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Brainstorming Broadband: Developing a Roadmap for India

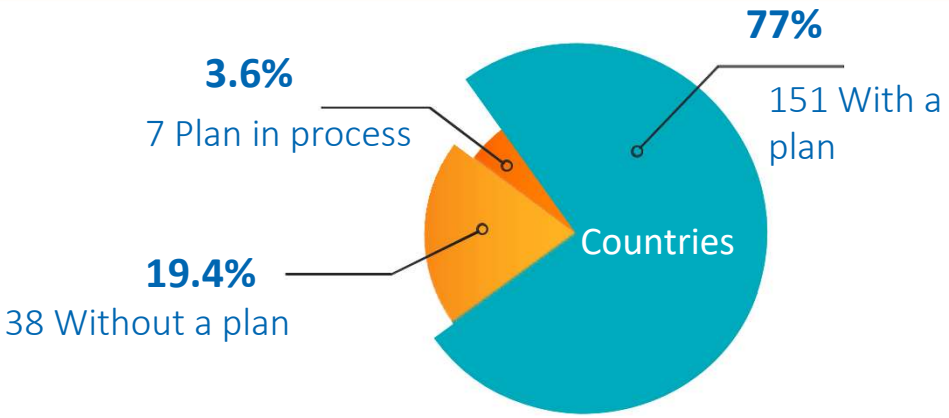
Broadband essential for growth & productivity

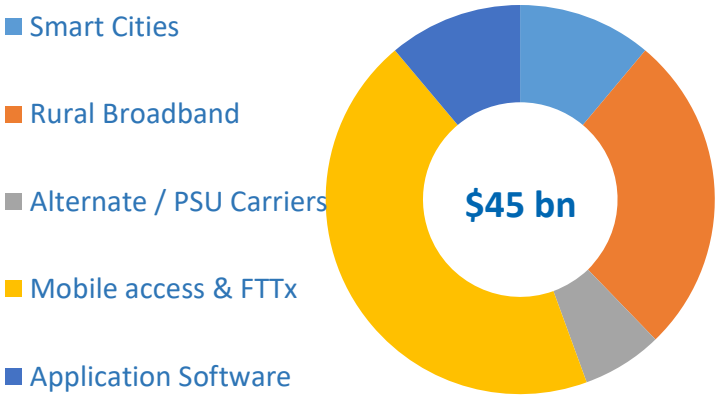
The citizens' need to data access is CRITICAL to Life & Lifestyle

- ✓ Enables access to quality education, health, government services, etc.
- ✓ 10% increase in broadband penetration rate helps enhance per capita GDP of a nation by about 1.4%

Source: World Bank

High Focus on Broadband Infrastructure





151 Countries focus on national broadband plans

Indian Govt focus on Digital Infra High

Private sector responding to Data consumption growth

Sustainable, fiberized **Smarter Networks** is the need of the hour

Source: The state of broadband 2016 report & Sterlite Estimates

Sterlite Tech's end to end solutions deliver Smarter Networks

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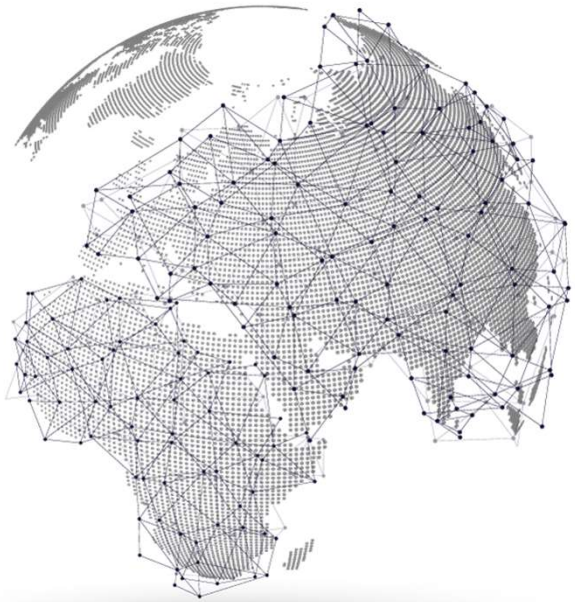

Only global company to have Smarter Network Solutions across

Products, Services and Software

- **OPTICAL COMMUNICATION PRODUCTS**
- **NETWORK & SYSTEM INTEGRATION**
- **SOFTWARE & SERVICES**

Transforming **everyday Living** of people

Sterlite Tech: Transforming Everyday Living by Delivering Smarter Networks

Case studies towards delivering Smarter Networks

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MPLS

Core / EDGE MPLS network and 0.5 million lines broadband deployment in Delhi / Mumbai

NFS

Protecting nation's borders with end-to-end execution of secure communication in Jammu and Kashmir

Smart Cities

India's first Smart City Solution: End to end implementation for Gandhinagar & Jaipur

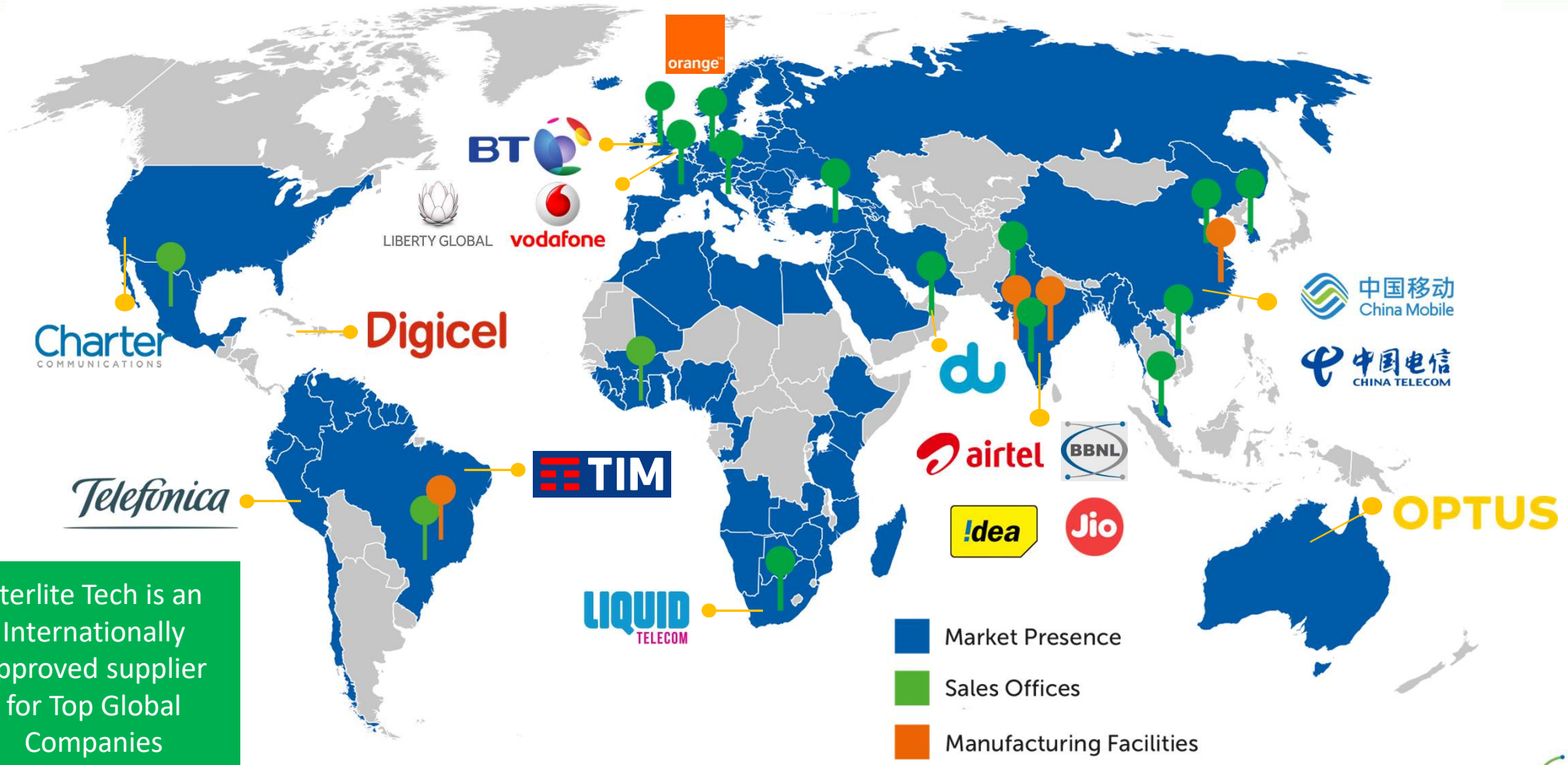
FTTH

Urban Infrastructure of 165,000 fibre connected homes across 6 cities

Billing

Elitecore OCS empowers TIME customers to check their balance in real time & get notified of their usage, eliminating "Bill Shock"

Serving customers in 100+ countries



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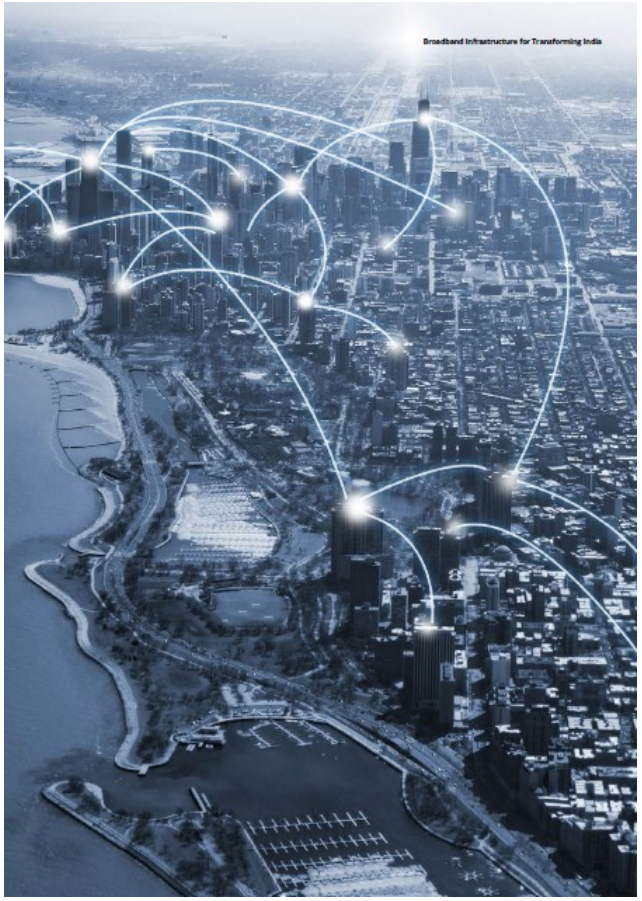
The Impact of FTTx in India

Customer First: Quality of User Experience, Rural or Urban

- Low latency upload and download → customer satisfaction, monetization
- High speeds per user → adoption & growth of broadband across the country
- A network that is always up & reliable → value for money
- At the right price points → affordable

Fiber has the least down time, lowest cost per GB and can provide services to very high data usage customers. Fiber roll-outs in India need to match the surge in data consumption as well as digitization initiatives that are under-way.

Source: Deloitte, 2016



FTTH: Deployment in AP

AP FIBER GRID

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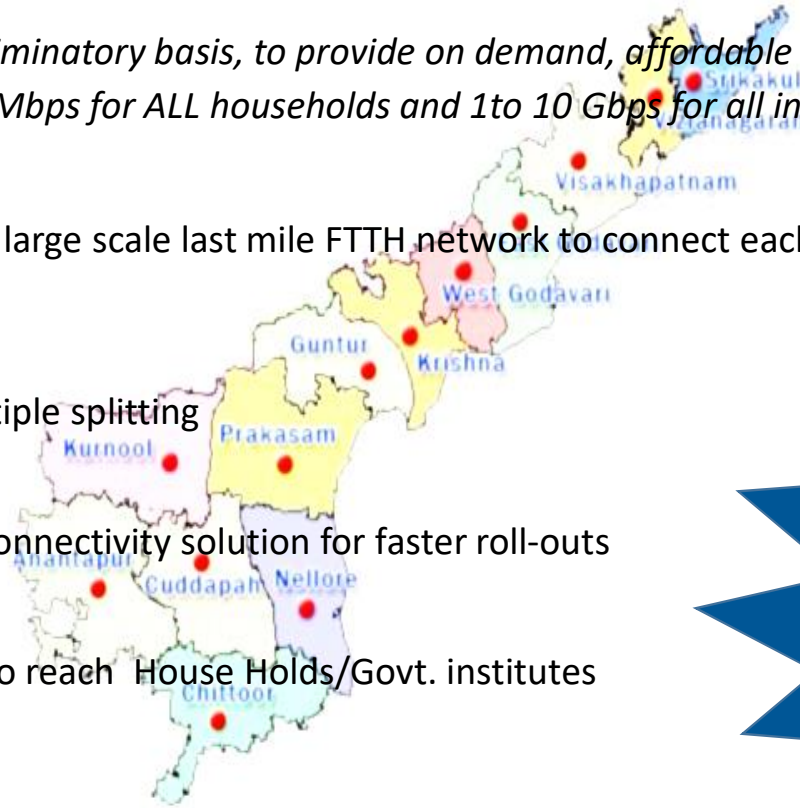
Vision : *To establish a highly scalable BB network infrastructure,*

- *accessible on a non-discriminatory basis, to provide on demand, affordable and end-to-end broadband*
- *connectivity of 10 to 20 Mbps for ALL households and 1to 10 Gbps for all institutions.*



- AP found unique way to built large scale last mile FTTH network to connect each every hone in the state with optical fiber
- GPON Technology using multiple splitting
- Quick deployment last mile connectivity solution for faster roll-outs
- Partnering with LCOs/MSOs to reach House Holds/Govt. institutes

Launched with 100% Fiber Connectivity in Mori village

How do we get there: End-to-End Infrastructure Manager

- A managed service provider is needed to ensure end-to-end infrastructure reliability, uptime via SLAs
  - Essential to ensure network is “always available”
  - Monetization, tenancy etc..

- Design, build & manage a complete network – Actives & Passive
  - Stitching together a complete solution involving components from multiple vendors and agencies.
    - Block to GP fiber, is owned by BBNL;
    - district to block fiber may belong to BSNL (or other Telcos);
    - switching/routing equipment may be supplied by OEM 1
    - GPON may come from OEM 2, WiFi from OEM 3, etc.

- Develop and enforce a “Standard” Infrastructure Delivery Model / Template
  - Best global practices in design and deployment
  - Ensure accountability via a standards based governance model

How do we get there ?
Focus on Quality & Reliability of Network

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Study Objectives and Methodology

Objectives:

Understand challenges and best practices in fiber network design and build

Methodology:

Primary interviews

1. Indian Telco Technology organization
2. Global design and deployment companies
3. Strategy consultants and Sterlite experts

Fiber network health monitoring data

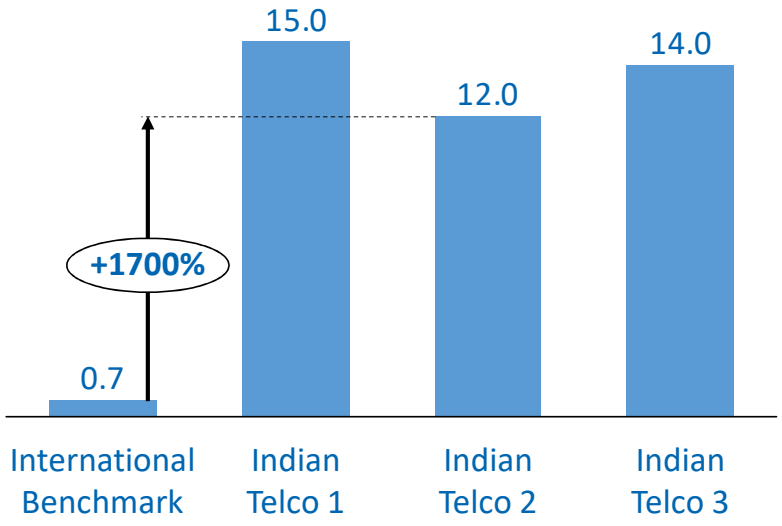
1. Network health data of key Telcos in India analysed to derive key insights

Study Dimensions

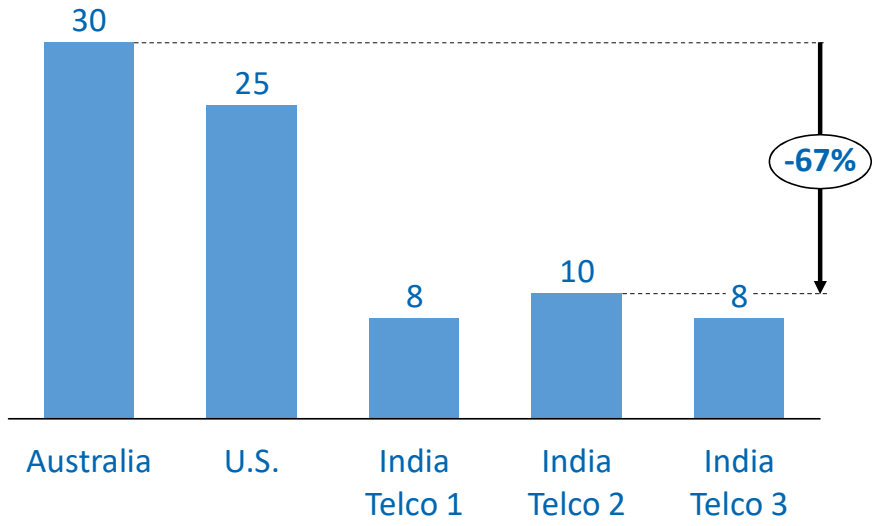
1. Network design practices
2. # of cuts in fiber networks and its impact on network life
3. Passive network redundancy practices
4. Active network redundancy practices
5. Network traceability

1 Higher number of cuts in fiber network results in lower life

# of Cuts per 1,000 kms per Month
(Intra-city average)



OFC Network Attenuation Life
(in years) (doubling of link attenuation)



Indian Telcos have 2-3 times faster fiber network CAPEX replacement cycle compared to global benchmarks

Source: Results from STL network health monitoring project or shared by Telco
International benchmark data sourced rom partners working with those Telcos (includes Australia, Western Europe, U.S).

2 Network life simulation model output: How important is cable cut, all other factors being equal?

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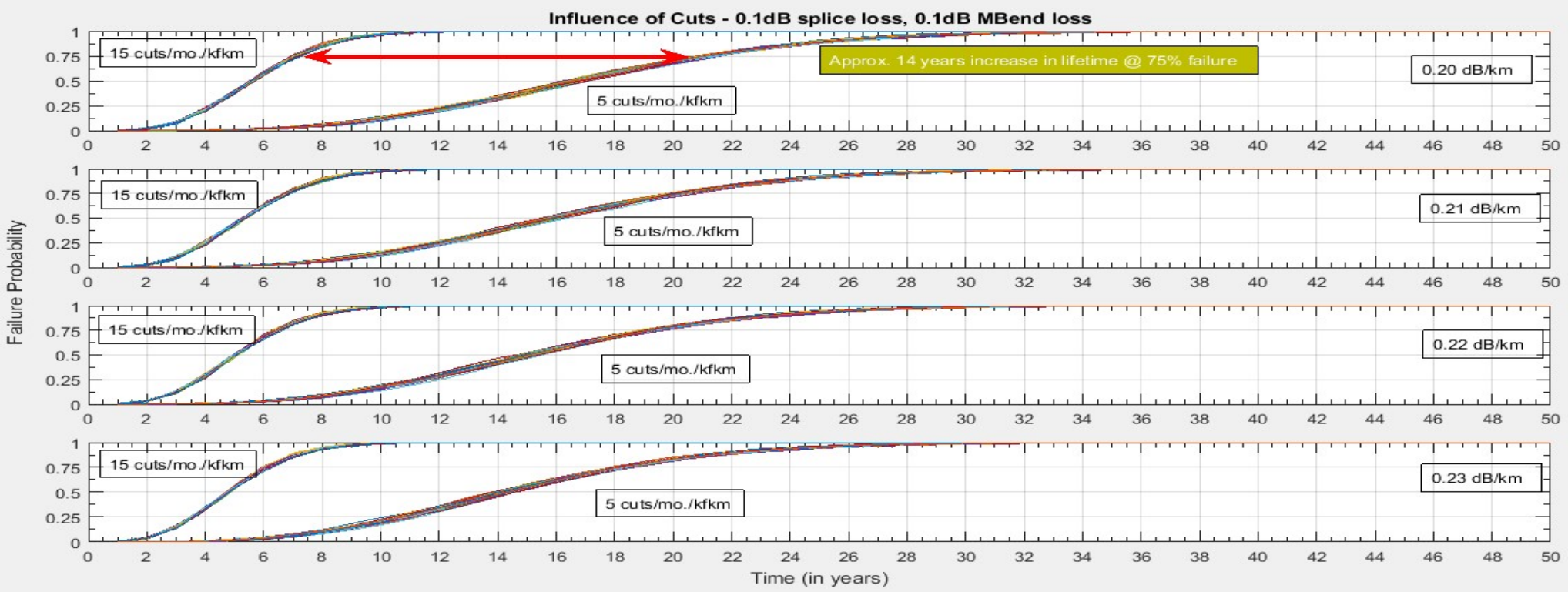
Network Life Simulation Model Output



Bringing cuts from 15/m/kfkm to 5/m/kfkm adds 12-14 years life @75% failure

3 Passive network redundancy

Network Type	Current Duct Configuration
NLD	1+1
Intra-city	1+2
FTTH	1+1

Problem

1. Duct repair is not a common practice in India
2. Therefore, spare ducts become un-usable after 4-5 years due to frequent cuts and soil penetration

5%-10% improvement in CAPEX productivity due to duct planning optimization

Source: Primary interviews

4 Active network redundancy

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Network Type	Current Duct Configuration
Access	1+1
Aggregate	1+1
Core	1+2 or 1+3

Problem

1. High number of cuts force planners to build redundant logical routes
2. This increases the active transport CAPEX significantly

Solution

Highly reliable network can eliminate the need for redundancy CAPEX

- Global installation and PMO practices
- SLA based O&M for network built to global standards

20%-30% improvement in Core Transport network CAPEX productivity due to improved network reliability

5 Network traceability

Network Traceability
(after 5 years)

Telco 1	**> 30% of network is not traceable**
Telco 2	**> 40% of the network is not traceable**

1. Limited network traceability (no single source of truth) as planning, deployment and O&M is done by different organizations
2. GIS based planning and single partner can help improve network traceability

Source: Primary interviews

A holistic design, build and management framework is essential

	Challenge	Impact	Solution
1	Multiple agencies without clear end-to-end accountability	Gaps in SLA management	End-to-end infrastructure manager
2	High cuts leading to lower life	2-3 times faster CAPEX replacement cycle compared to global benchmarks	▪ Global installation and PMO practices
3	Passive network redundancy	5%-10% improvement in CAPEX productivity	Currently available technology innovation
4	Active network redundancy	20%-30% improvement in core transport CAPEX productivity	SLA based O&M on network built to global standards
5	Network Traceability	> 30% of the network is not traceable after 5 years	GIS based planning and single partner (design, build and manage) can help improve network traceability

Discussion/ Q&A

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Thank You

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