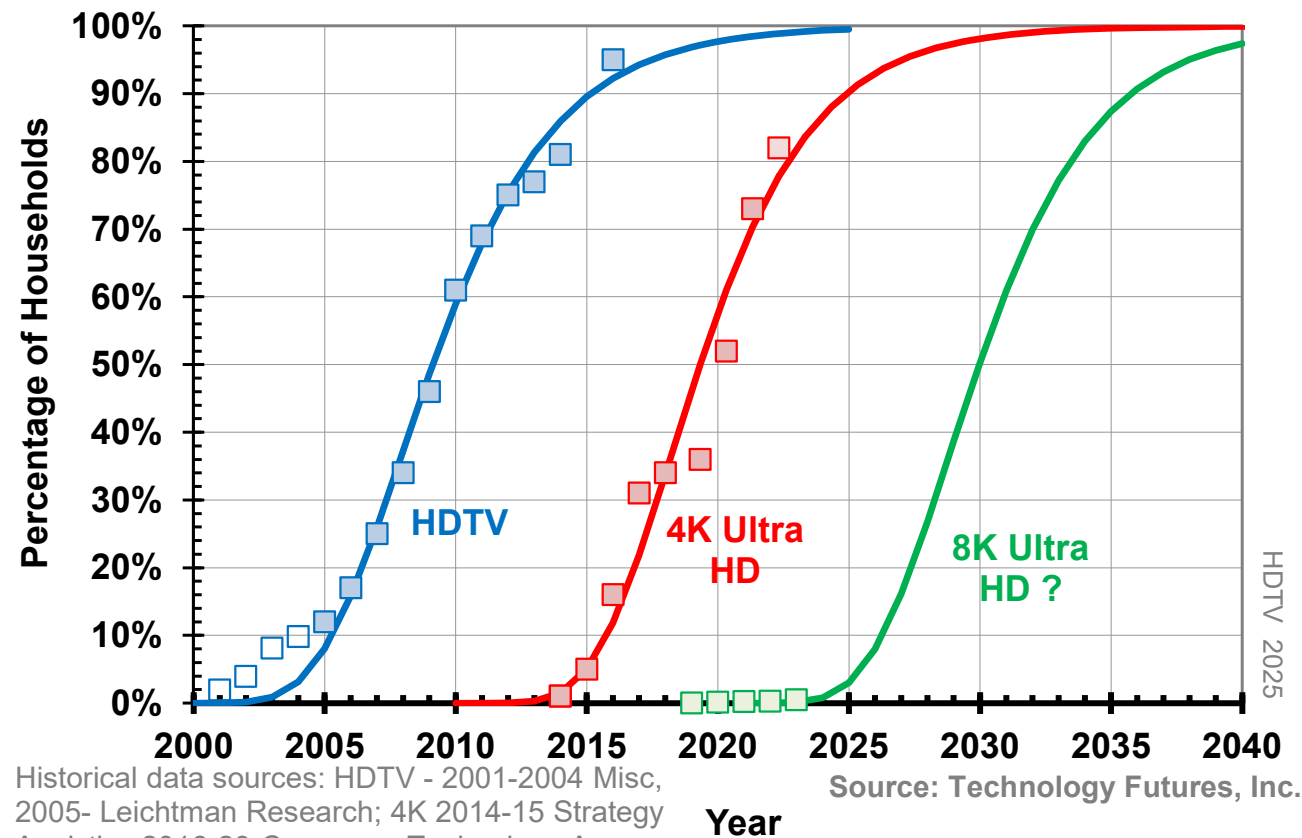
Ultra HD Households (4K and 8K) - 2024 TFI Forecast



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Ultra HD Households (4K and 8K) - 2025 TFI Forecast



Historical data sources: HDTV - 2001-2004 Misc,
2005- Leichtman Research; 4K 2014-15 Strategy
Analytics, 2016-23 Consumer Technology Assc
8K - 2019-20 Strategic Analytics, 2021-23 CTA

Source: Technology Futures, Inc.

Typical Streaming Data Rates

Std TV = ~ 2 Mb/s

HDTV = ~ 4 Mb/s

4K UHD = ~ 18 Mb/s

8K UHD = ~ 60 Mb/s

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Implications for Cable Companies

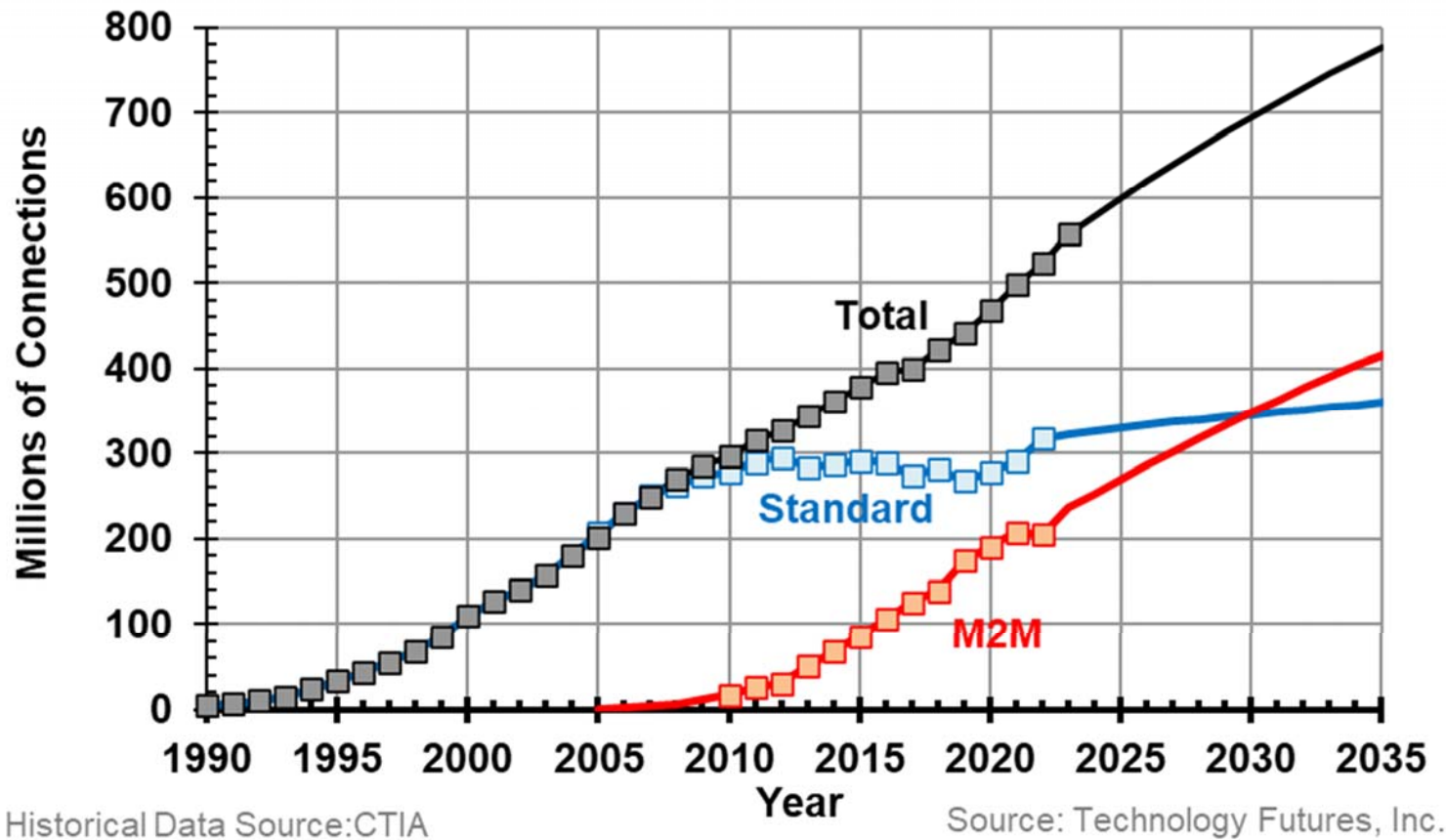
- Continued losses in multichannel TV subscriptions
- Continued need to provide multichannel and enhance broadband service simultaneously
- Competition from wireless, especially 5G
- Telcos have stepped up their game
- HFC networks are less energy efficient
- Increased investment without commensurate increase in revenue

Wireless Forecasts

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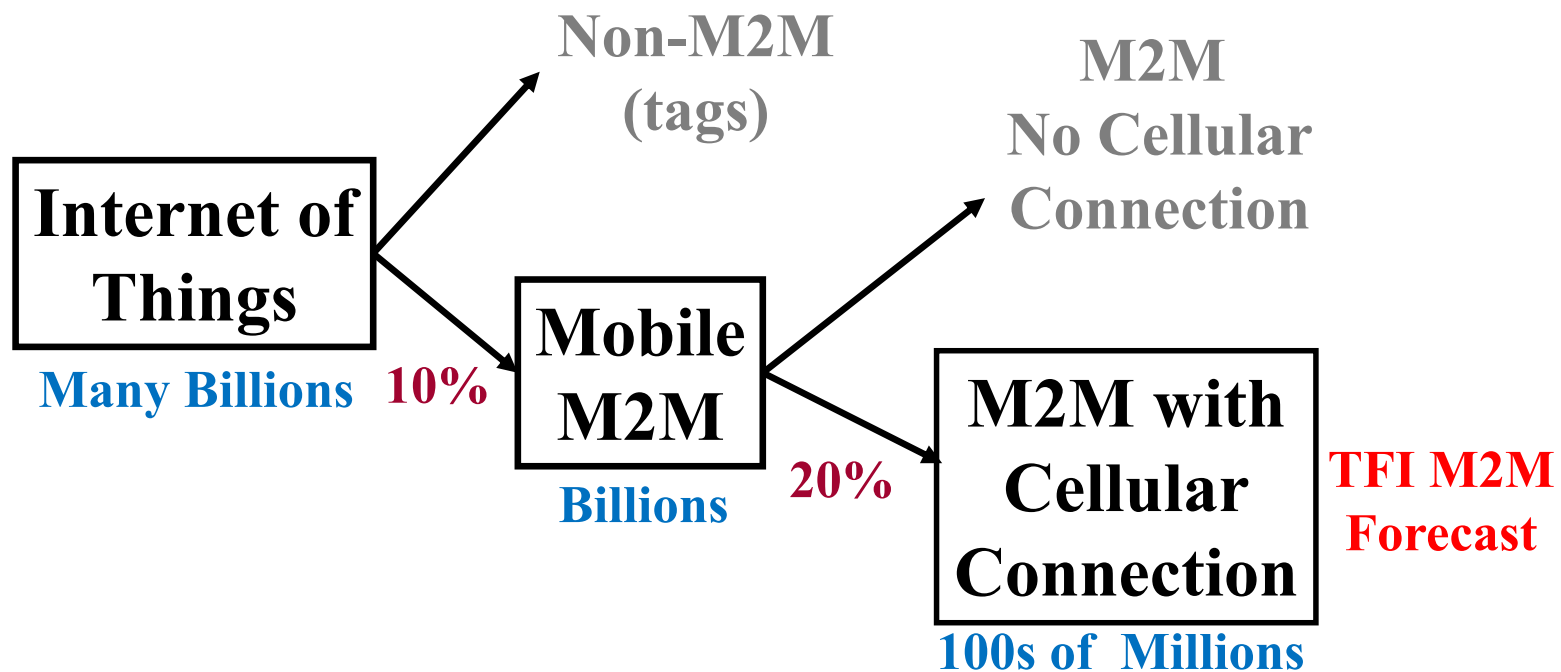
Wireless Connections – 2025 TFI Forecast



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The IoT will include many items unconnected to the cellular network

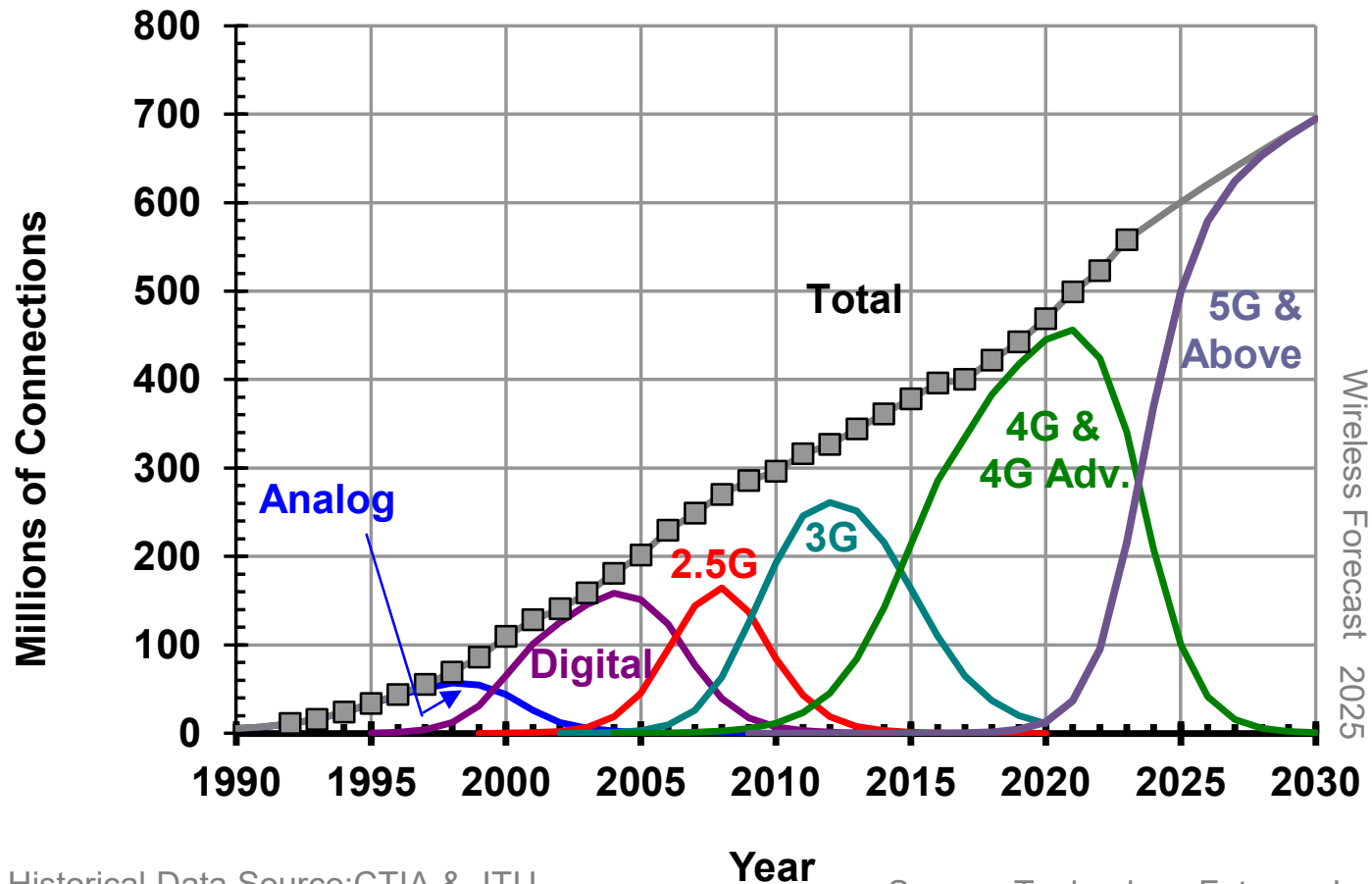


Based on GSMA estimates

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Wireless Generations – 2025 TFI Forecast



Historical Data Source: CTIA & ITU

Source: Technology Futures, Inc.

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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

Implications for Wireless Providers

- Never ending appetite for more bandwidth and performance
- Now seriously competing with wireline broadband in some cases
- More focus on M2M than before
- Greatly improving cost/performance of newer technology
- Continuous investment in new technology and spectrum

Overall Industry Assessment

- Continued increases in demand for bandwidth and higher performance
- Continued delivery of those increases – No rest for the wicked
- Continued investment in technology to make them happen
- All in a highly competitive environment
- And still central to our future!

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A stylized graphic of a bridge with two arches, rendered in light blue and pink. The bridge spans the width of the slide, with its supports extending down to the bottom edge. The main title is centered over the bridge.

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