STL 25 YEARS OF OPTICAL FIBRE

stl.tech

Webinar

Bend Insensitive Fibres- Foundation for Stellar, Future Ready Networks

31st August 2020

Tech ecosystem disrupting with new use cases

Consumer led use cases

Enterprise led use cases

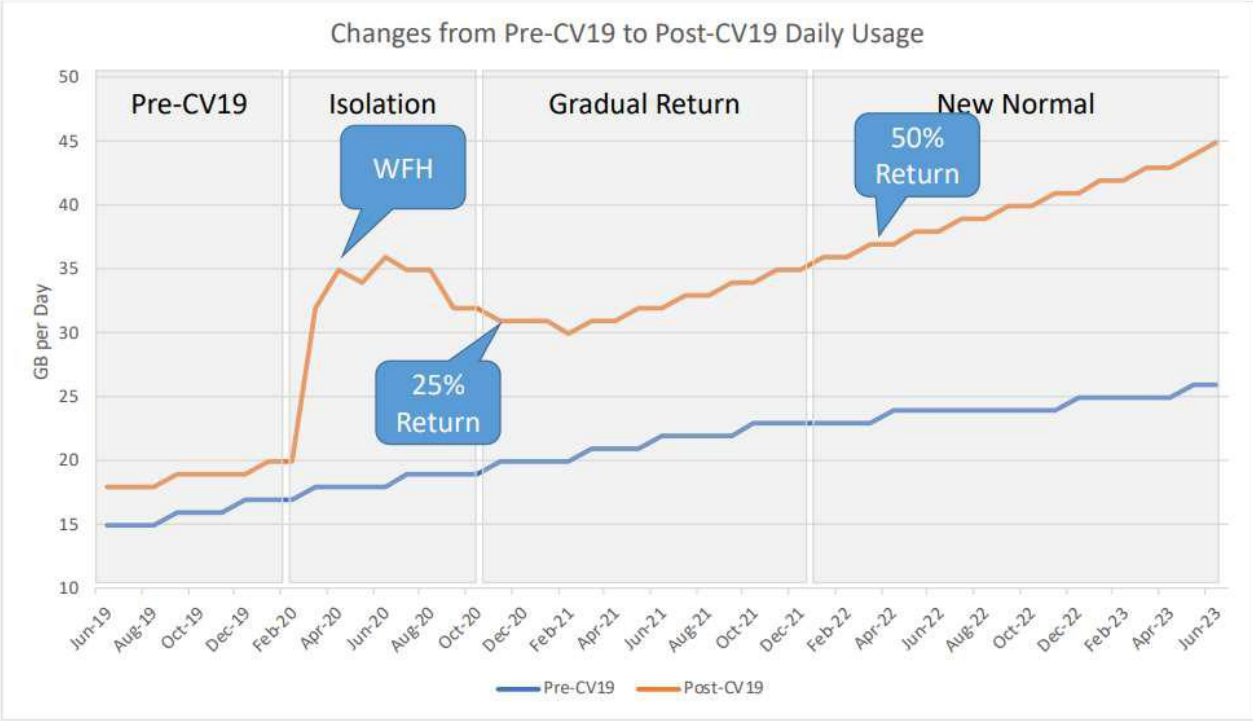
Connected everything

+

Contextual automated experience

Exponential Growth in data

Covid-19 lockdown accelerated use-case adoption; long-term growth trend on data consumption already emerging



Trends from European operators on COVID lockdown

Post- CV19 New Normal

Downstream increases
Over pre-CV19 usage

- **10%** Video streaming
- **16%** web traffic
- **12%** file sharing
- **90%** tunneling
- **300%** conferencing
- **15%** social media
- **80%** all other traffic

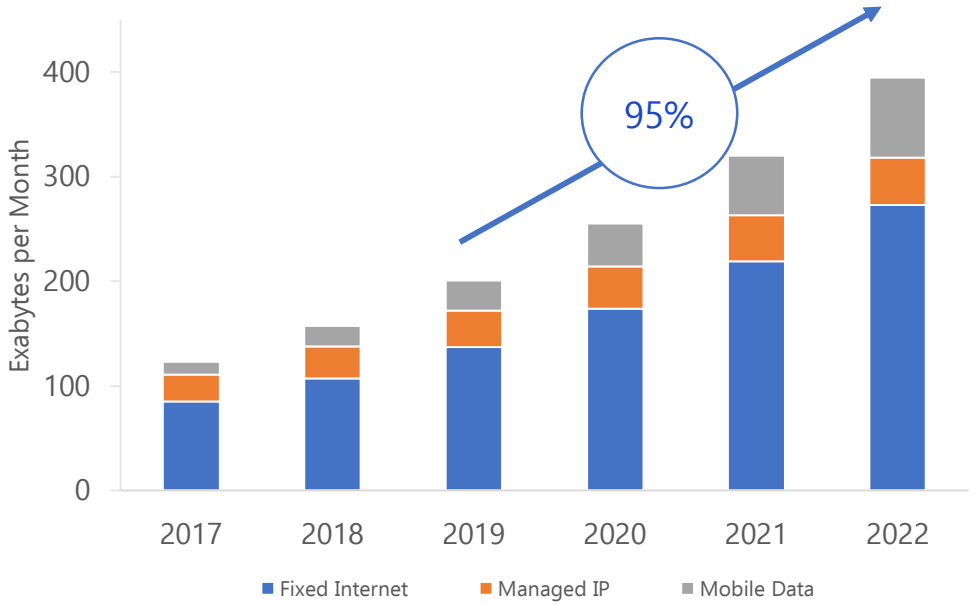
Upstream increases
Over pre-CV19 usage

- **20%** Video streaming
- **70%** web traffic
- **100%** file sharing
- **800%** tunneling
- **400%** conferencing
- **100%** social media
- **50%** all other traffic

Growing requirement for symmetrical bandwidth across Fixed and Wireless networks

Increasing data demand pushing for new network creation

2x increase in global data demand Fixed line internet to be the major contributor



Source: Cisco VNI forecast

New networks would be different

Converged, fibre dense and deep fiberized

Denser Networks

Access layer end points will multiply

Deep Fiberization

Fiber intensive network to support latency and capacity requirements

ITU standards focus on Bend optimization but maintaining backward compatibility is an industry imperative

Same MFD for true backward compatibility

STL Fiber	Attn. 1310nm (dB/km)	Attn. 1550nm (dB/km)	MFD Mean (μm)
?	?	?	?
OH-LITE NOVA	0.33	0.19	9.1
BOW-LITE-250	0.34	0.20	9.1
OH-LITE (E)	0.33	0.19	9.1
OH-LITE	0.34	0.20	9.1

ITU Standards

G.657.B3
G.657.A2
G.657.A1(+)
G.657.A1
G.652.D

Bend optimized fibers

STL Fiber	Attn. 1310nm (dB/km)	Attn. 1550nm (dB/km)	MFD Mean (μm)
BOW-LITE SUPER	0.35	0.21	8.6
BOW-LITE (E)	0.35	0.21	8.6
BOW-LITE PLUS	0.33	0.20	8.8
BOW-LITE 200	0.34	0.20	8.8

New networks – Perform better, provisioned faster and cost less

1

Enhanced network performance

Optical products ensuring optimized power budget throughout network lifetime

2

Reduced network ownership cost

Optical products ensuring lesser network capital and operational expense

3

Faster network provisioning

Solutions enabling faster network deployment and thus, faster customer on-boarding

Deep dive into each one of these
Optical solutions solving for these challenges

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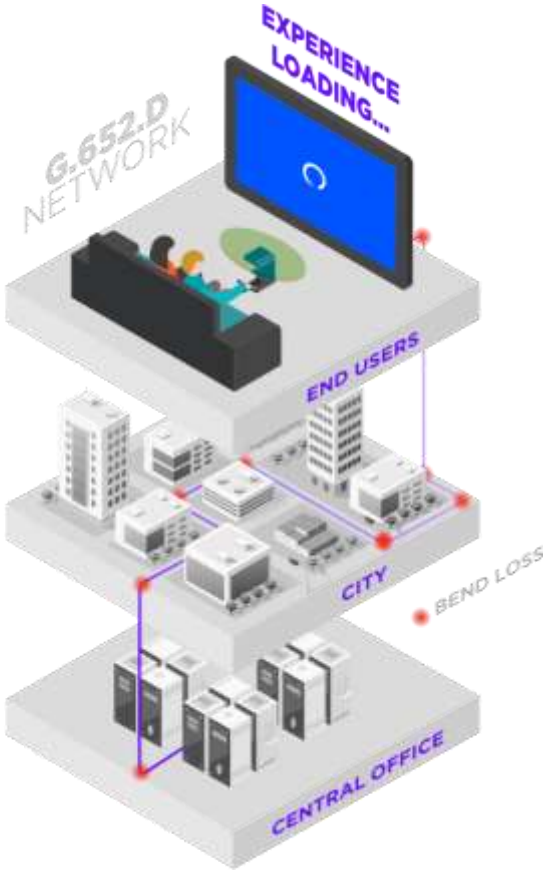
Networks are susceptible to optical losses

Macro Bend Loss

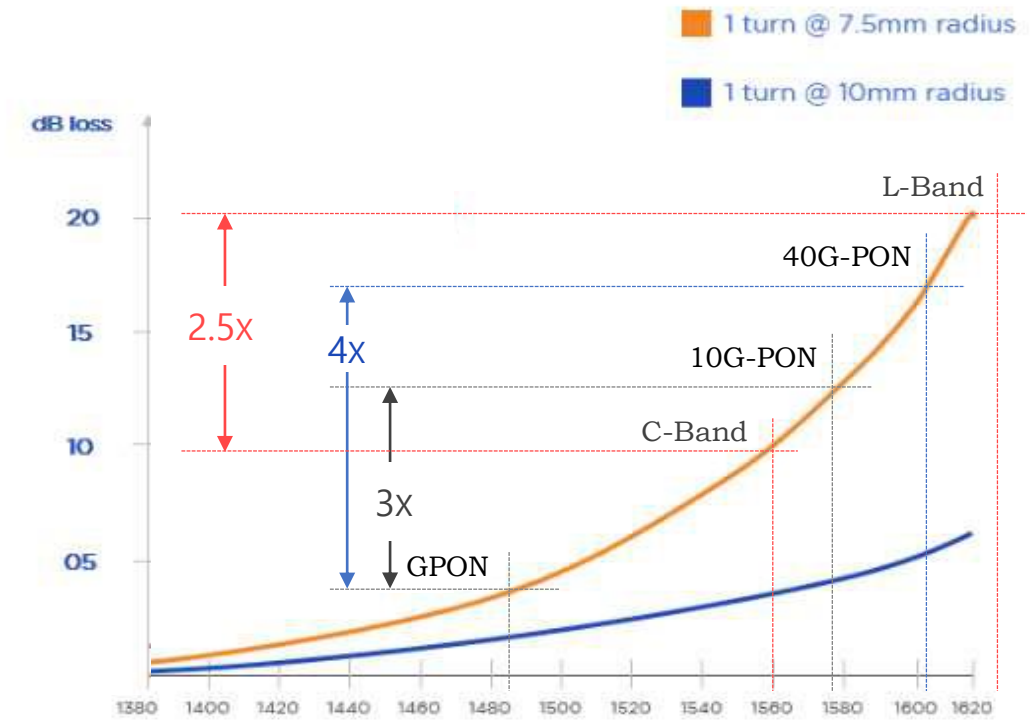
Increasing geographical spread

More no. of tight bends & turns



Legacy fibre (G.652.D) loss increasing

At higher wavelengths and tighter bends



Macro-bend Loss Prevalent In Passive Ancillaries
Long Distance Route

1.06dB avg. Macro Bend Loss

per macro-bend point with legacy G.652.D fibre @ 1625nm

Location	No. of M-bend	Total M-bend loss (dB)		Average M-bend loss (dB)	
		1550 nm	1625 nm	1550 nm	1625 nm
Link 1	4	1.22	3.78	0.31	0.95
Link 2	2	0.43	0.8	0.22	0.40
Link 3	3	1.45	2.25	0.48	0.75
Link 4	3	2.97	5.94	0.99	1.98
Overall average / macro-bend points				**0.51**	**1.06**

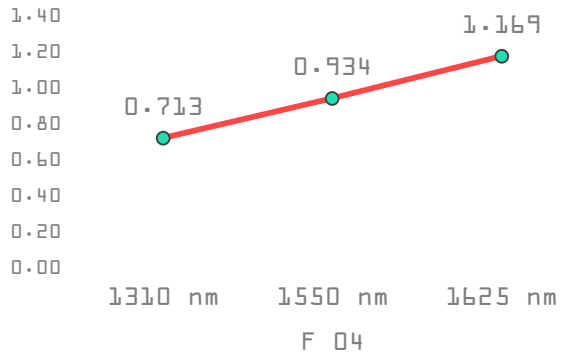
Source: Route survey of a leading Indian Telco

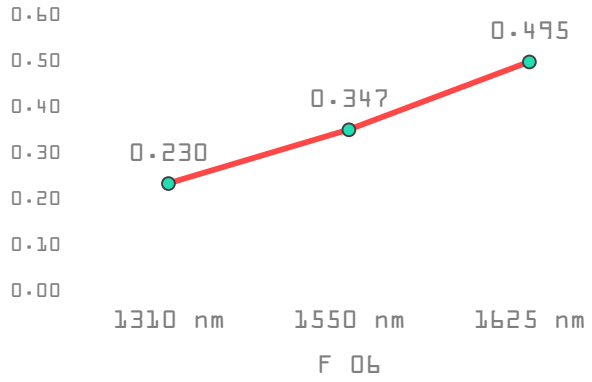
Macro-bend prevalent in passive ancillaries

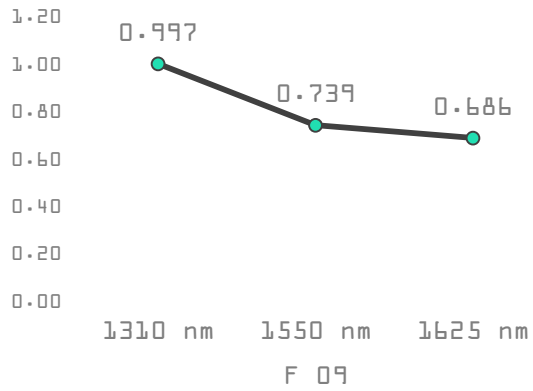
Access networks

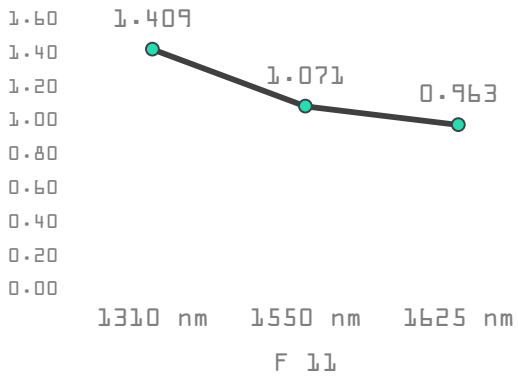
6 out of 16 routes tested positive for losses

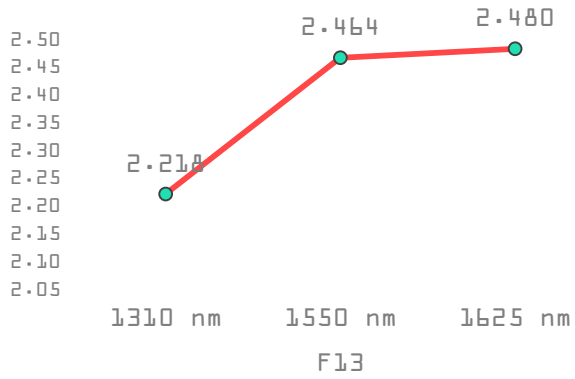
Significant (>0.5 dB) macro bend losses found in JBs, Tapping Boxes etc.

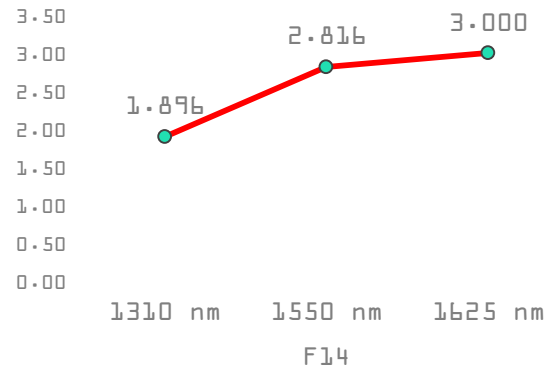












Several factors across network span lead to macro bend losses

Feeder Network

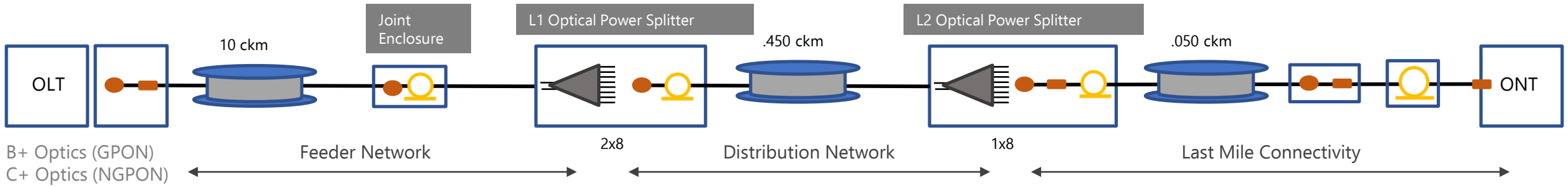
- Joint Splicing
- Fiber Attenuation
- Fiber Cuts
- Connector Loss
- Accidental Bends

Distribution Network

- Splitter loss
- Connector loss
- Splice loss
- Accidental Bend

Last Mile
Inside Building

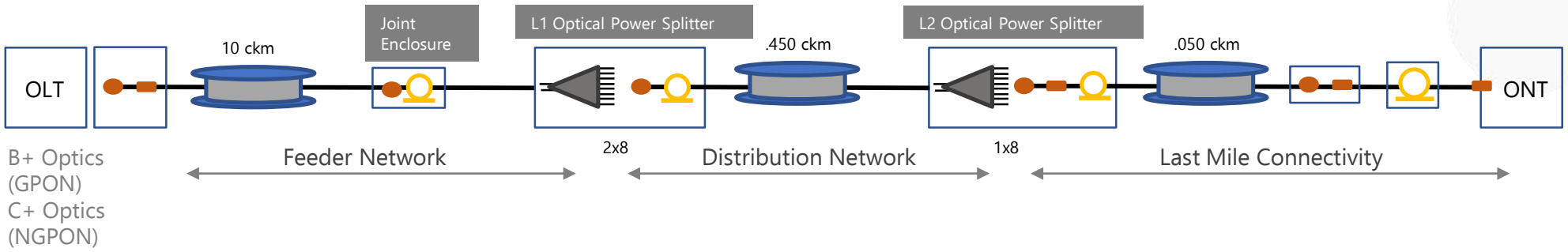
- HTB connector loss
- Bend loss
- Staple loss
- Accidental Bend during O&M



Schematic of a 10Km FTTH network

Connector Splice Macro Bend

One accidental bend →
Data transmission interrupted with legacy fibre

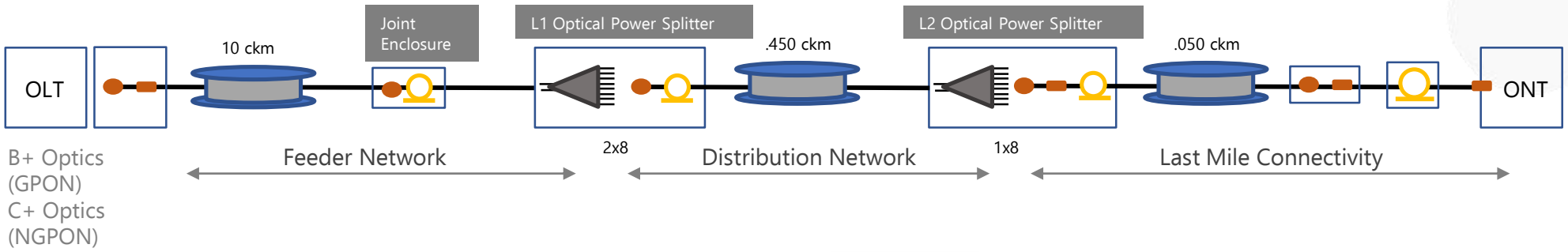


	Fiber Attenuation (10.5Ckm)	+ Splice Losses (15 splices)	+ Connector losses (2 Connector + 4 FMC)	+ Splitter losses	+ Accidental Bends (10mm / 7.5mm)	+ Bend and Staple loss	= Total
GPON 28dB budget	2.11 dB	1.0 dB	1.52 dB	20 dB	**0.5 dB / 3.755 dB**	.15 dB	25.28 dB / 28.53 dB
NGPON 32dB budget	2.43 dB	1.0 dB	1.52 dB	20 dB	**1.5 dB / 6.275 dB**	.75 dB	27.20 dB / 31.92 dB

Due to
- Accidental bends during cut repairs
- Rushed rollout & unskilled manpower

Connector Splice Macro Bend

A Bend insensitive fibre solves the challenge



	Fiber Attenuation (10.5Ckm)	+ Splice Losses (15 splices)	+ Connector losses (2 Connector + 4 FMC)	+ Splitter losses	+ Accidental Bends (10mm / 7.5mm)	+ Bend and Staple loss	= Total
GPON 28dB budget	2.11 dB	1.0 dB	1.52 dB	20 dB	**0.1 dB / 0.5 dB**	.15 dB	24.88 dB / 25.28 dB
NGPON 32dB budget	2.43 dB	1.0 dB	1.52 dB	20 dB	**0.2 dB / 1.0 dB**	.75 dB	25.9 dB / 26.7 dB

Resilience to
- Accidental bends during cut repairs
- Deskilled installation for faster rollout

Connector Splice Macro Bend

Bend insensitive fiber ensures passive infra can be reutilized when upgrading GPON to XGS-PON/NG-PON/NG-PON2

Deep dive into each one of these
Optical solutions solving for these challenges

1

Enhanced network performance

Optical products ensuring optimized power budget throughout network lifetime

2

Reduced network ownership cost

Optical products ensuring lesser network capital and operational expense

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Faster network provisioning

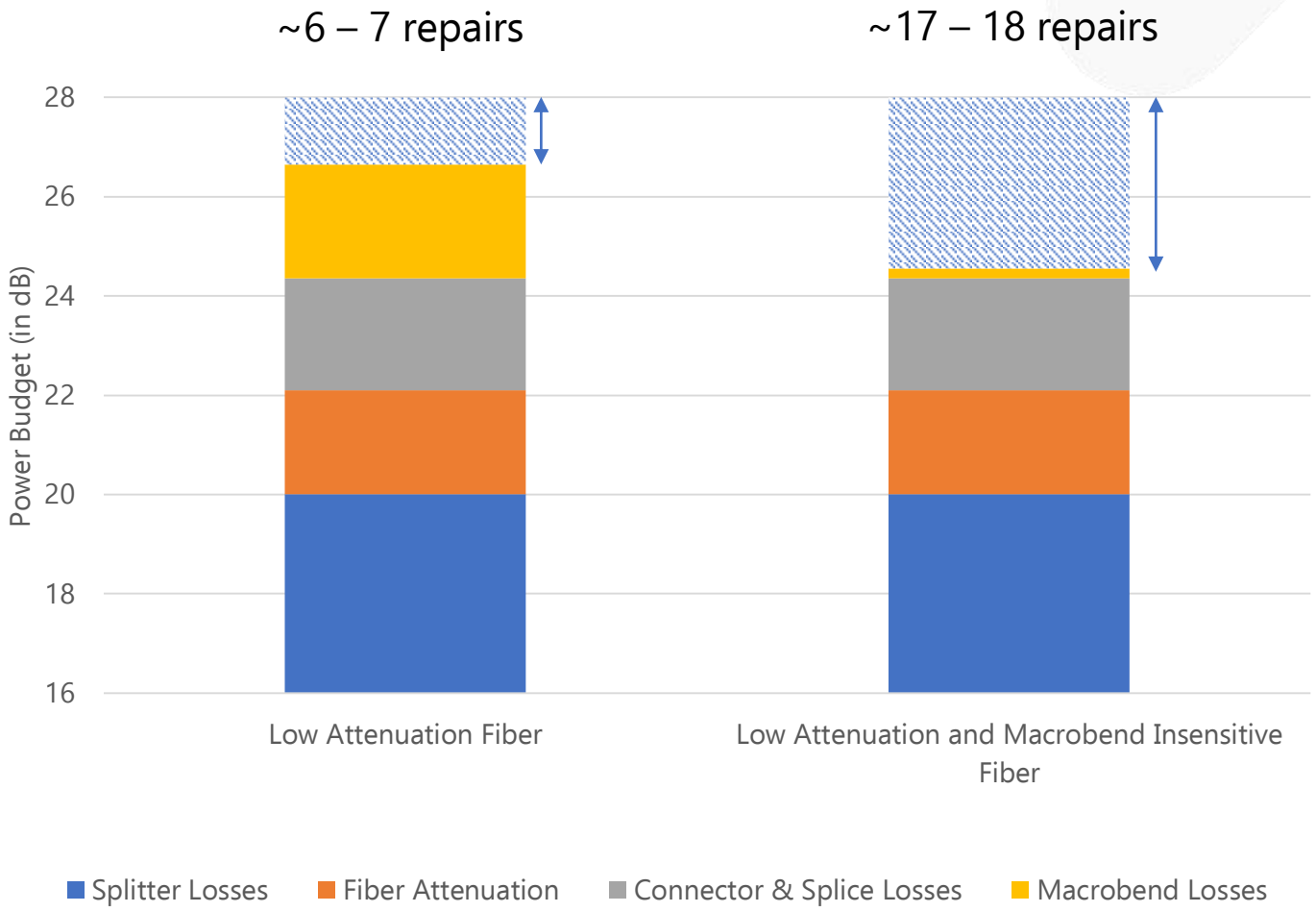
Solutions enabling faster network deployment and thus, faster customer on-boarding

Reduced operational expense with Bend insensitive fibre

10+ years

increased network life*

Lower loss increases repair resilience enhancing overall network life



Assumptions:

- *Accidental 15mm bend at time of repair*
- *Average link length : 14kms, 1000 links per sim and 51 sims in total*
- *Splice loss: 0.1 dB (G.652.D vs G.657.A2)*
- *Cuts/1000km/month: 10*
- *BOL drum attenuation: 0.20/0.21/0.22/0.23 dB/km*

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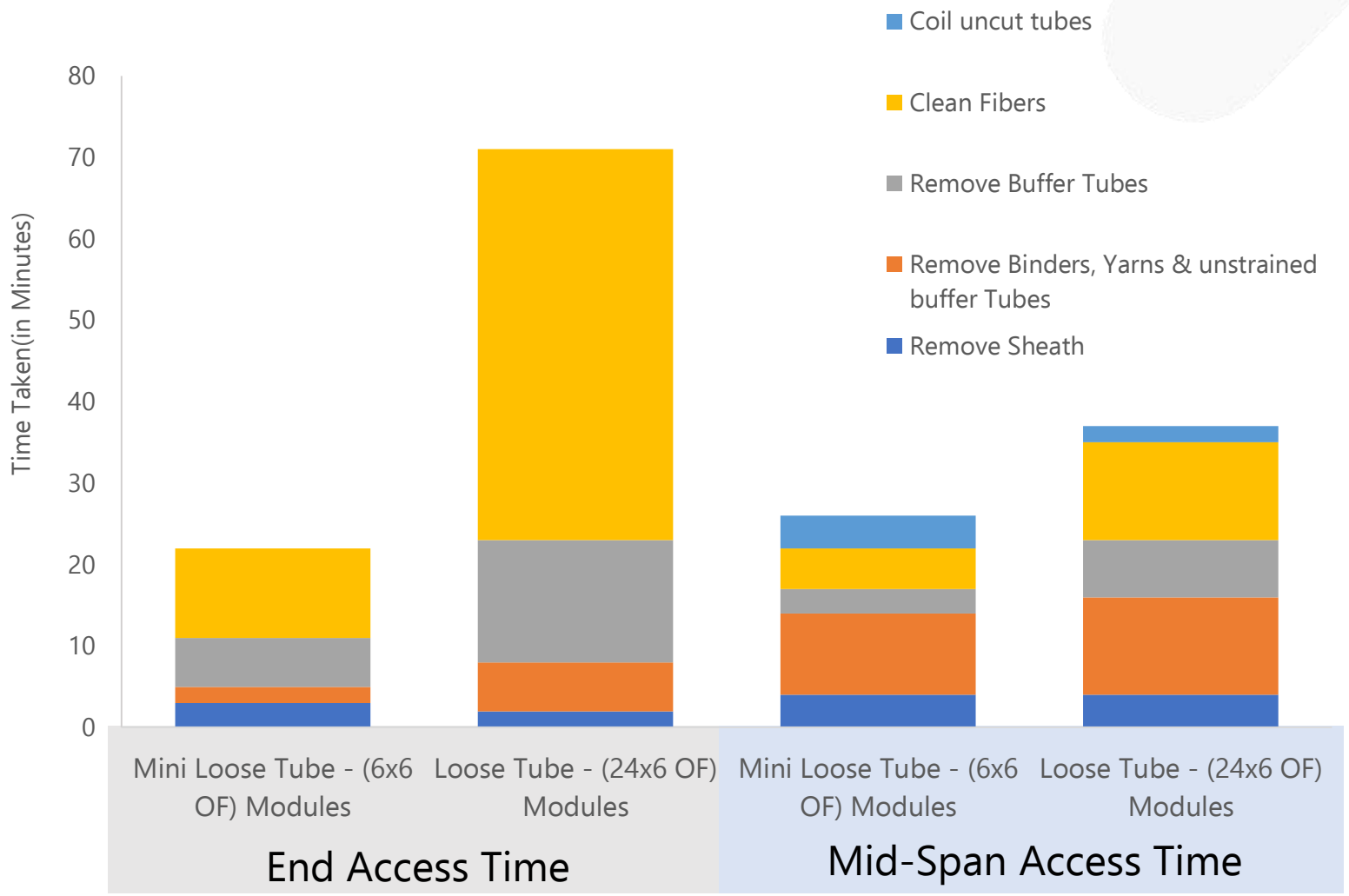
Cables based on legacy fiber - Not suitable for faster network densification

End-to-end
joint splicing
process of
≥144 fiber
count cables can take an
entire day!

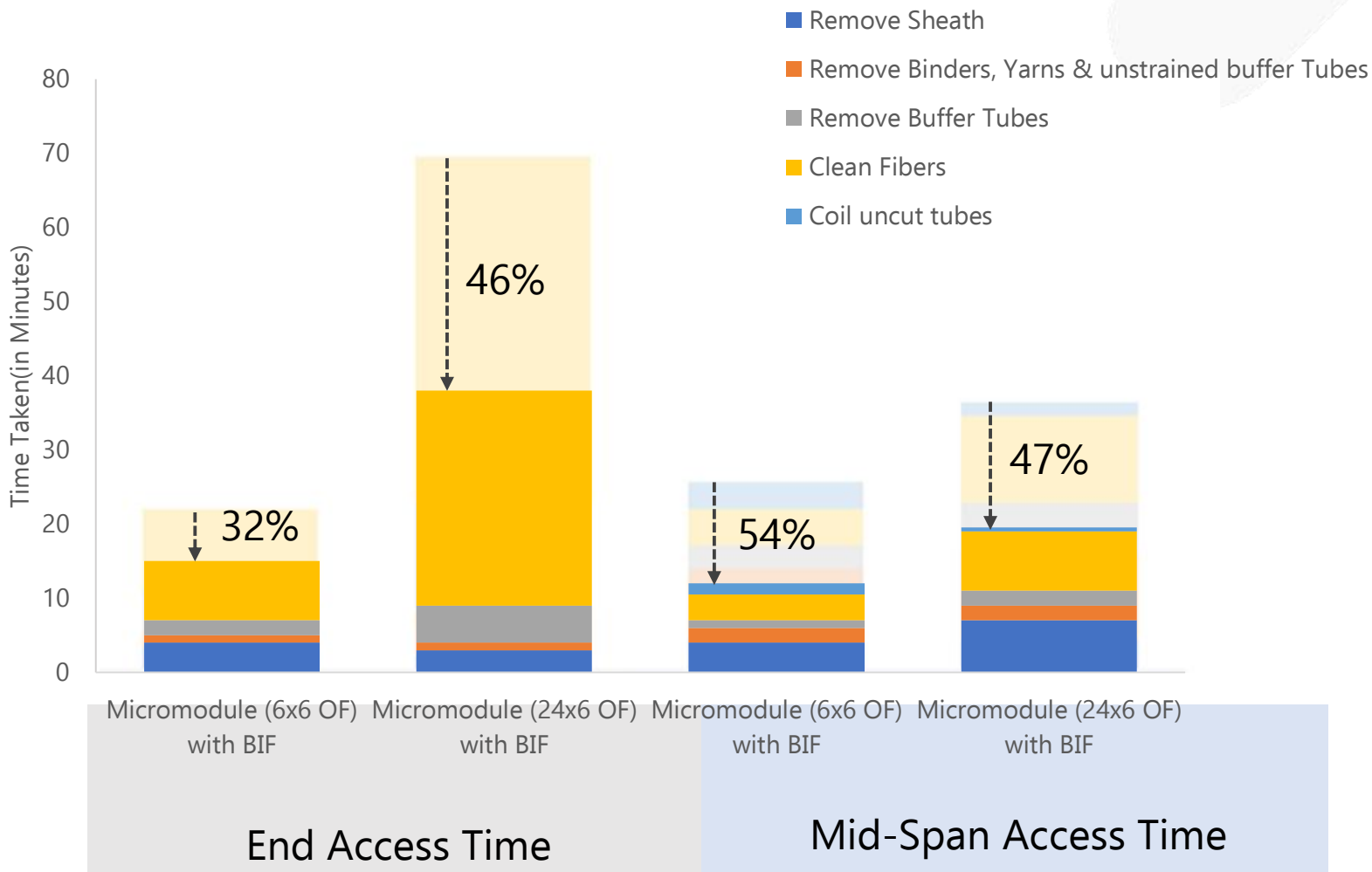


Bend insensitive fibre enables faster network provisioning

40% reduction

in installation time

Micro module designs made using bend insensitive fibre



So, while BIF enables all these…

New network provisioning or capacity augmentation

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Enhanced network performance

Optical products ensuring optimized power budget throughout network lifetime

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Reduced network ownership cost

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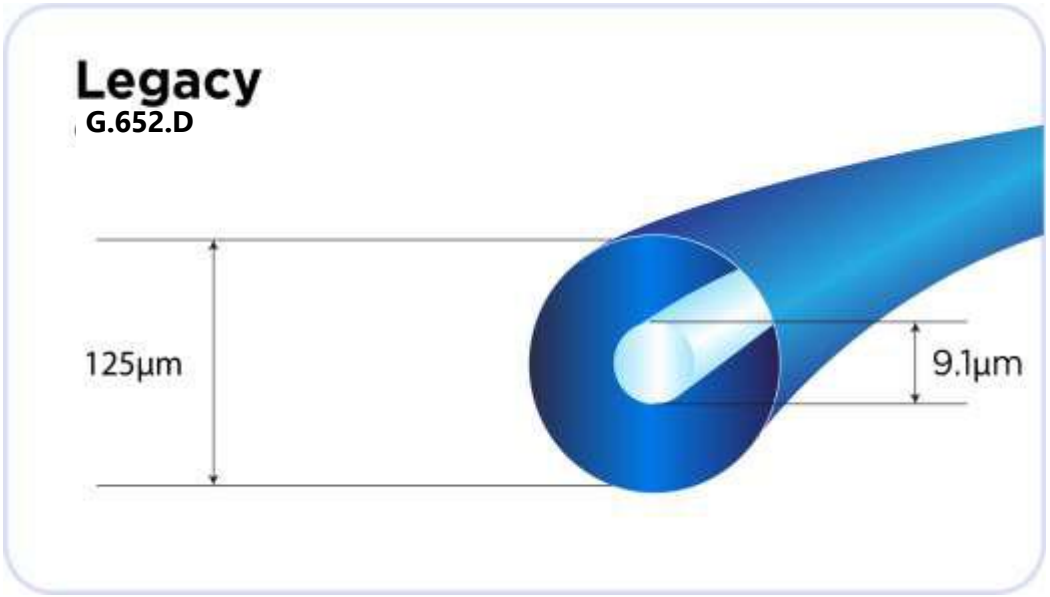
The challenge that still remains

MFD mismatch

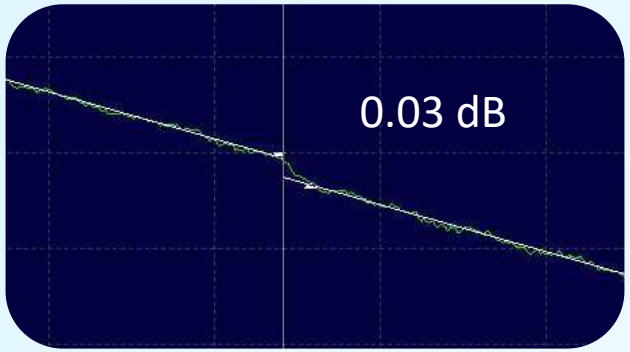
G.657.A2 with 8.6 +/- 0.4µ MFD @ 1310 nm

G.652.D with 9.1 +/- 0.4µ MFD @ 1310 nm

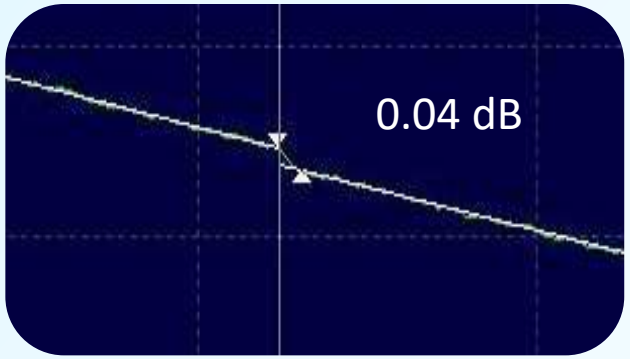


MFD Mismatch Makes Link Qualification Confusing

OTDR → Stellar | D

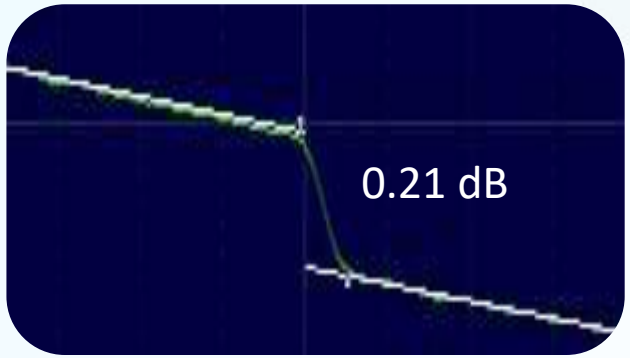


OTDR → D | Stellar

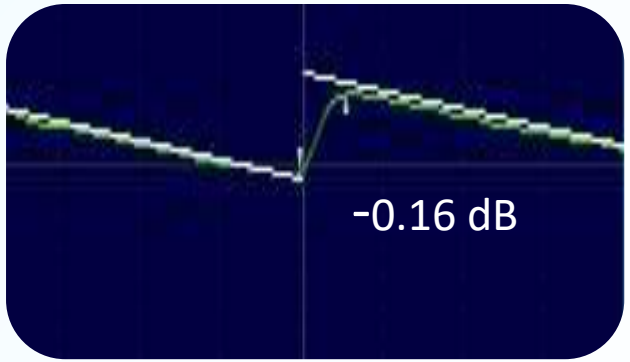


OTDR accurately measures loss

OTDR → A2 | D



OTDR → D | A2



OTDR produces incorrect confusing results

One Product, multiple applications

Bringing the best of both worlds

We've achieved the right balance

Best-in-class attenuation and bend insensitivity

Attribute	STL OH-LITE NOVA (Enhanced G.652.D and G.657.A1)	STL BOW -LITE (E) (G.657.A2)	stellar™
Typical Attenuation Values (in dB/km)			
@ 1310nm	0.33	0.34	**0.33**
@ 1550nm	0.19	0.20	**0.19**
@ 1625nm	0.21	0.22	**0.21**
@ 1383nm +/- 3nm	0.31	0.34	**0.31**
MFD @1310NM	9.1 +/- 0.4µ	8.6 +/- 0.4µ	**9.1 +/- 0.4µ**
Typical Macro Bend Loss Values (in dB)			
1 turn 10mm radius, 1550 nm	≤0.5	≤0.1	**≤0.1**
1 turn 10mm radius, 1625 nm	≤1.5	≤0.2	**≤0.2**

Upto 10x reduced bend losses than OH-LITE NOVA

Same MFD for true backward compatibility

STL Fiber	Attn. 1310nm (dB/km)	Attn. 1550nm (dB/km)	MFD Mean (μm)
STELLAR	0.33	0.19	9.1
OH-LITE NOVA	0.33	0.19	9.1
BOW-LITE-250	0.34	0.20	9.1
OH-LITE (E)	0.33	0.19	9.1
OH-LITE	0.34	0.20	9.1

ITU Standards

- G.657.B3
- G.657.A2
- G.657.A1(+)
- G.657.A1
- G.652.D

Bend optimized fibers

STL Fiber	Attn. 1310nm (dB/km)	Attn. 1550nm (dB/km)	MFD Mean (μm)
BOW-LITE SUPER	0.35	0.21	8.6
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BOW-LITE PLUS	0.33	0.20	8.8
BOW-LITE 200	0.34	0.20	8.8

We integrate digital networks for our customers

Core Business

Customer Segments

- Telcos
- Cloud Companies
- Citizen Networks
- Large Enterprises

End-to-End Solutions

- opticonn — Optical Connectivity
- LEAD 360° — Fibre Deployment
- FTTx mantra — One Solution. Countless Opportunities — FTTx Access Network
- netmode — Network Modernisation

Portfolio Offerings

Optical Interconnect Products

- Glass Preform
- Optical Interconnect
- Optical and Speciality Cables
- Optical Fibre

Virtualised Access Products

- Programmable FTTx
- Virtualised Radio
- RAN Intelligent Controller
- RAN Orchestration

Network Software Products

- Telecom Billing Operations Software
- Monetisation and Engagement Software

System Integration Services

- Network Design Services
- Fibre Rollout Services
- Network O&M Services
- Data Centre Integration
- Private Enterprise Integration

Unique Capabilities

STL in Numbers

$736 Mn.

FY20 REVENUE
India (66%), Europe (22%),
China (3%), Rest of world (9%)

7

GLOBAL PRODUCTION FACILITIES
50m fkm optical fibre capacity

GLOBAL FOOTPRINT

4

INNOVATION CENTRES
Research & Development

358

PATENTS
Across the network layer

Zero

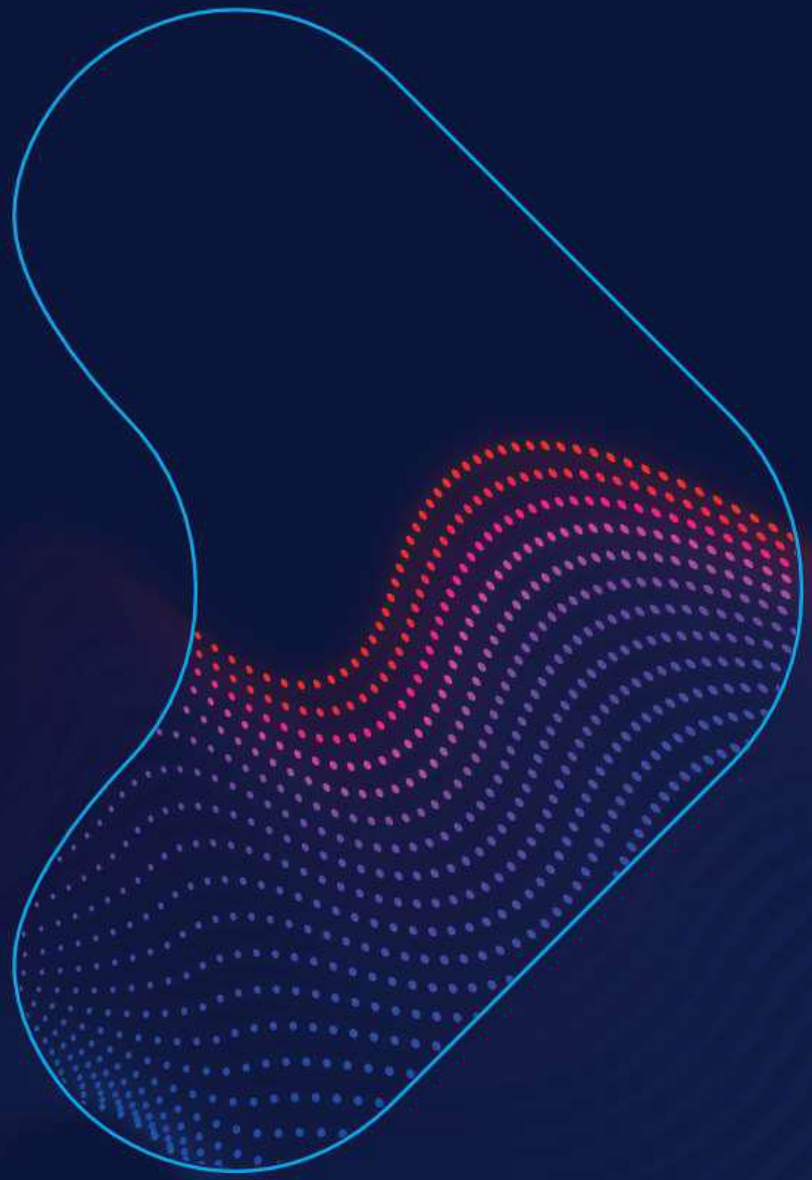
WASTE TO LANDFILL
Shendra, Rakholi, Dadra

30+

NATIONALITIES
~3,100 Employees

Let us know your thoughts

#STLWebinar



beyond tomorrow