Connecting America's Students: Opportunities for Action

An Analysis of E-rate Spending

April 2014

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Agenda

- Data Sample and Collection Process
- Where We Stand vs. ConnectED Goals
- What Drives the Connectivity Gap
- Opportunities to Accelerate Progress to 99% in 5

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Key Takeaways

- **40 million students lack adequate access to high-speed broadband**
  - Wealthiest districts are twice as likely to meet the current ConnectED goals
  - Poorest districts are 30% less likely to meet the current ConnectED goals
  - Rural schools are more than twice as likely to be without access to fiber
- **Affordability is the #1 challenge to meeting the ConnectED goals**
  - Schools meeting the current ConnectED goals pay 1/3 the price
  - Schools meeting the current ConnectED goals budget 450% more per student
- **Focusing E-rate on broadband allows 96% of schools to meet today's Internet access and WAN standards**
  - Would not provide sufficient resources to meet LAN / Wi-Fi goals
- **Meeting the five year ConnectED goals will likely require both lower prices and more resources**
  - Migrate to fiber
  - Purchase at scale
  - Take advantage of competition
  - Take local initiative to create more broadband options

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The Data

Final Item 21 data sample represents ~11,000 schools & ~6M students across 45 states

Total Item 21 sample:

- 1,044 public school districts
- $468M pre-discount spending
- $363M funding requested

Priority 1 sample:

- 1,039 public school districts
- $263M pre-discount spending
- $188M funding requested

- Analysis assumes 95% of districts benefit from E-rate and receive an average discount of 70% → overall E-rate discount of 66.5%
- Analysis extrapolates data sample to $2.38B funding cap for Funding Year 2013 and national population of ~100,000 public K-12 schools

Data Collection and Coding Process

Key steps to collect and analyze E-rate Form 471 Item 21 attachment data

1 Data Collection	• Collect Item 21s from schools, districts and consortia
2 Data Check	• Check that all Item 21 attachments have been received based on submitted Form 471 Application Numbers and FRNs
3 Data Input	• Input every line item into a protected database
4 Data Categorization	• Categorize each line item into ESH-specific subcategories and service/product types and highlight those that are unclear
5 Data Clarification	• Clarify ambiguous line items by emailing and/or calling school district contacts
6 Data Analysis	• Match sample to actual E-rate distribution by district size and geography

ConnectED Goals in Practice

	Current Goals	Five Year Goals
Internet Access	100 kbps per student	1 Mbps per student
Wide Area Network (WAN)	1 Gbps per school	
Local Area Network (LAN)	1 Gbps	
Wireless Network	Capable of supporting 1:1 learning in every classroom and learning area	

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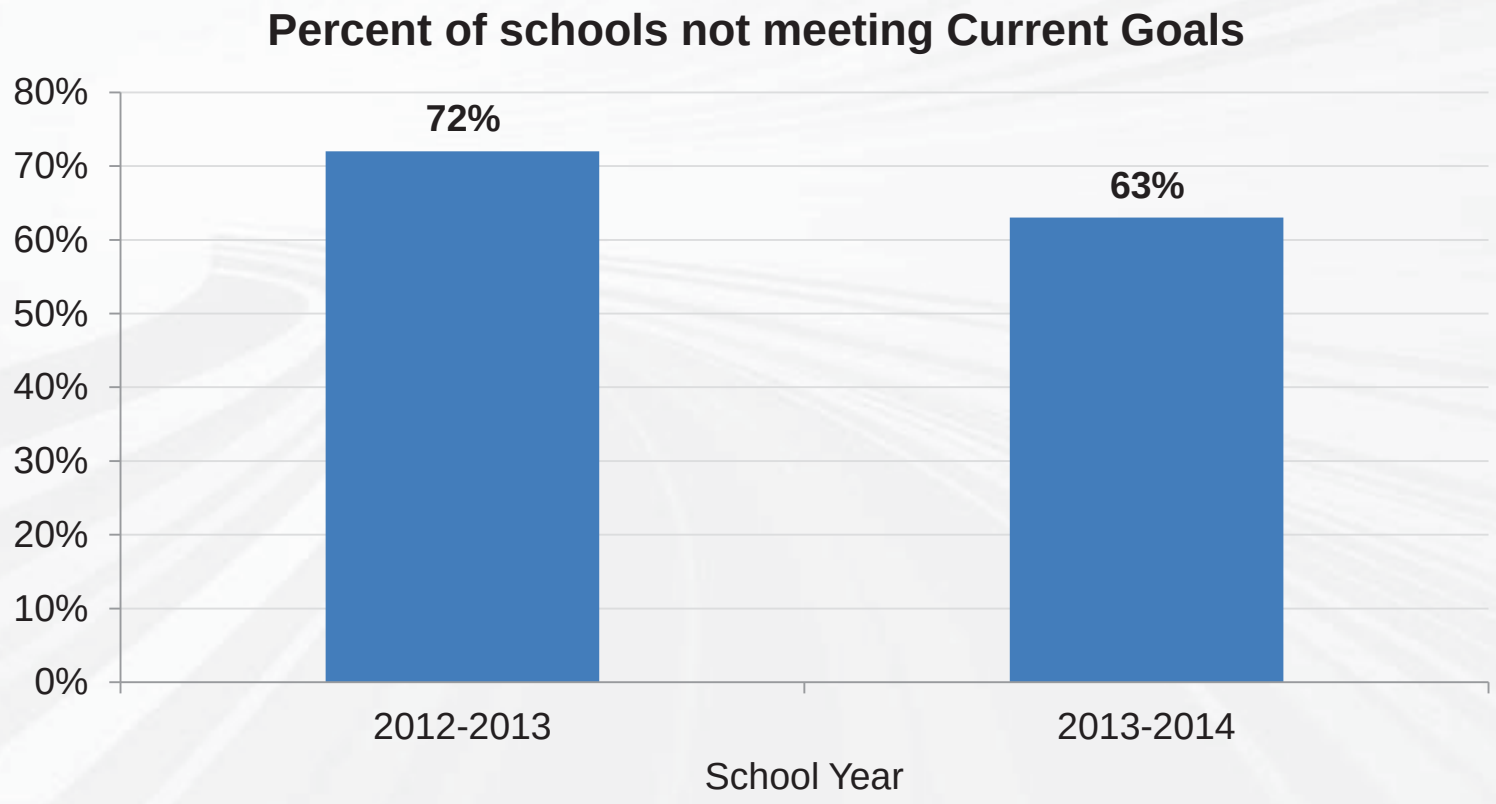
Where We Stand (SchoolSpeedTest)

It will take 7 years to reach the current ConnectED goals, by which time schools will need 10x more bandwidth

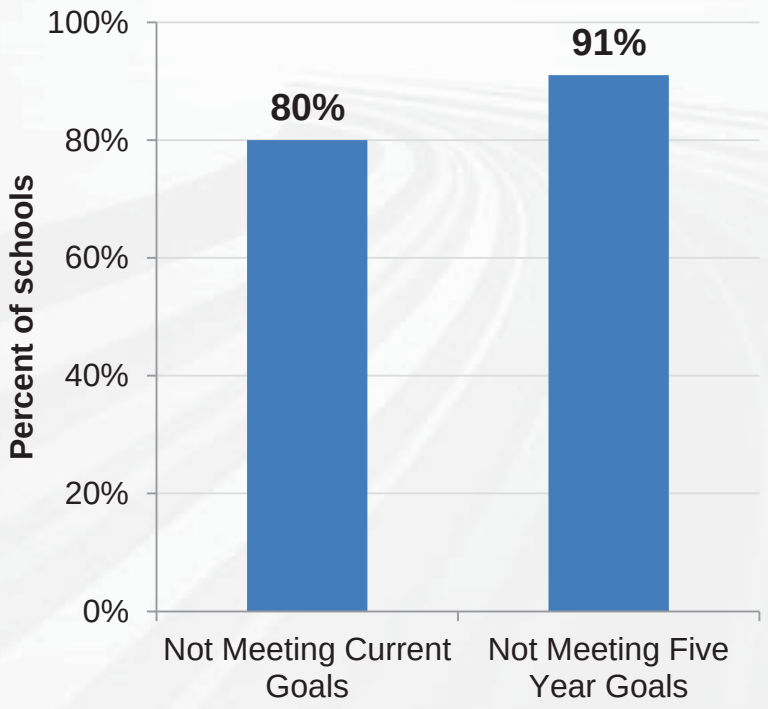


Source: EducationSuperHighway National SchoolSpeedTest

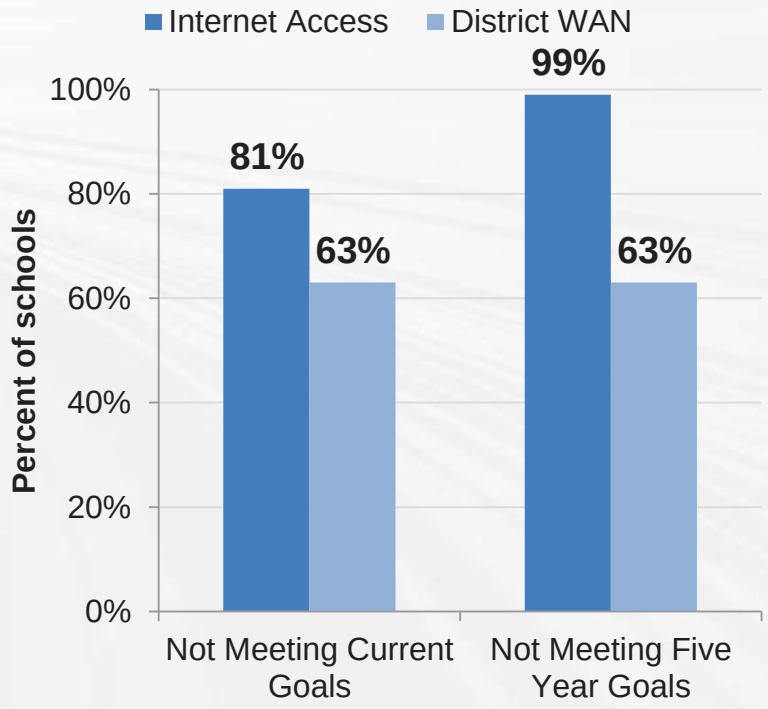
Where We Stand (Item 21 Analysis)

The vast majority of districts are not purchasing enough bandwidth to meet Current Goals

Overall Network Readiness



Internet Access vs. WAN Readiness



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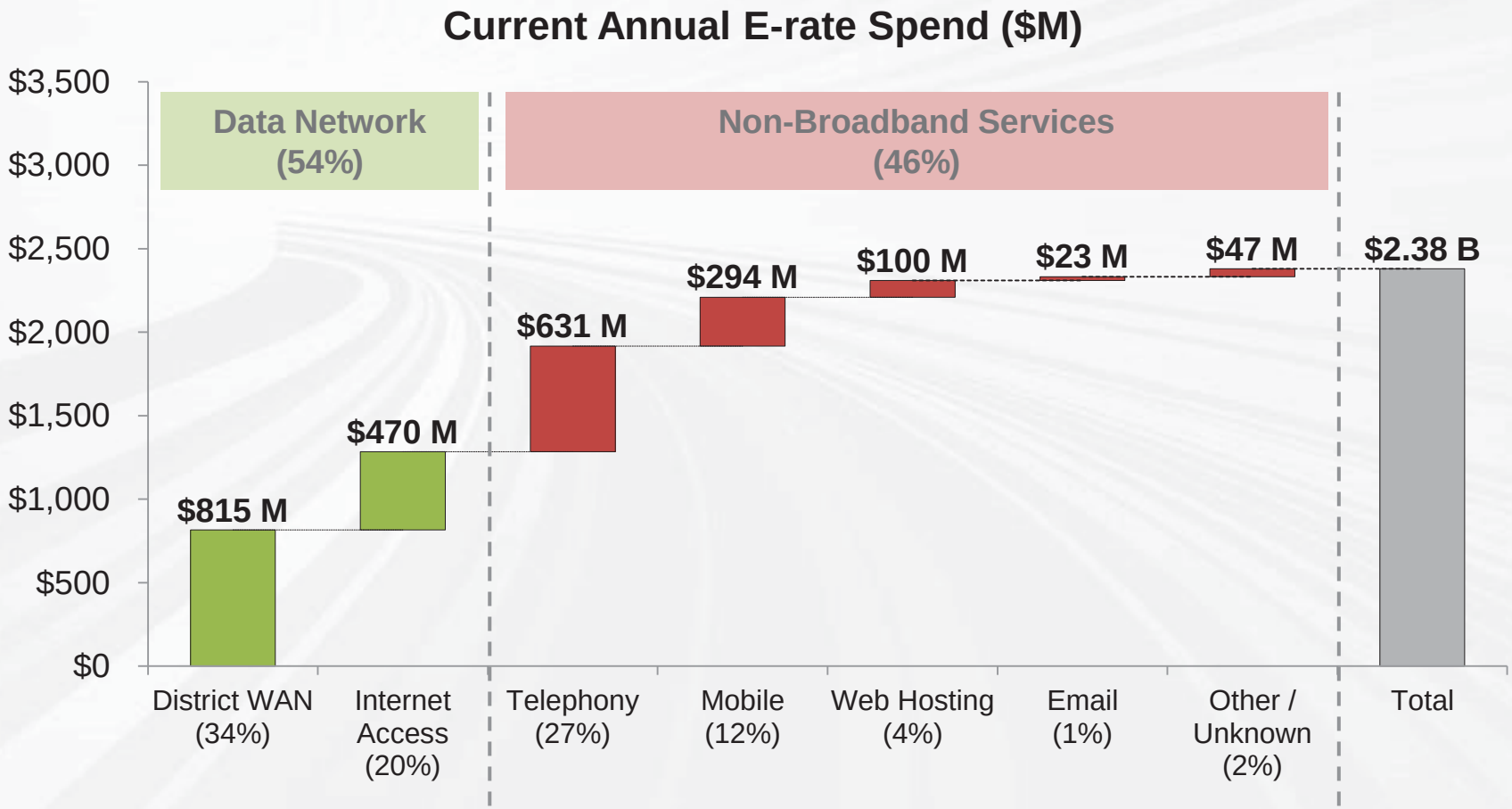
How E-rate is Spent Today

$1.1 billion is being spent on non-broadband legacy services that do not support learning



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What Drives the Connectivity Gap

Key Issues:

1. Access to fiber
2. Affordability and district resources
3. Scale of procurement
4. Effectiveness of procurement

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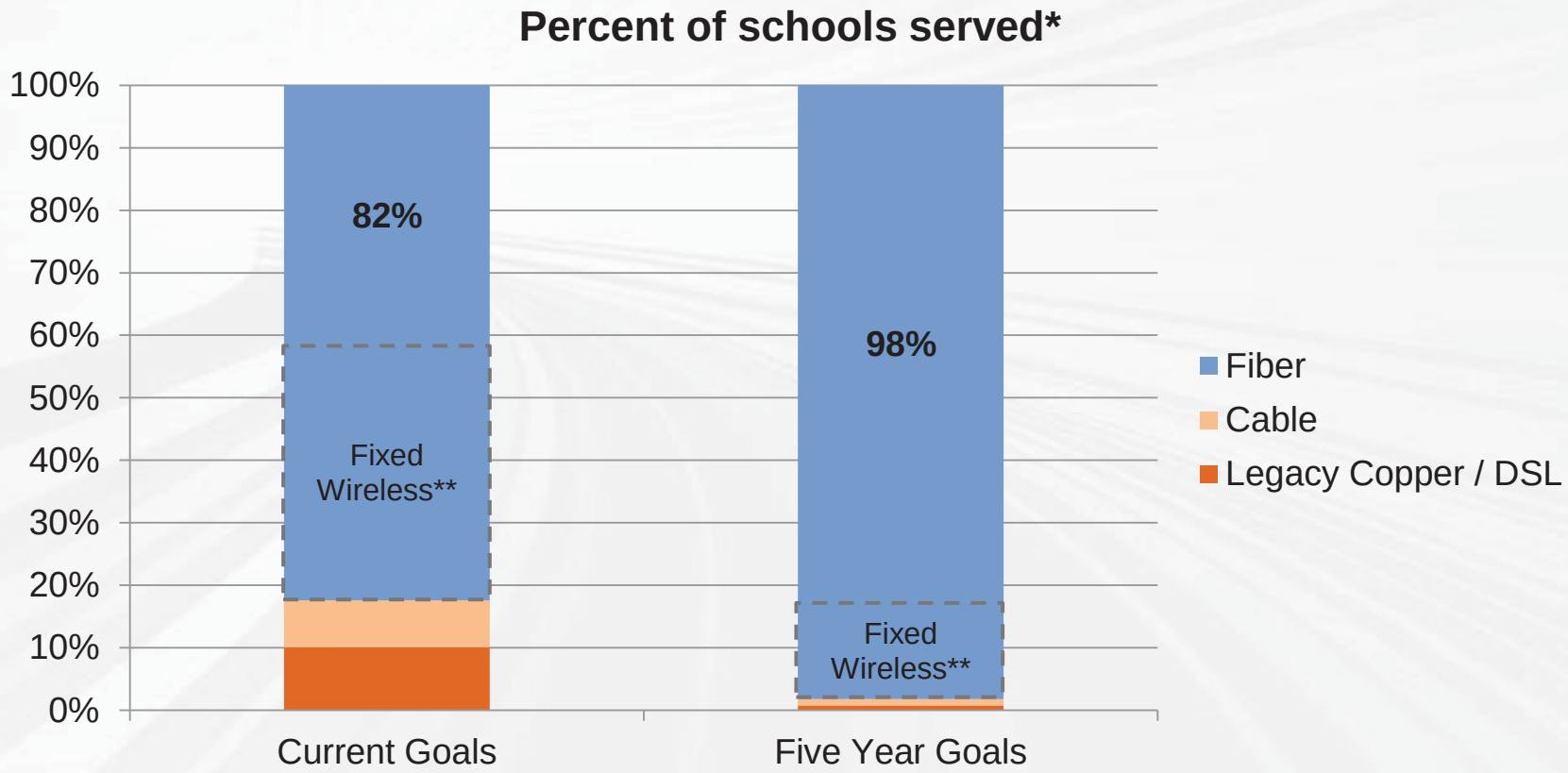
Issue 1:

Access to Fiber

Only fiber can meet the needs of 98% of schools in five years



*Based on common commercially available maximum speeds of various technologies.
**Fixed wireless (max capacity 1 Gbps) can serve an additional 41% of schools today and 16% of schools in five years, however it is over 2x more expensive than fiber

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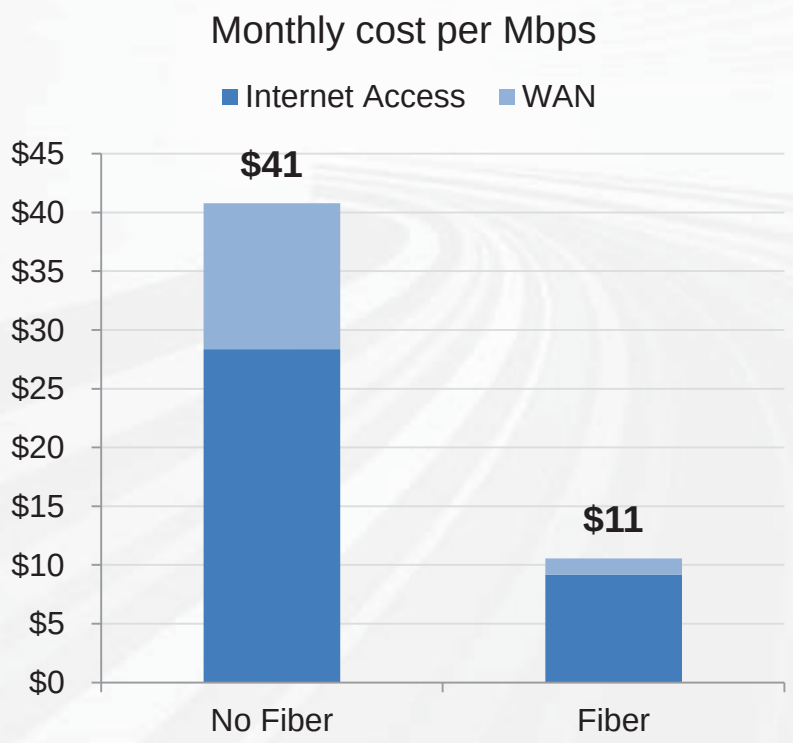
Issue 1:

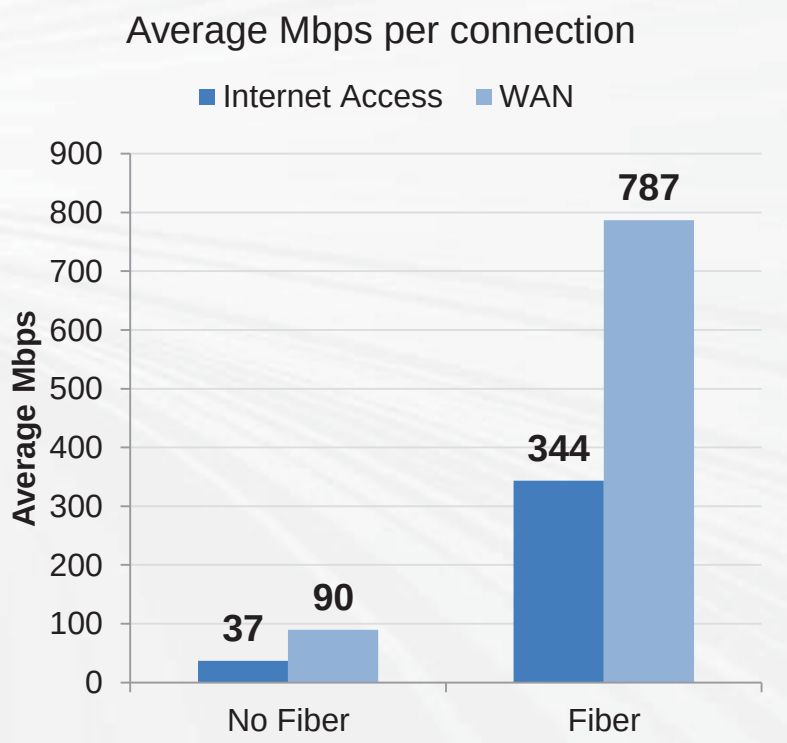
Access to Fiber

Districts with access to fiber have 75% lower costs and ~9x more bandwidth

Cost of Fiber



Capacity of Fiber



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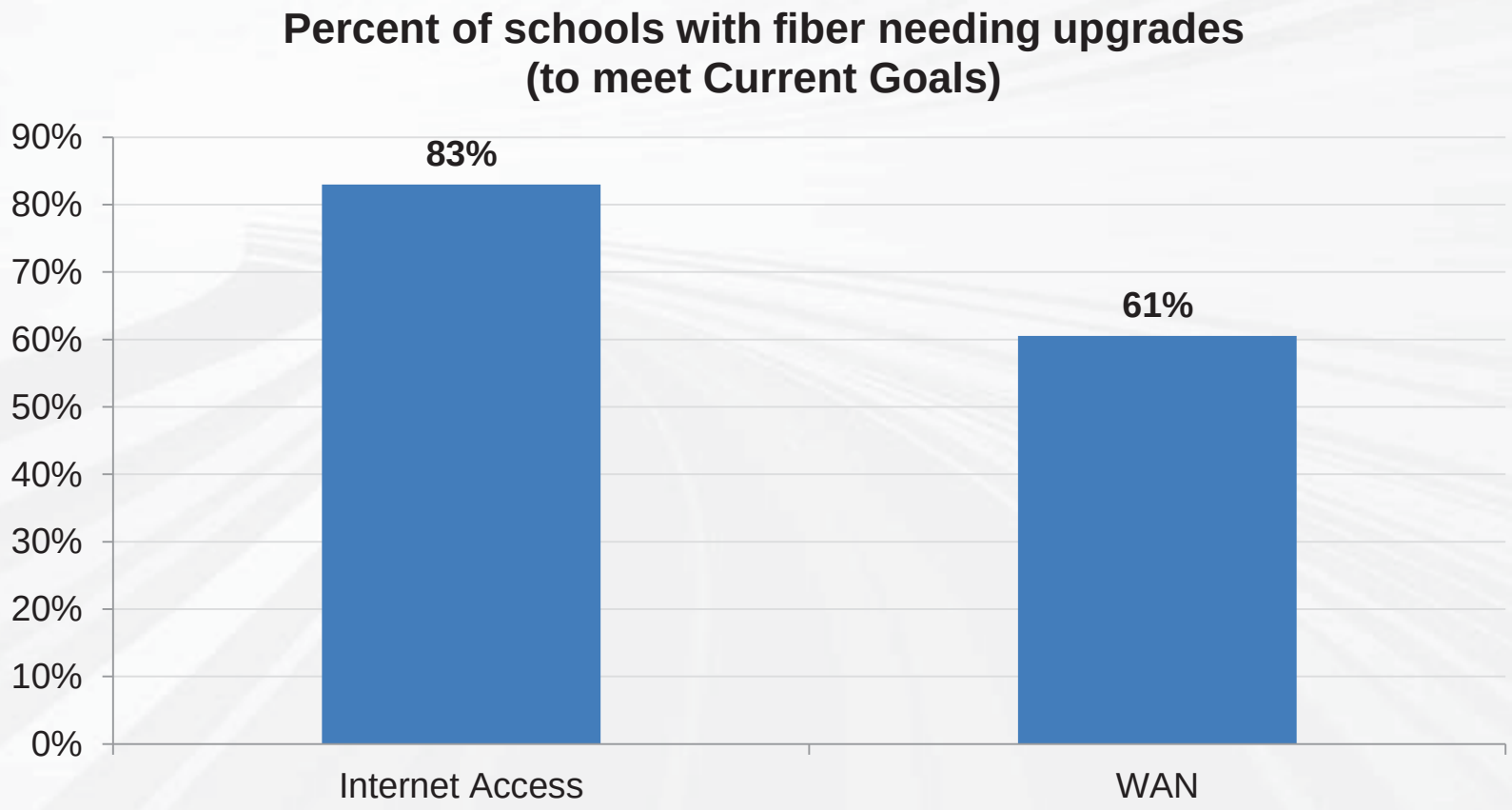
Issue 2:

Affordability and Resources

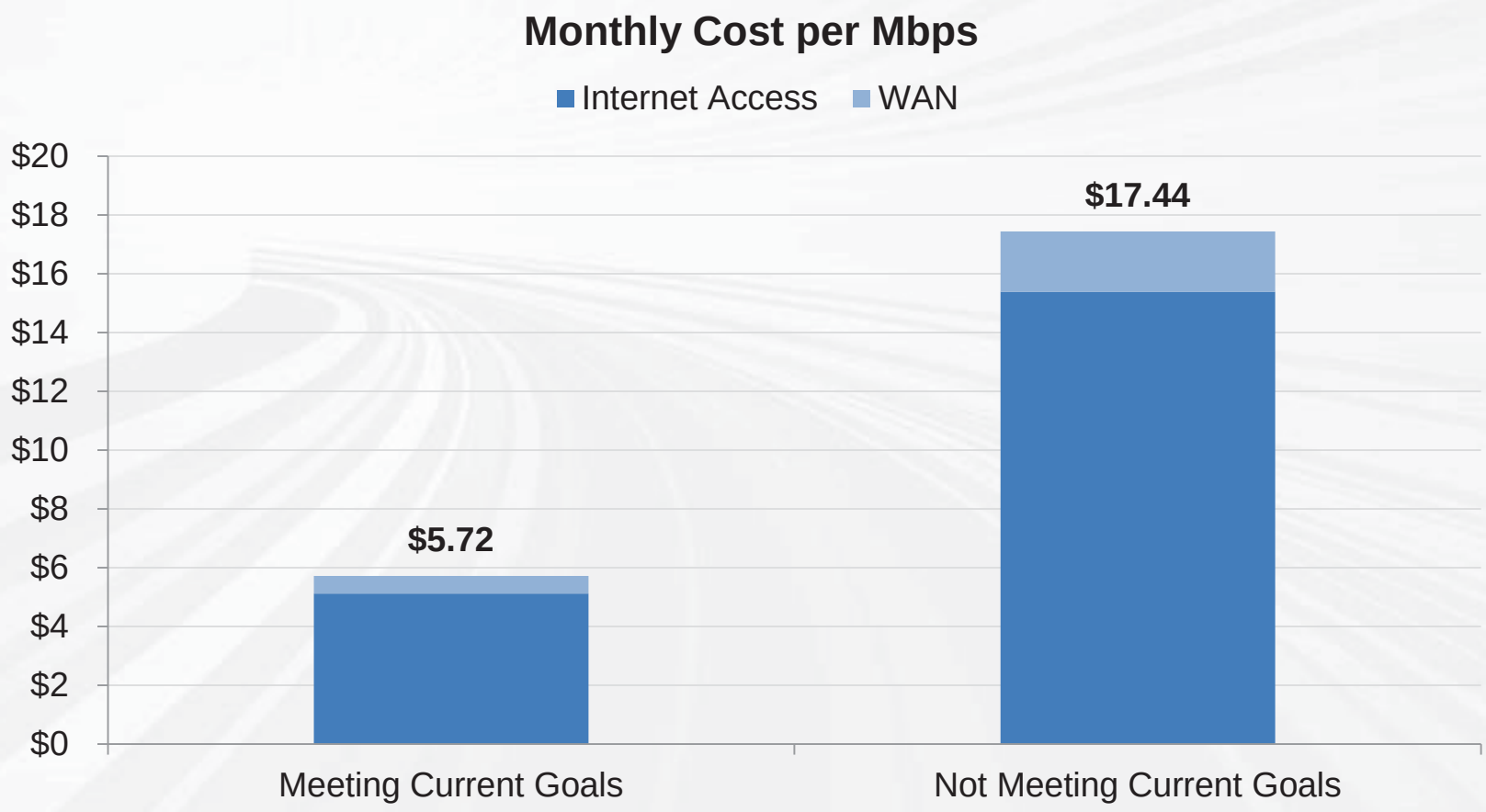
Majority of schools with access to fiber still don't purchase enough bandwidth



Issue 2:

Affordability and Resources

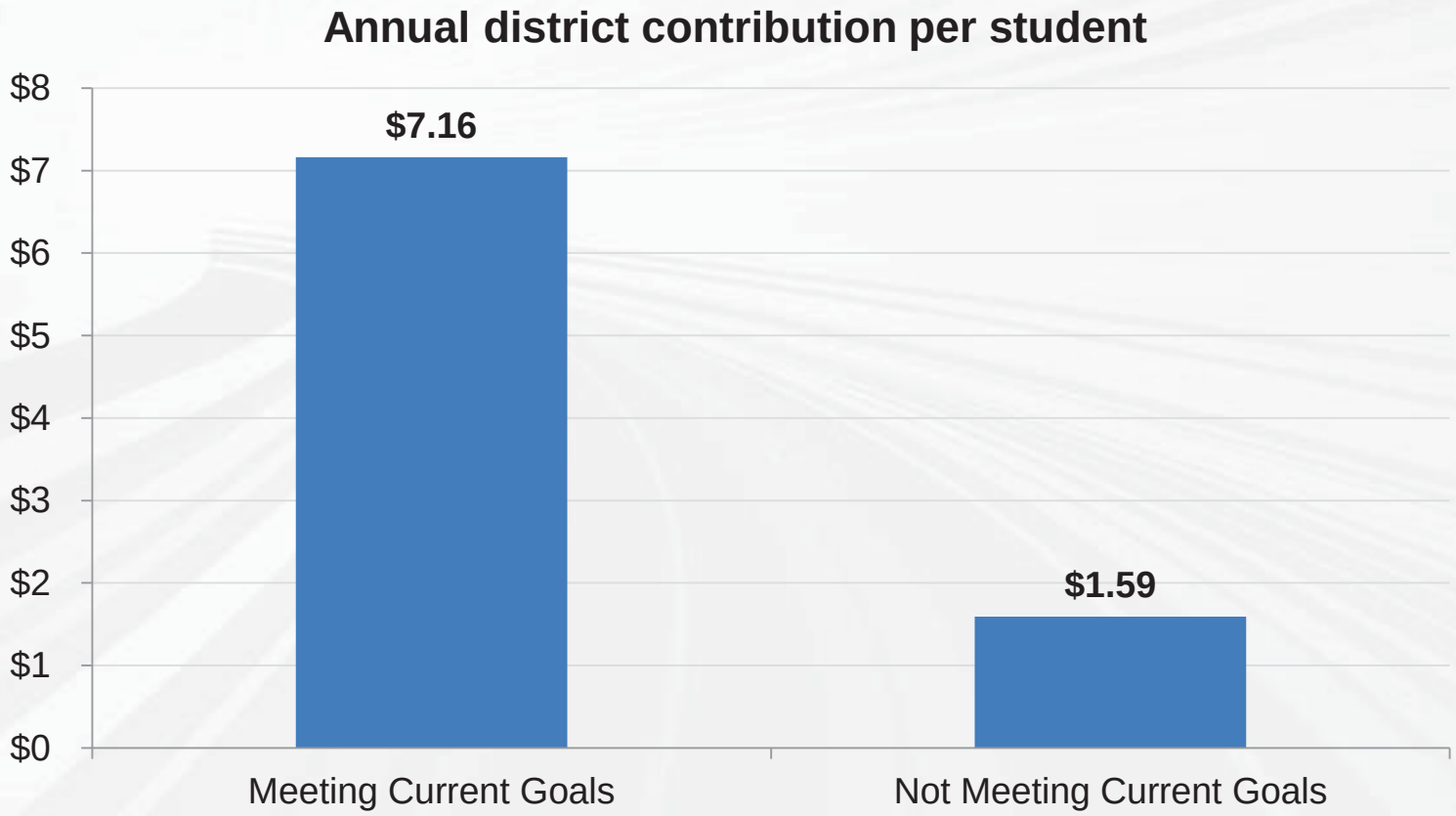
Districts meeting Current Goals pay 1/3 the price of those that do not meet Current Goals



Issue 2:

Affordability and Resources

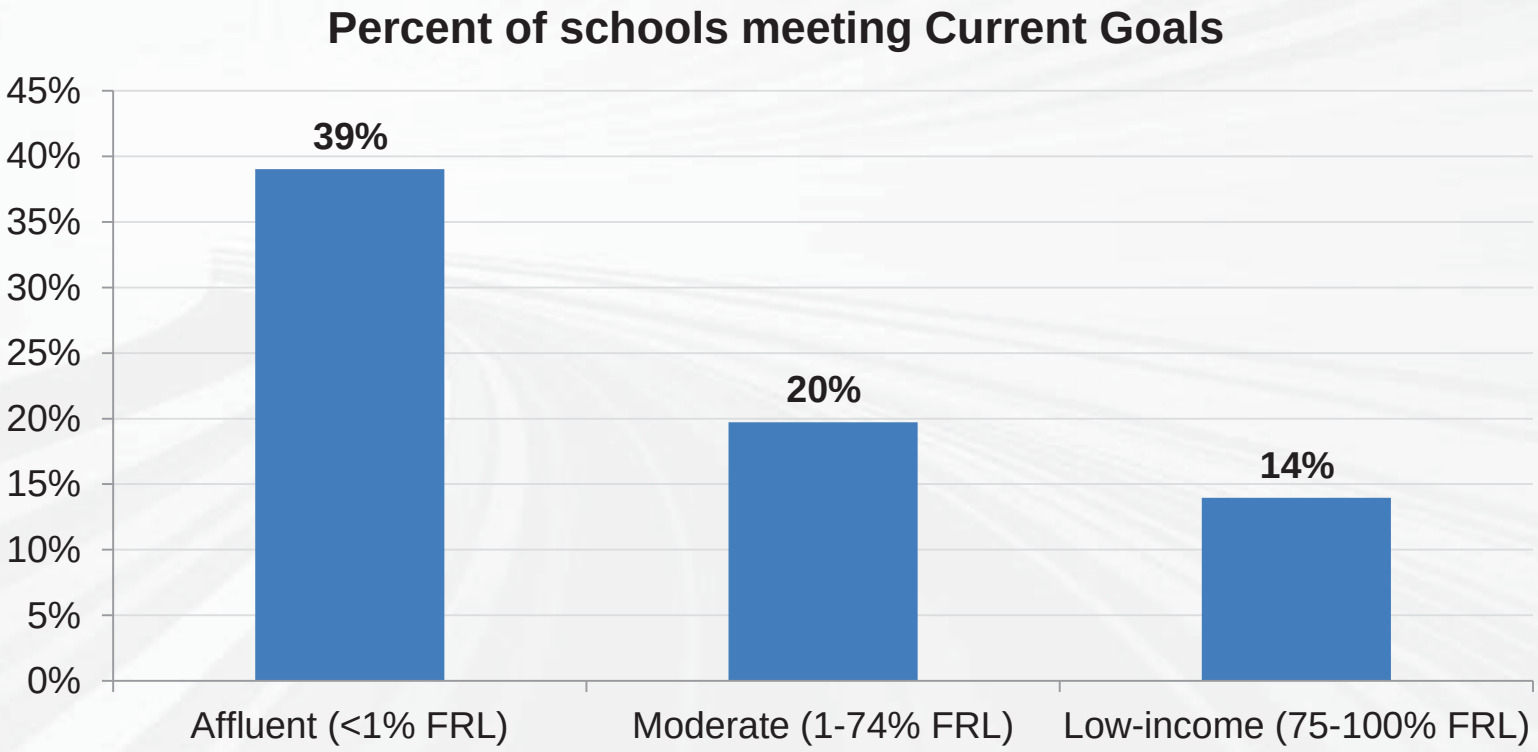
Districts meeting Current Goals invest approximately 4.5 times more from their budgets for Internet access



Issue 2:

Affordability and Resources

Affluent schools are ~ 3x more likely to be meeting Current Goals than low-income schools



% of total schools	2%	83%	15%

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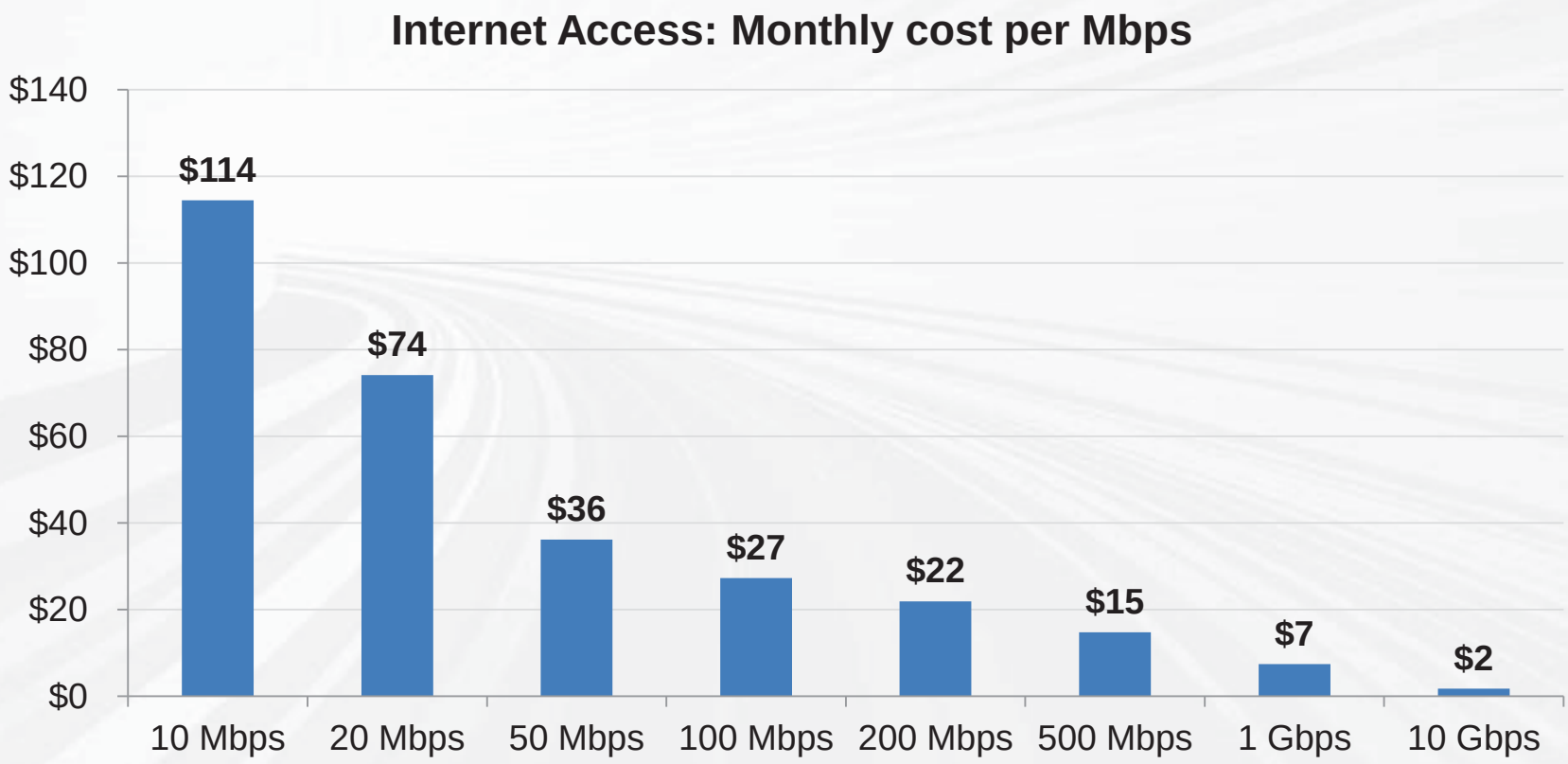
Issue 3:

Scale of Procurement

Schools are purchasing too little bandwidth to take advantage of economies of scale



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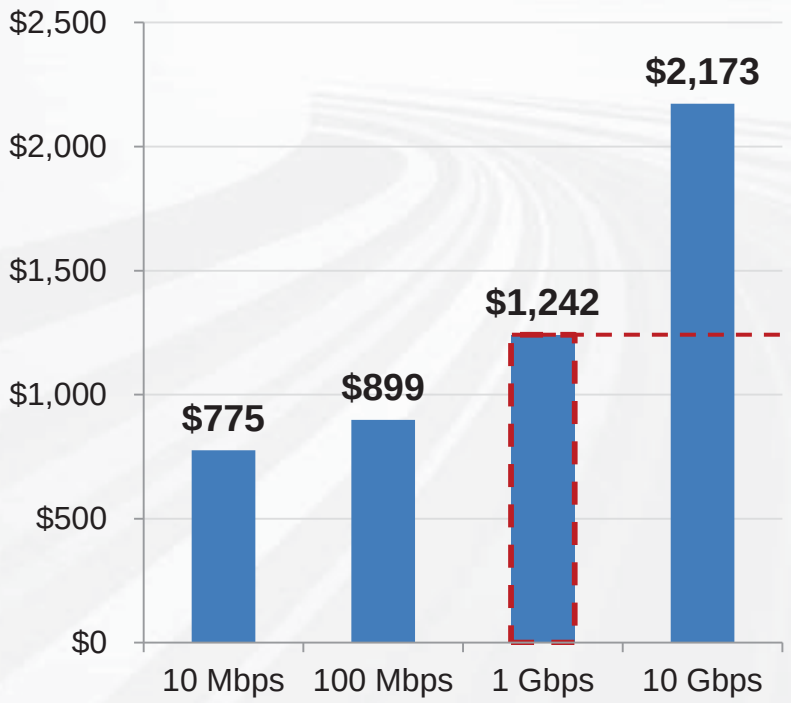
Issue 3:

Scale of Procurement

WAN economies of scale are present in all geographic categories

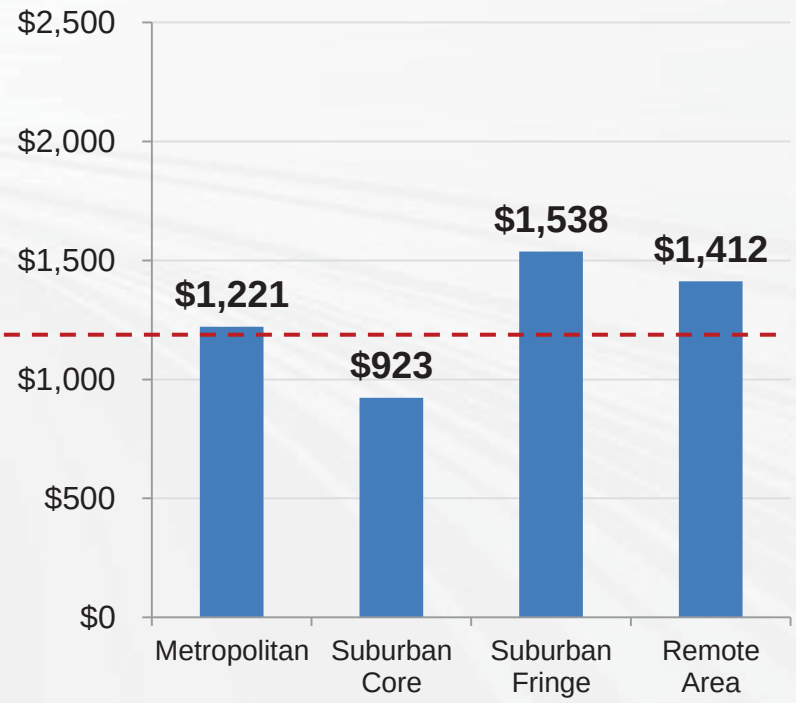
WAN Cost per Circuit

Monthly cost per connection
(lit fiber)



WAN Cost by Locale

Monthly cost per connection
(1 Gbps lit fiber)



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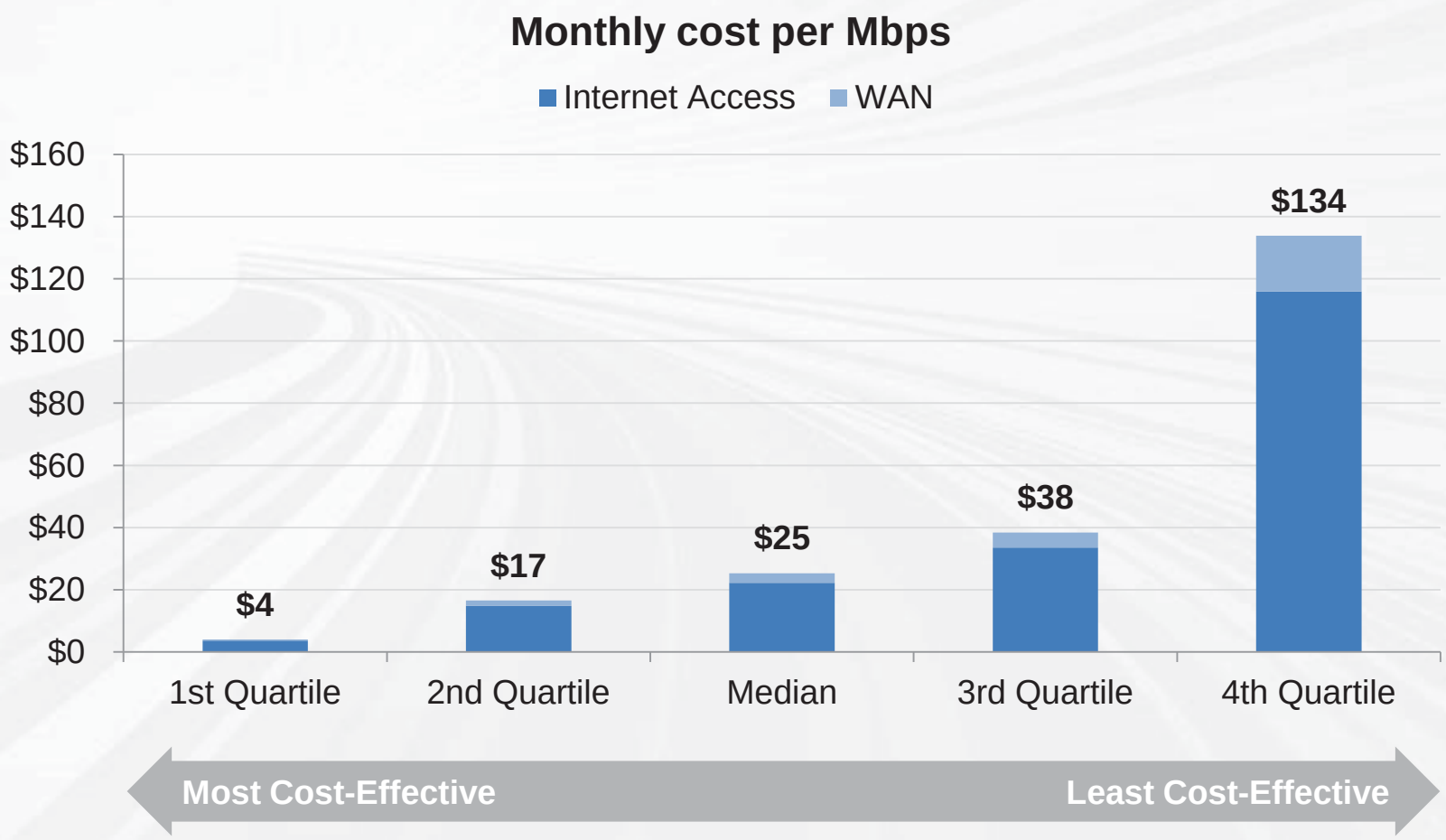
Issue 4:

Effectiveness of Procurement

Median cost per Mbps is over six times higher than the top quartile



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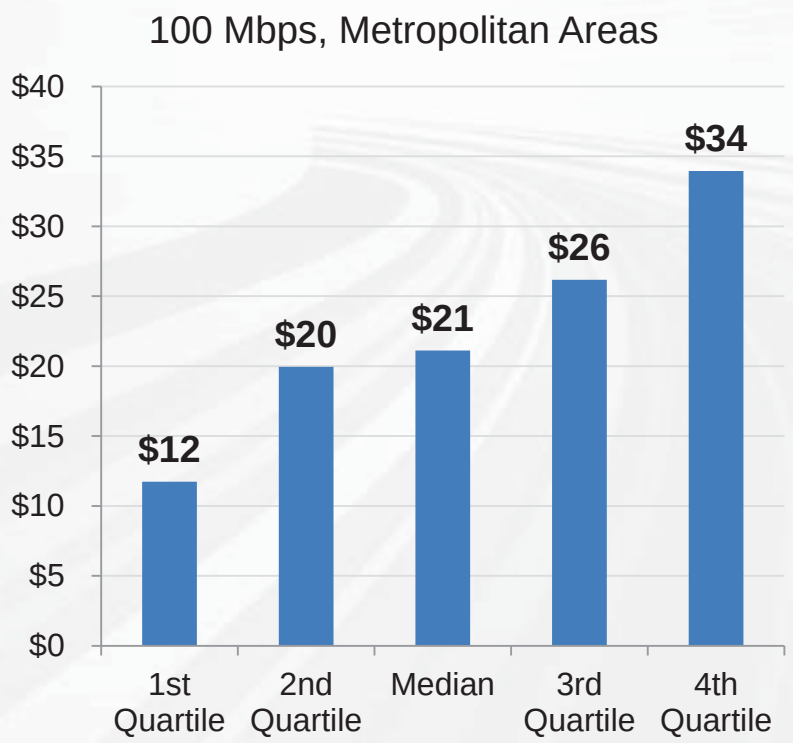
Issue 4:

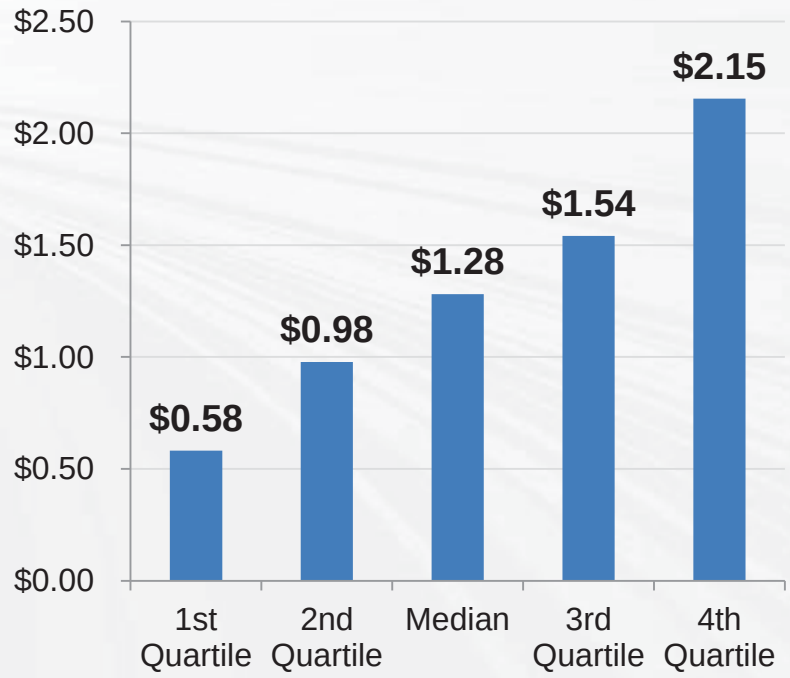
Effectiveness of Procurement

Cost per Mbps varies even controlling for locale and speed

Internet Access: Monthly cost / Mbps



District WAN: Monthly cost / Mbps



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How to Accelerate Progress to 99% in 5

Accelerators:

1. Connect schools to fiber
2. Focus E-rate on broadband
3. Lower the cost of broadband
4. Increase the E-rate funding cap

Strategies must be pursued holistically to close the gap for all schools

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Accelerator 1:

Connect Schools to Fiber

- **98% of schools will need fiber to meet the Five Year Goal**
- **Cable modem is an effective option for small districts today**
  - Median district meeting Current Goals on cable modem has 3 schools and ~500 students
  - Most schools served by cable companies use fiber
- **Fixed wireless delivers 1 Gbps capacity, but at over 2x the cost**
  - Internet Access: Fixed wireless costs $73 per Mbps
  - WAN: Fixed wireless costs $2,283 per circuit
- **Mobile LTE is not an affordable wide-scale solution**
  - At current rates, it would cost E-rate $16B per year to serve all students

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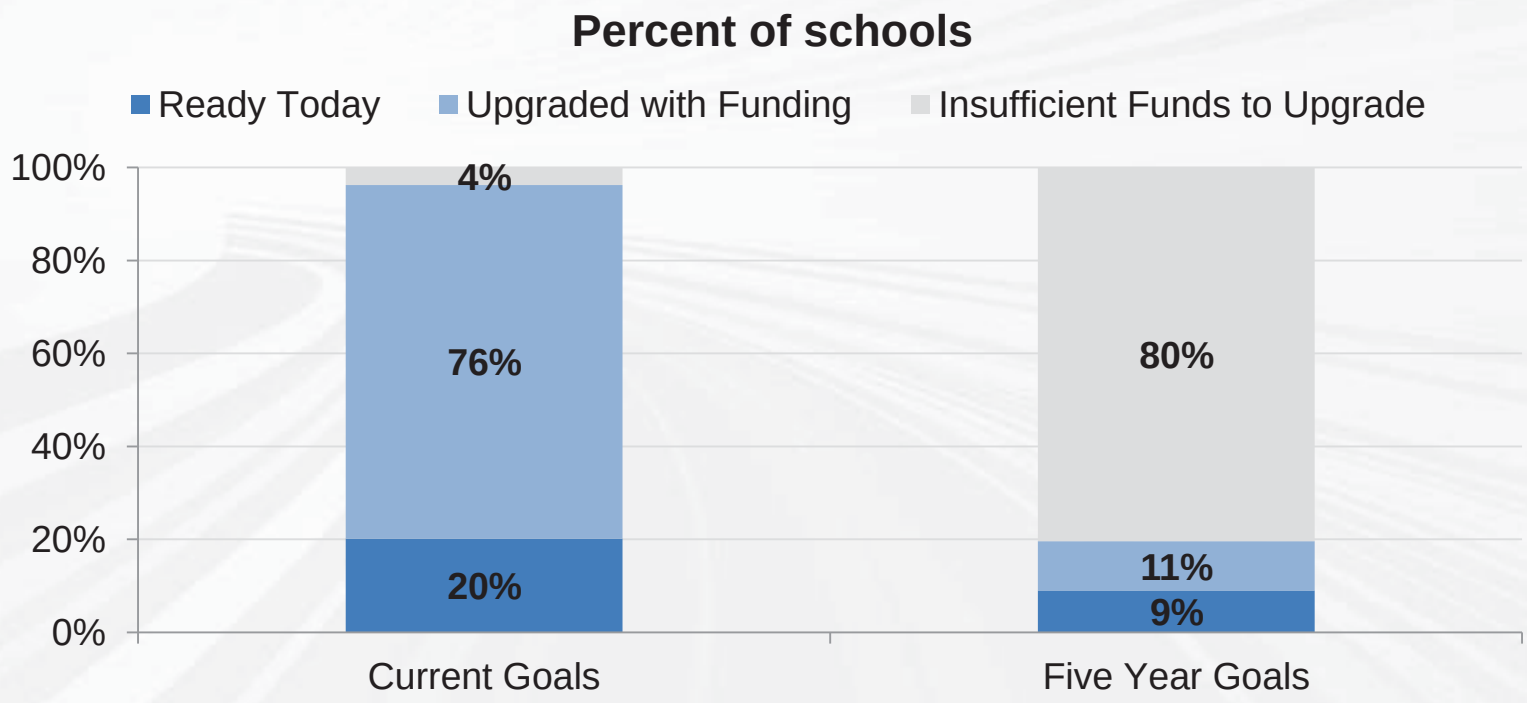
Accelerator 2:

Focus E-rate on Broadband

Transitioning $1.1B of legacy spending to broadband advances Current Goals but leaves a large gap against Five Year Goals



Additional $750-800M per year needed for LAN / Wi-Fi

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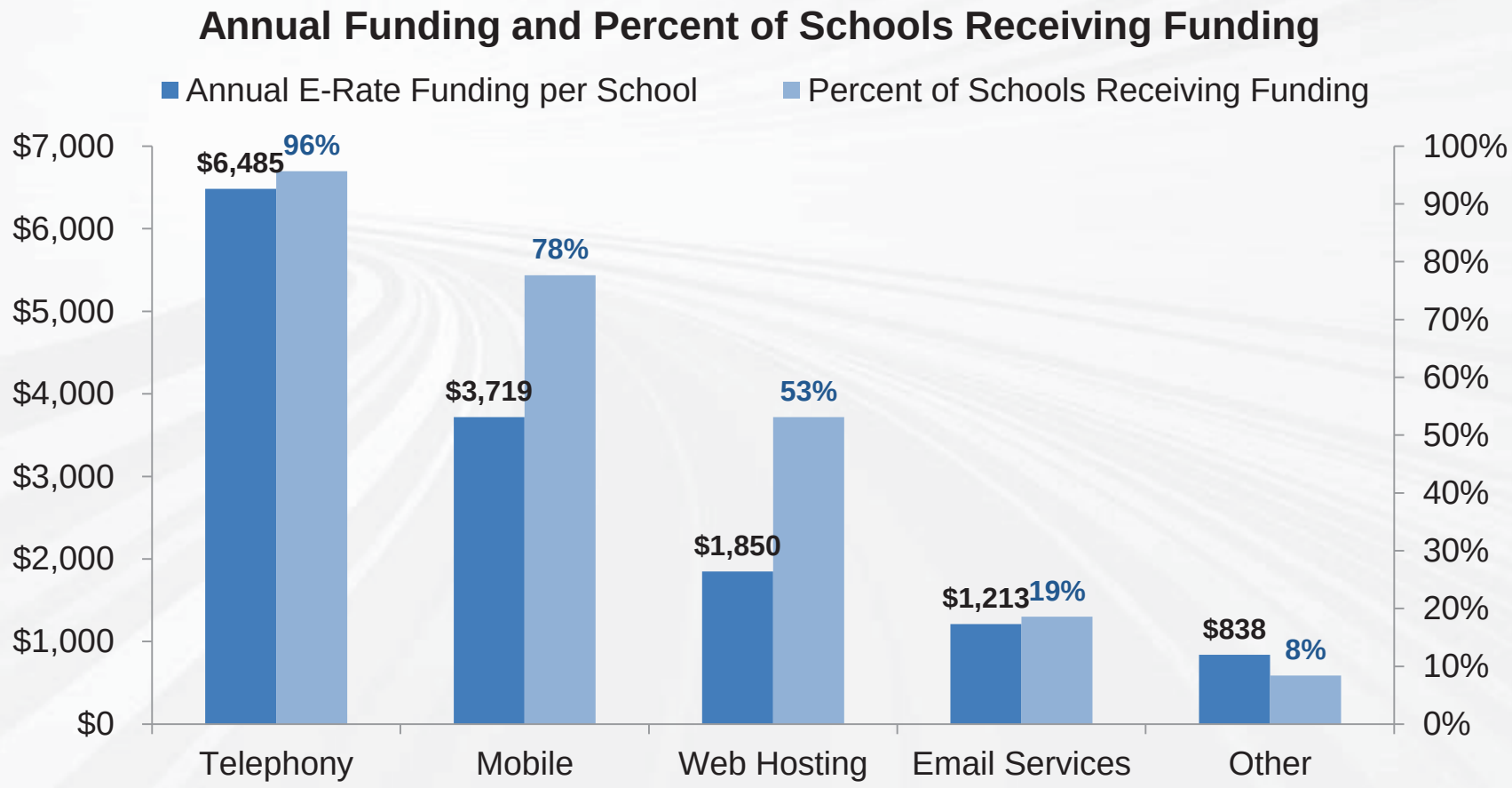
Accelerator 2:

Focus E-rate on Broadband

On average, schools receive ~$11,000 per year for non-broadband services



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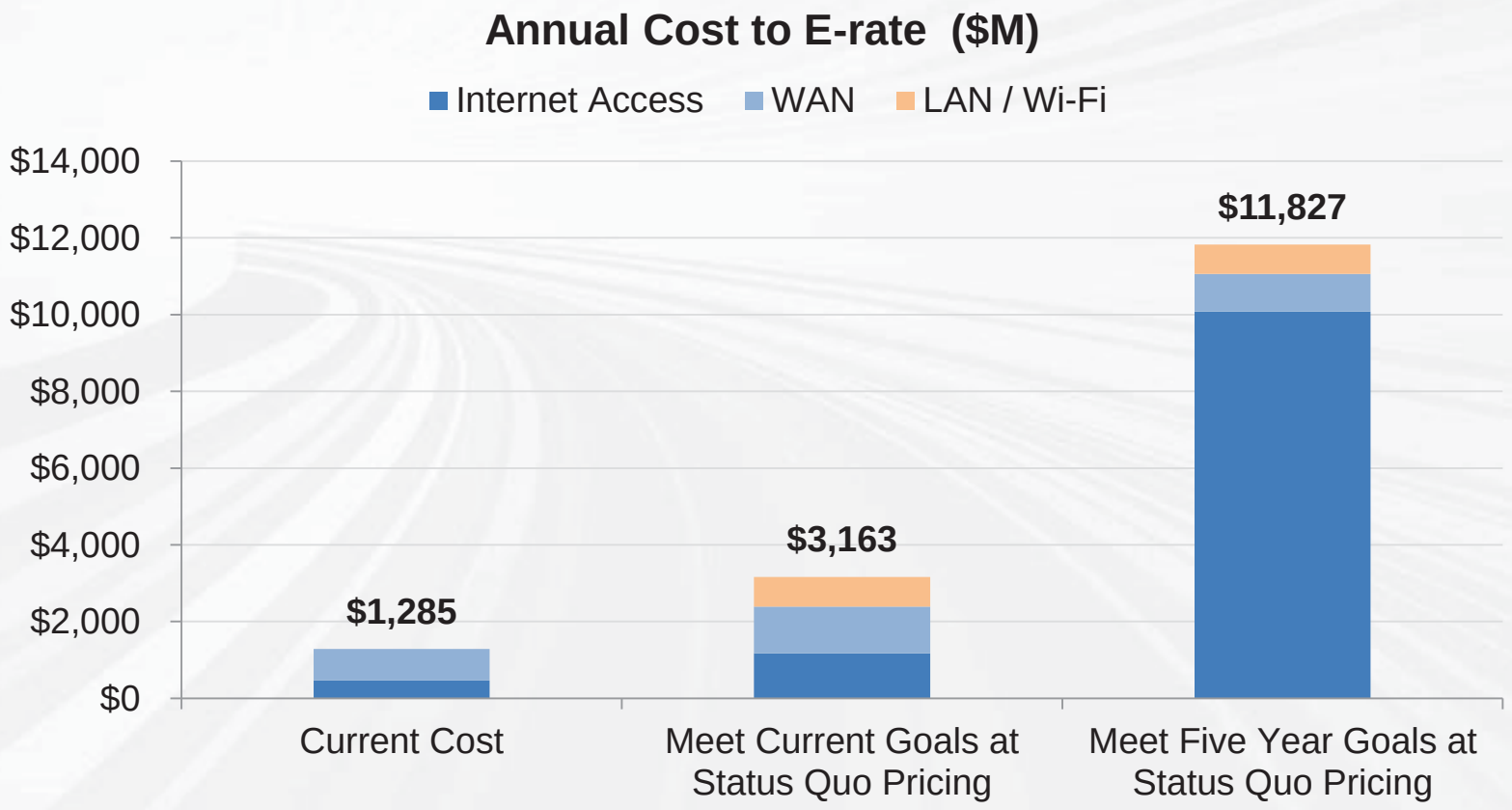
Accelerator 3:

Lower the Cost of Broadband

It would cost over $11B per year to meet Five Year Goals, assuming status quo pricing



Note: Assumes all districts needing upgrades get additional bandwidth at current cost per Mbps

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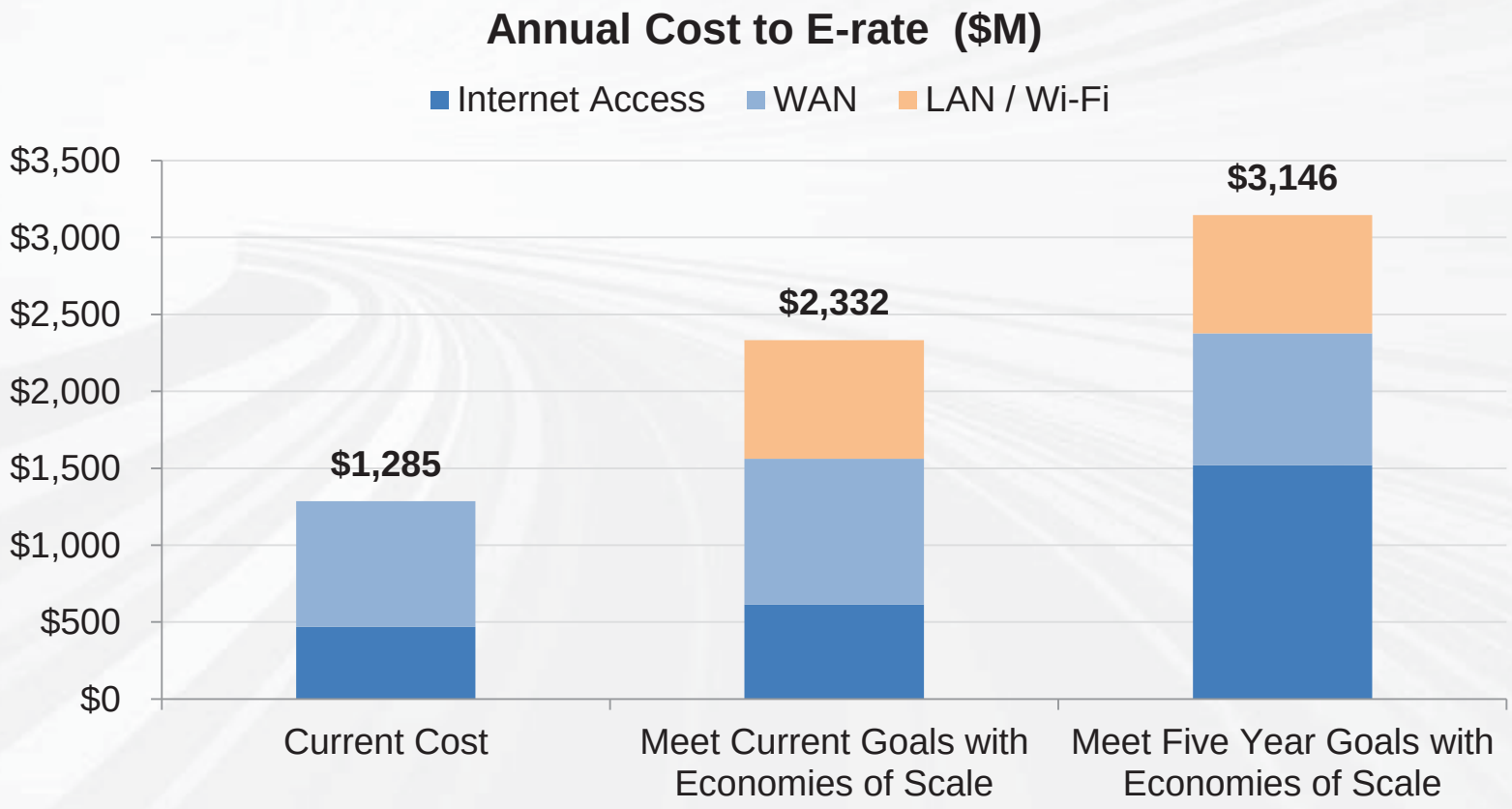
Accelerator 3:

Lower the Cost of Broadband

Leveraging economies of scale could save E-rate over 70% annually



Note: Assumes all districts needing upgrades get additional bandwidth at average market cost per Mbps of total needed bandwidth level

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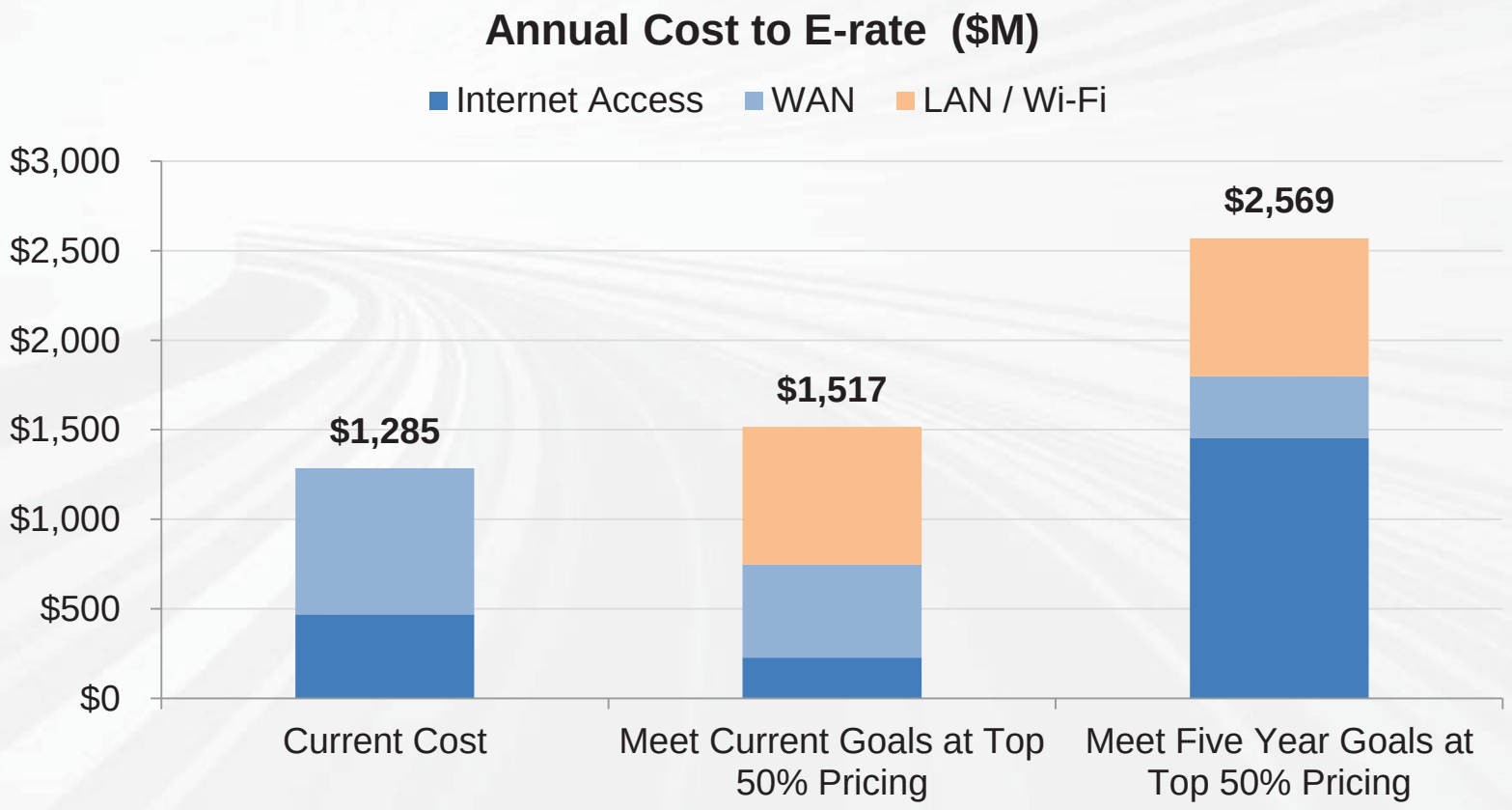
Accelerator 3:

Lower the Cost of Broadband

More efficient procurement can increase the impact of economies of scale



Note: Assumes all districts needing upgrades get additional bandwidth at average cost per Mbps of top (lowest) 50% of prices observed at total needed bandwidth level

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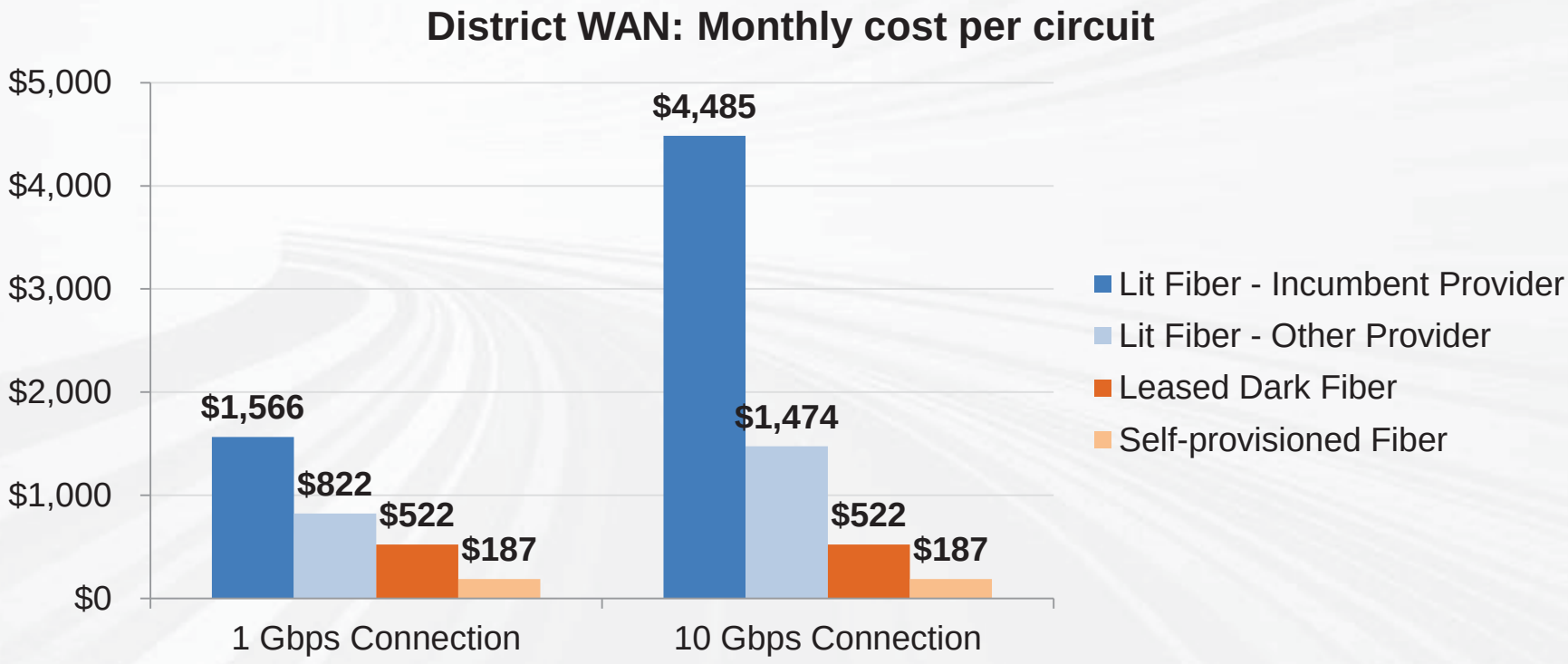
Accelerator 3:

Lower the Cost of Broadband

Increasing competition significantly reduces district WAN cost



Rural healthcare fund allows self-provisioned fiber WANs when it is the most affordable option

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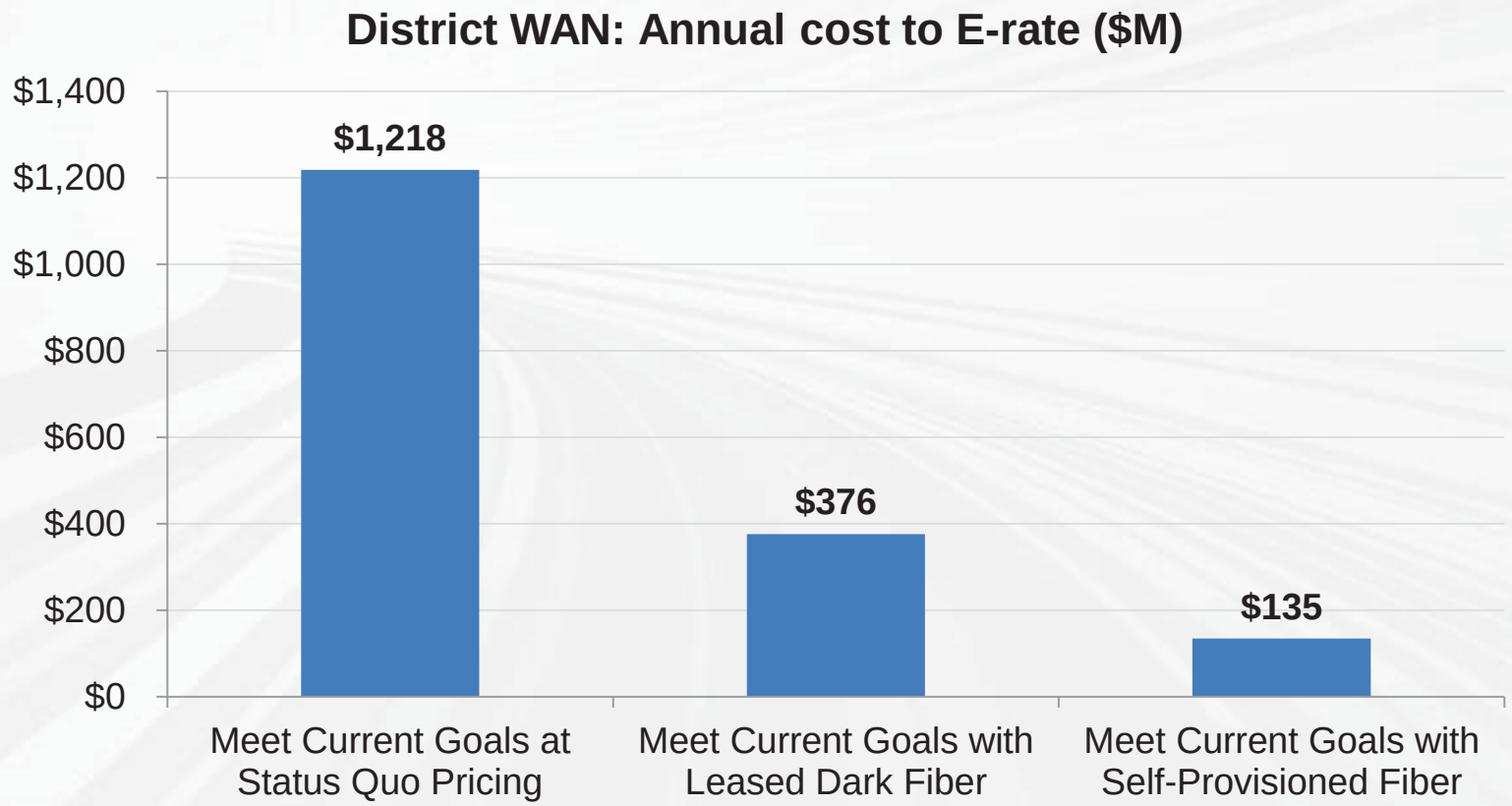
Accelerator 3:

Lower the Cost of Broadband

Widespread deployment of dark fiber could save up to 70 - 90% annually for district WAN



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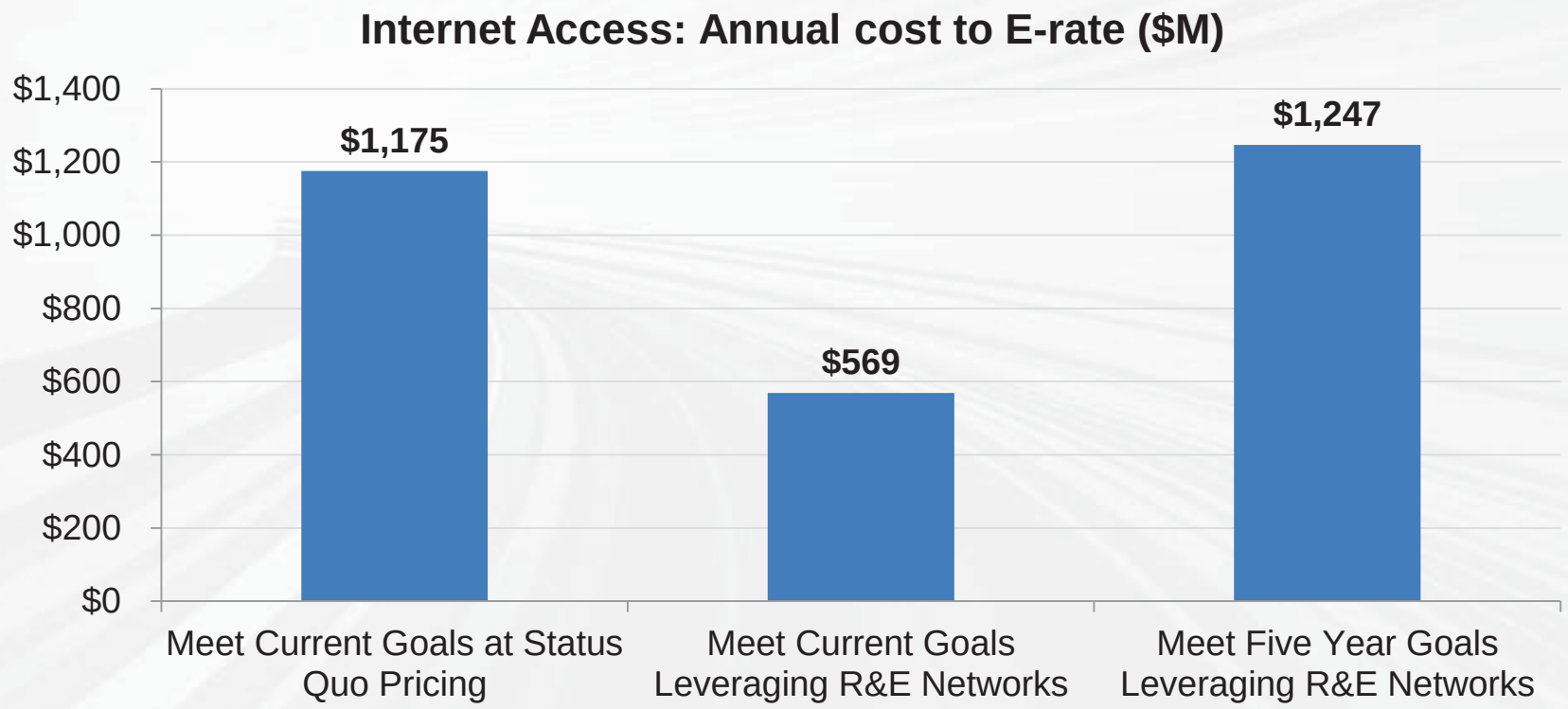
Accelerator 3:

Lower the Cost of Broadband

State R&E networks can deliver Internet access for $3 per Mbps and could save E-rate up to ~90% annually



Requires one-time investment in transport

Note: Includes $15M annual fixed operating overhead per state

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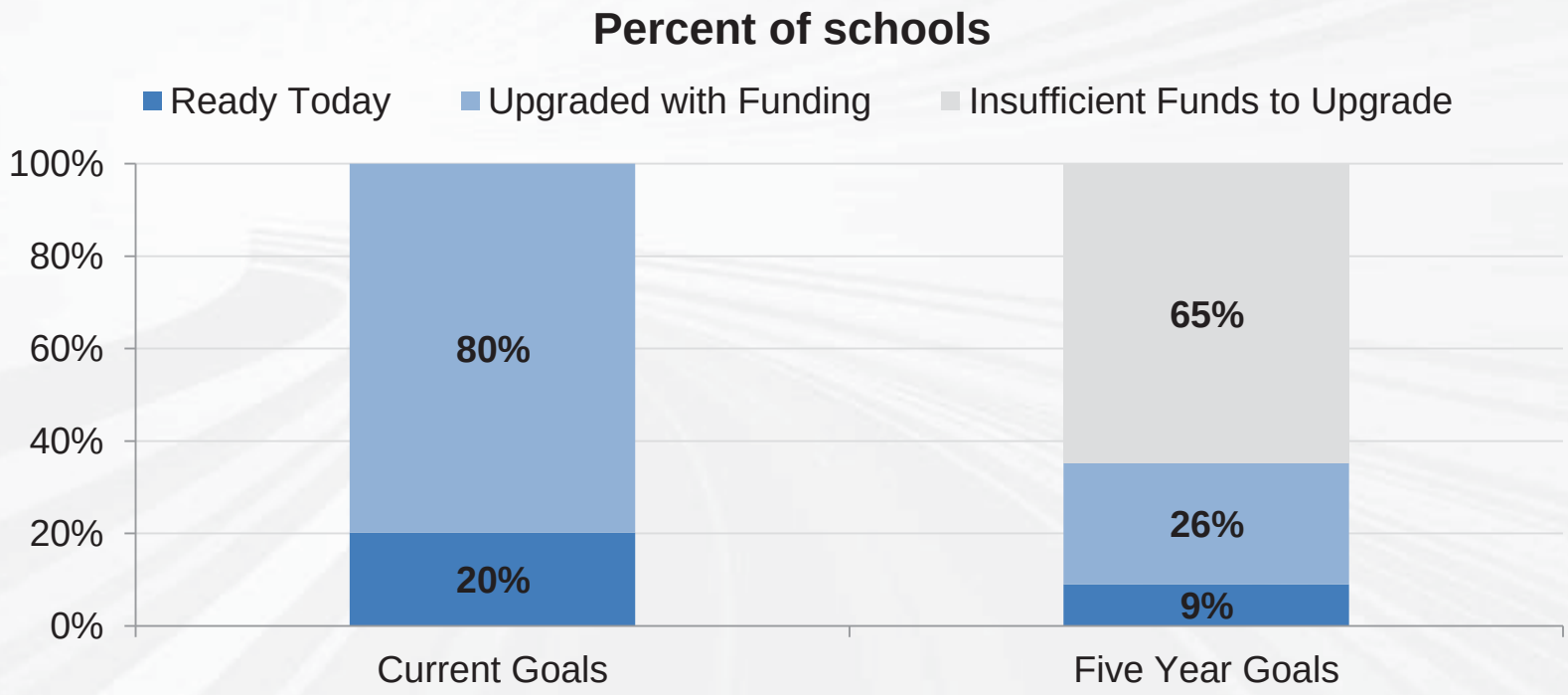
Accelerator 4:

Increase the E-rate Funding Cap

Doubling E-rate funding addresses Current Goals but does not meet Five Year Goals without significant improvements in affordability



Additional $750-800M / year needed for Five Year LAN / Wi-Fi Goals

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Conclusions and Implications

- **E-rate modernization must holistically address all challenges driving the connectivity gap in schools**

- **Key policy levers available to achieve ConnectED goals:**
  1. Eliminate capital investment barrier that precludes districts from the option of connecting their schools via fiber

  2. Focus on broadband by swiftly and thoughtfully phasing out support for non-broadband services

  3. Leverage all available options to lower the cost of bandwidth
     - Goal: Average costs of $750 per 1 Gbps WAN connection and $3 per Mbps for Internet access
     - Additional funding needed if average cost goal cannot be met

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Thank You

If you have additional questions, please contact Nell Hurley at nell@educationsuperhighway.org