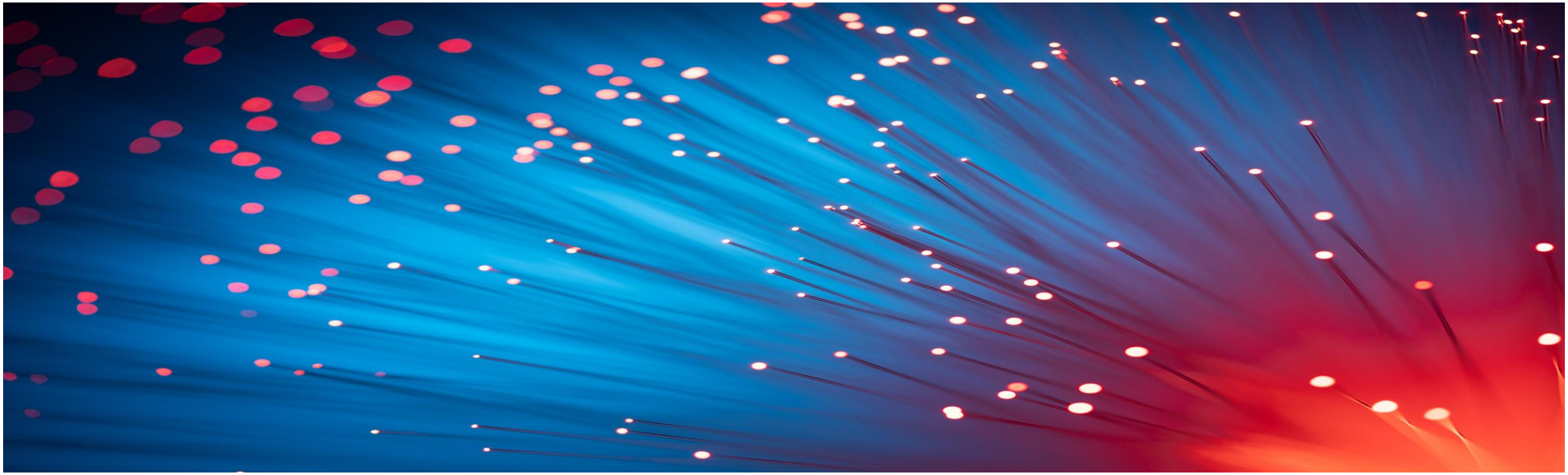


Optimizing Common Utility Corridors for Digital Infrastructure- Strategies for Shared Infrastructure and Global Case Studies

Sep 2025

Creation of common utility corridors, its impact and utilization strategy as a shared infrastructure for National Gati Shakti Master Plan

Why Invest in Utility Corridors?

Objective

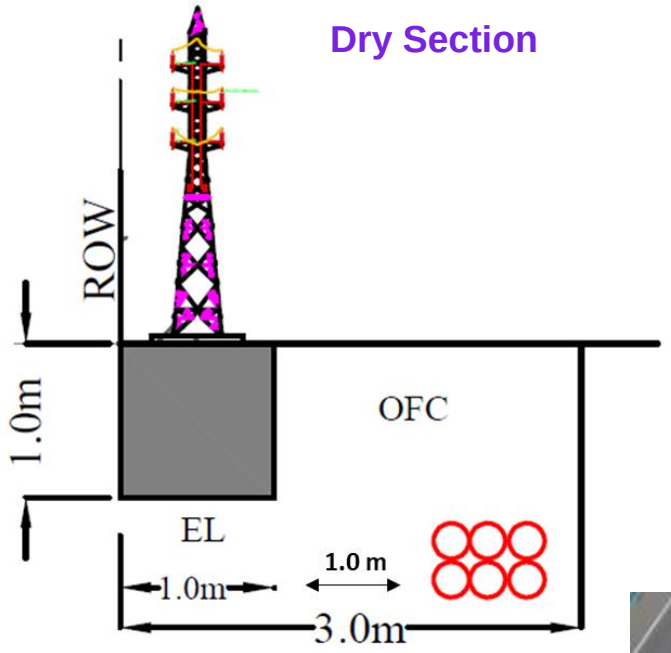
Enhance digital connectivity, reduce infrastructure duplication, and support smart Highway initiatives.

Benefits

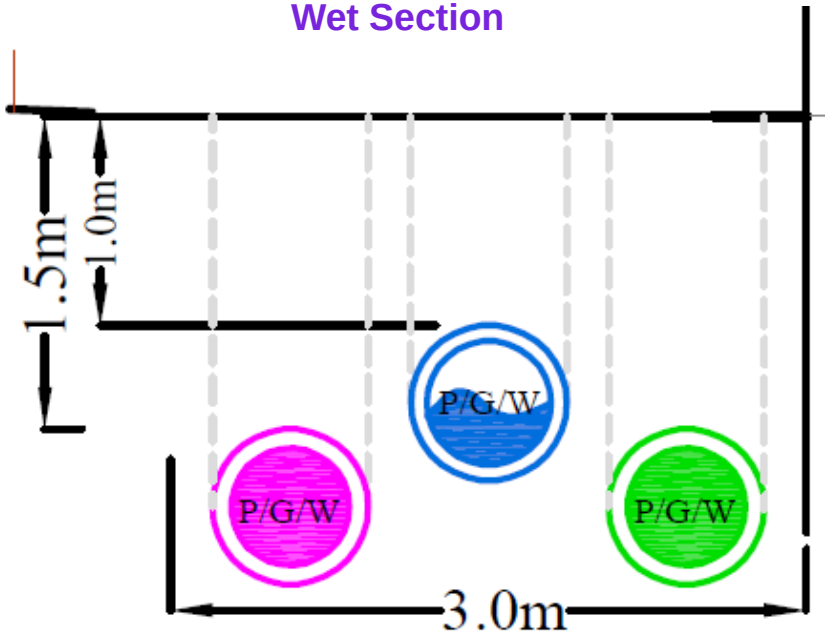
- **Economic: Lower deployment costs through shared ROW.**
- **Operational: Simplified maintenance and upgrades.**
- **Social: Bridging digital divide in underserved areas.**

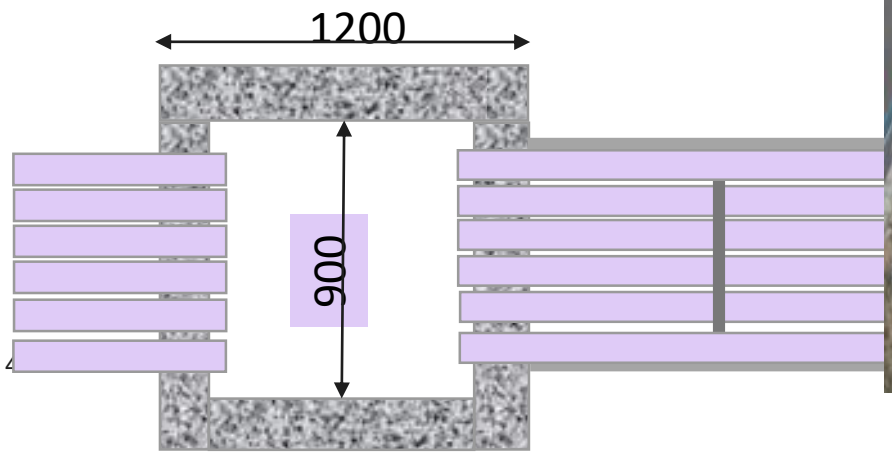
The following diagrams show the typical cross section of utilities for Utility Corridor:

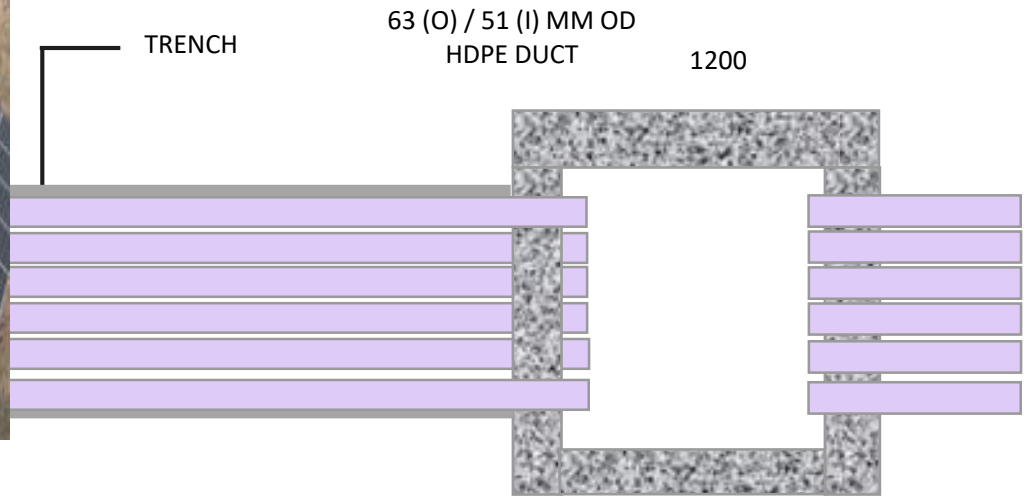
Dry Section



Wet Section

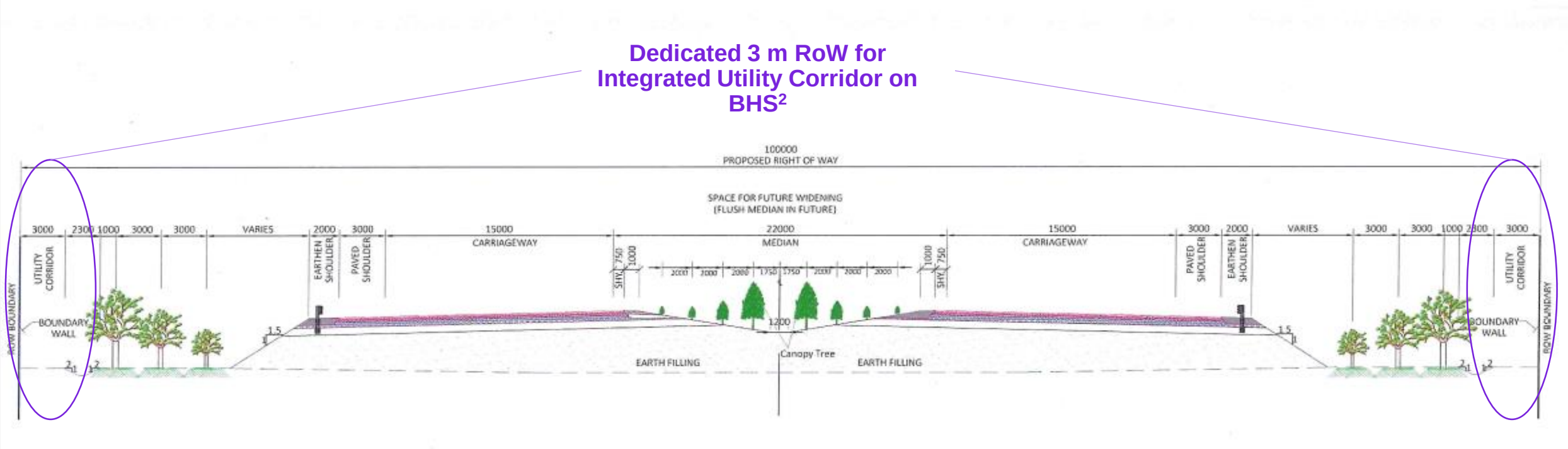






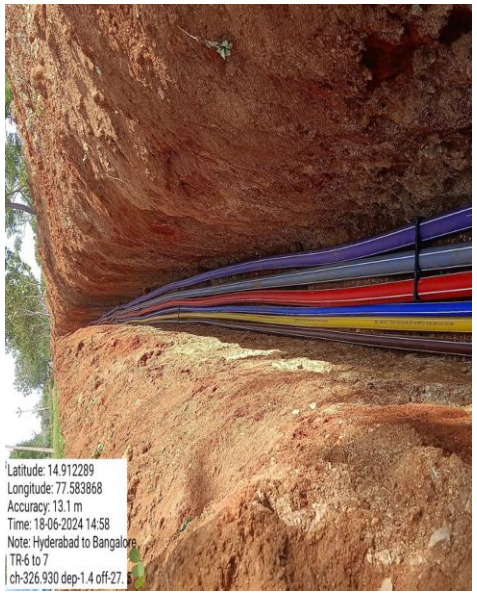
Cross Section of Delhi – Mumbai Expressway (part 1)

Dedicated 3 m RoW for Integrated Utility Corridor on BHS[2]



1. Integrated Utility Corridor
2. Both Hand Side

Cross Section of Delhi – Mumbai Expressway (site images)



Dedicated Utility Corridor

Cross Section of Delhi – Mumbai Expressway (part 2)

1. Integrated Utility Corridor

NHAI plans to undertake development of OFC (dark-fibre) infra. in-line with NBM[1] & PM Gati Shakti

10% increase in the **broadband penetration** of any developing country like India is expected to **boost the GDP growth rate by ~1.4%**[2]

Key features

National Broadband Mission

- **Enable** fast track **growth of digital** communications **infrastructure**
- **Bridge** the digital **divide for digital empowerment and inclusion**
- **Provide affordable and universal access** of broadband for all
- **Create a digital fiber map** of Digital Communications network

राष्ट्रीय ब्रॉडबैंड अभियान
National Broadband Mission

PM Gati Shakti initiative

- **Ensure integrated planning** and **implementation** of infrastructure projects
- **Leverage synergies across Ministries (E.g.** DOT and MoRTH for OFC)

PM GatiShakti
National Master Plan for Multi-Modal Connectivity

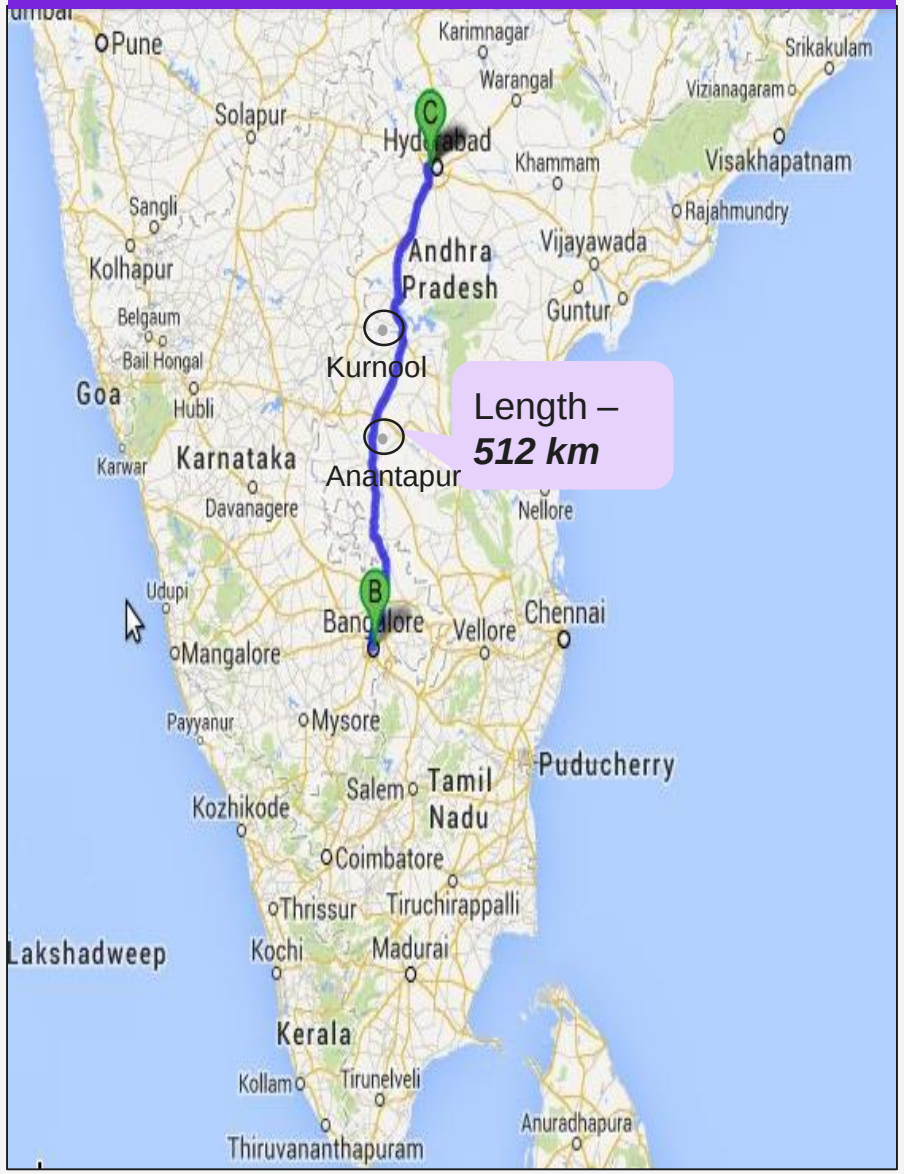
In line with the NBM[1] and PM Gati Shakti, NHLML plans to **leverage NHAI's extensive highway network** to undertake development of **~20,000 kms of OFC (dark-fibre) infra. by FY2025-26 with guidance from DoT and TRAI**

1. National Broadband Mission
2. As per study conducted by World Bank

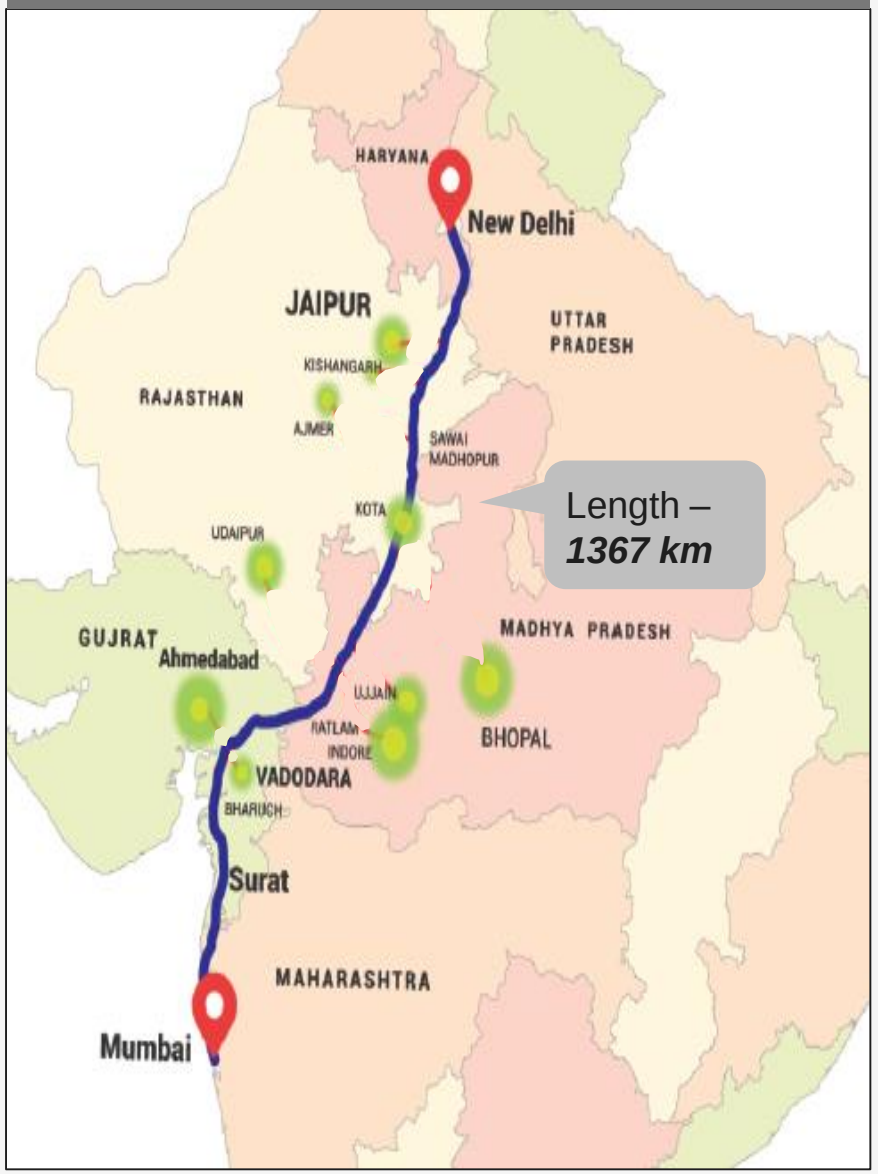
In Phase I, NHLML has awarded contracts for development of OFC infrastructure along 2 pilot projects of total length ~1,900 kms

Pilot projects **chosen based on feasibility study** for utility corridors along NH corridors

Hyderabad-Bangalore National Corridor

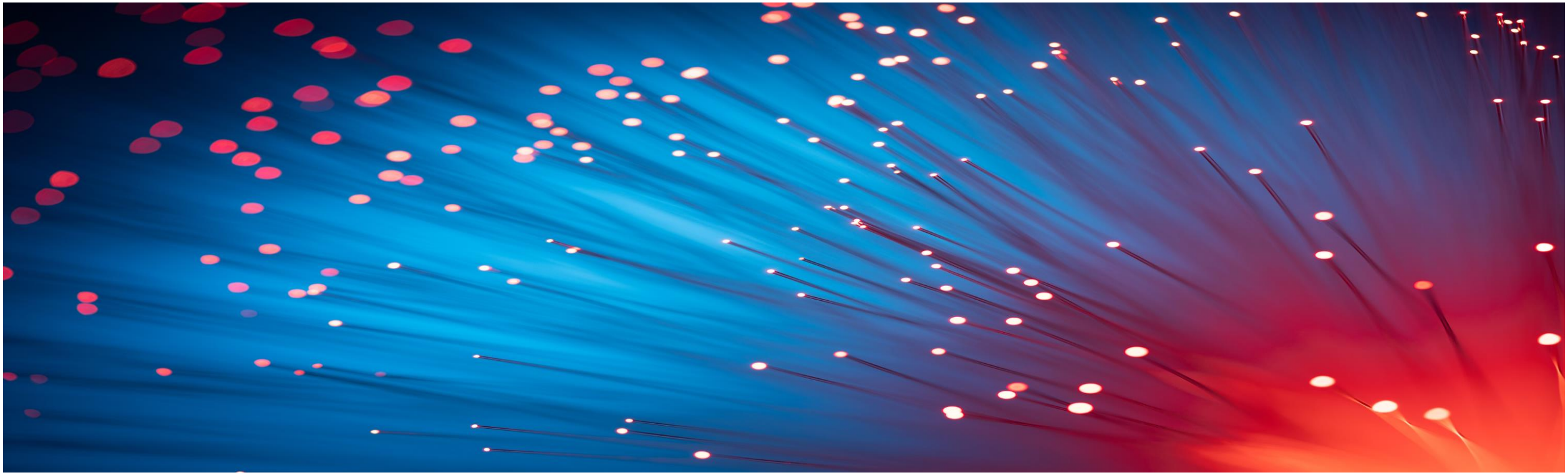


Delhi-Mumbai Expressway



Multiple Aerial Utility installed by Utility owners

Multiple Underground & Aerial Utility installed by Utility owners at National Highway



Technical Components of OFC Infrastructure

The planned OFC infrastructure shall be developed within 1.2 m Right of Way (RoW) and consists of 6 key technical components (1/2)

Key Technical Components

Component		Description	Qty. required per corridor	Salient features
Ducts		Ducts act as **supporting infrastructure** for cables	**3 ducts of 40/33 mm** dia. **+ 3 ducts of 63/50 mm** dia.	– Each **duct** shall be **Permanently Lubricated with High Density Poly-Ethylene** material – Each **duct** shall also have a **Hauling Rope**
Cables (dark-fibre)		Optical Fibre Cables **carry data through light pulses** at very high speed	**1 cable of 96 fibre** to be installed **in each 40/33 mm duct**	– **Total fibre-pairs** available for leasing = **144** (i.e., 96 fibre cable each in 3 ducts) – Each **cable** shall be **LT**[3] **Single Mode Armored Cable**
Network Operation Centers (NOC)		NOCs are required to **supervise, monitor, control and maintain** the installed & leased OFC network	**1 NOC Room** to be developed **per corridor**	Each NOC room shall comprise of, – **RFMS**[1]: Facilitate 24 x 7 monitoring of all fibres through integration with Telco Rooms – **GIS**[2]: Geographic mapping of developed/leased infra. – Space for **CCTV control center, server, etc.**

1. Remote Fibre Monitoring System; 2. Geographic Information System; 3. Loose Tube

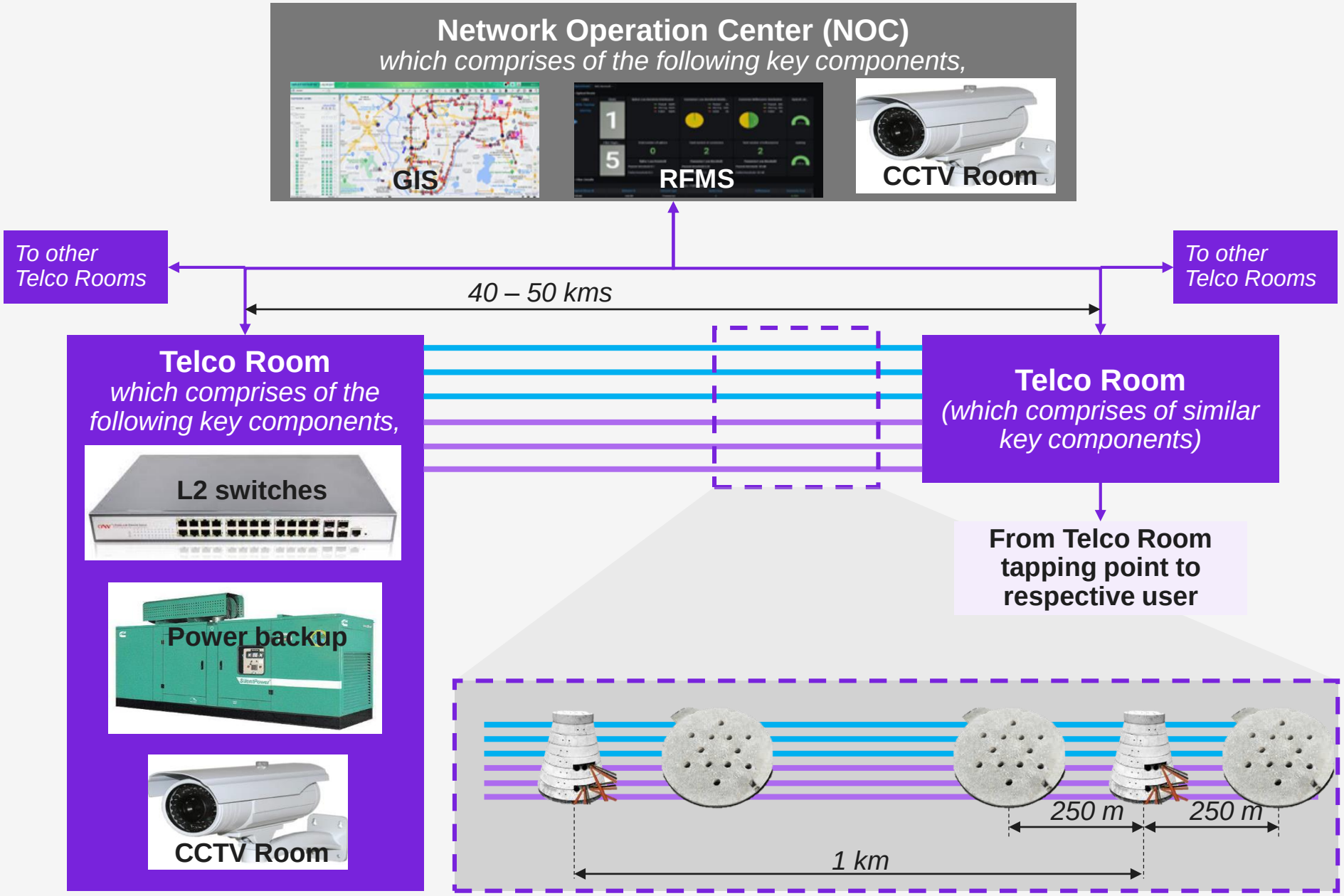
The planned OFC infrastructure shall be developed within 1.2 m Right of Way (RoW) and consist of 6 key technical components (2/2)

Key Technical Components

Component		Description	Qty. per corridor	Salient features
Telco Rooms		Telco Rooms **provide tapping points** for leasing, as required by any user	To be **installed at every 40-50 kms** along NH	Each Telco room comprises of, – **Emergency power back-up, CCTV room, L2 switches, etc.**
Manholes		Manholes and handholes **provide direct access to the installed OFC infrastructure**	To be **installed at every 1 km** along NH	– Manholes shall be **pre-cast covering 1.2 m dia.** with a **depth of 1.5 m** – Manholes and Handholes aid with, – **Installation and construction of OFC infrastructure** – **Regular and periodic O&M** – **Replacement of any sub-component**
Handhole			To be **installed at 250 m** on either side of each Manhole	

All key technical components are interlinked

Connectivity among key components between any 2 Telco Rooms



Focus zone

Handhole

Manhole

Connectivity

Duct of 63/50 mm dia.

Duct of 40/33 mm dia. + 1 cable of 96 fibre

NHLML plans to offer best-in-class Service Level Agreements (SLA) and Key Performance Indicators (KPI)

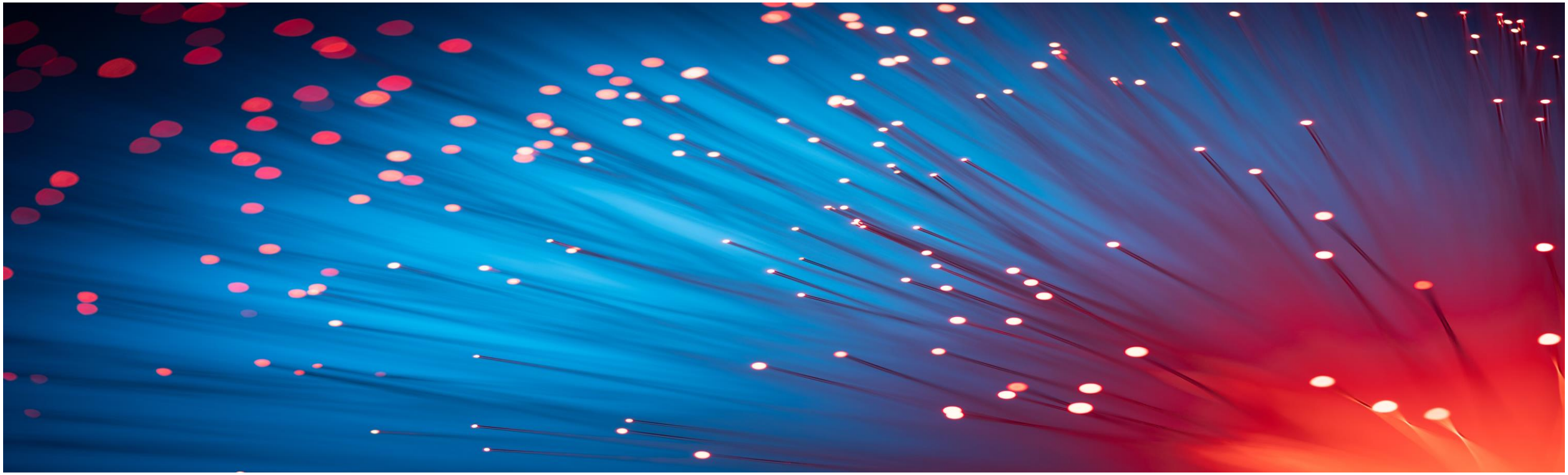
Target SLAs and KPIs have been **detailed in the RFP** for development of OFC infrastructure **for EPC contractor – EPC contractor to maintain asset for 10 years (DLP)**

Major SLAs and KPIs to be followed by EPC Contractor

SLA	Target KPI	Duration of Service outage with no penalty
Availability	**99.97% availability**	**Less than 12.58 minutes**
Mean Time To Restore (MTTR)	**3 hours MTTR**	**Less than or equal to 3 hours**
Avg. number of Optic Fibre Cable cuts / 1000 kms	**4**	**Once a month**
End of Life (EOL)[2]	**0.33 dB**[1] **per km**	**Once a month**
Periodic Audits of Duct/fibre infra.	**Once a month**	**Once a month**
Permanent Restoration *(including excavation)*	**Within 10 hours**	**Less than 10 hours**
Replacement of Fault Repair Team (FRT)	**Within 24 hours**	**Less than 24 hours**
GIS Update	**98% compliance**	**Less than 24 hours**

– **Appropriate penalties,** as defined in the Contract for each KPI, shall be levied

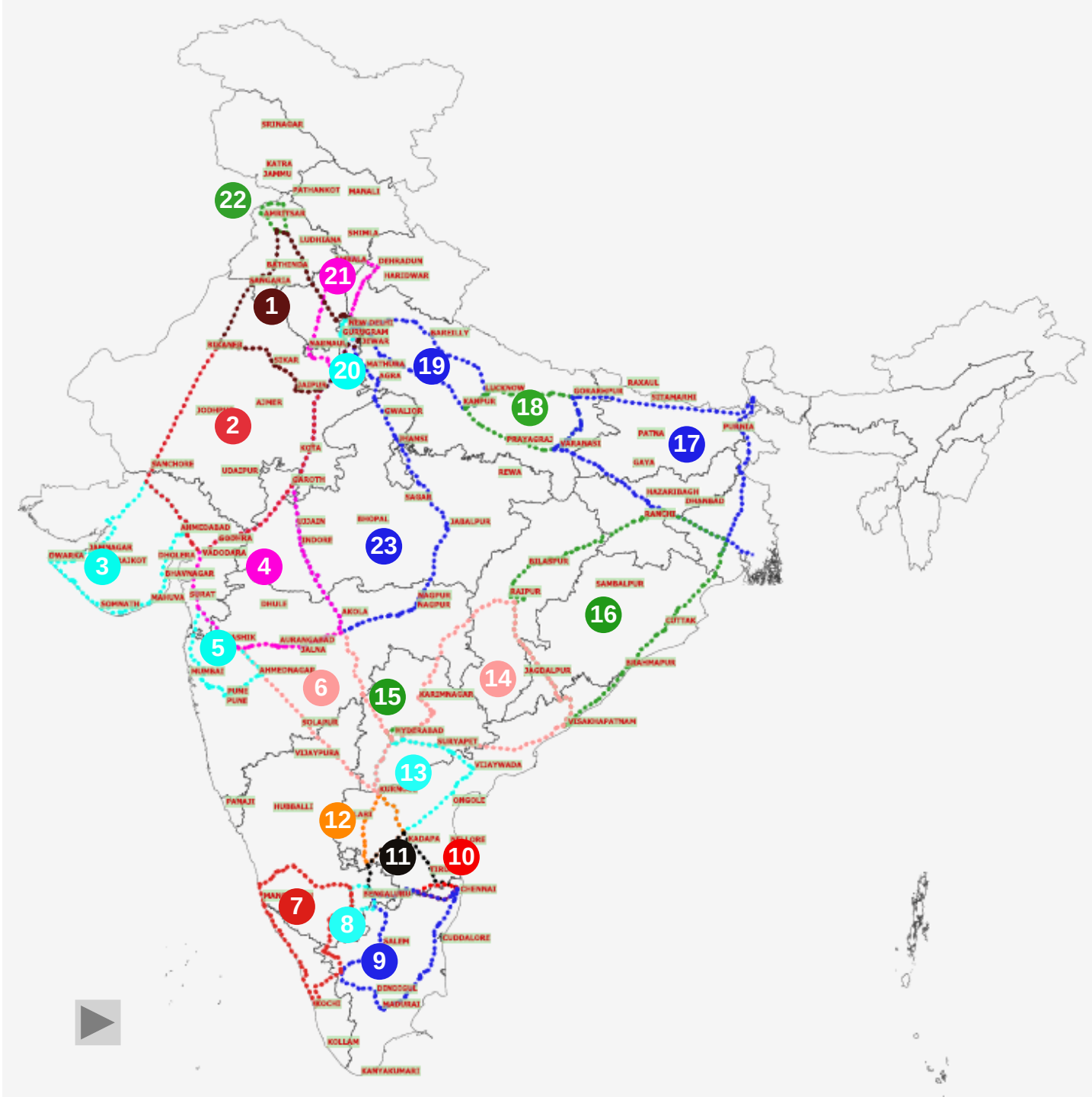
1. Decibel
2. Post installation; using 1310 nm wavelength measuring instrument



Proposed OFC Network Architecture

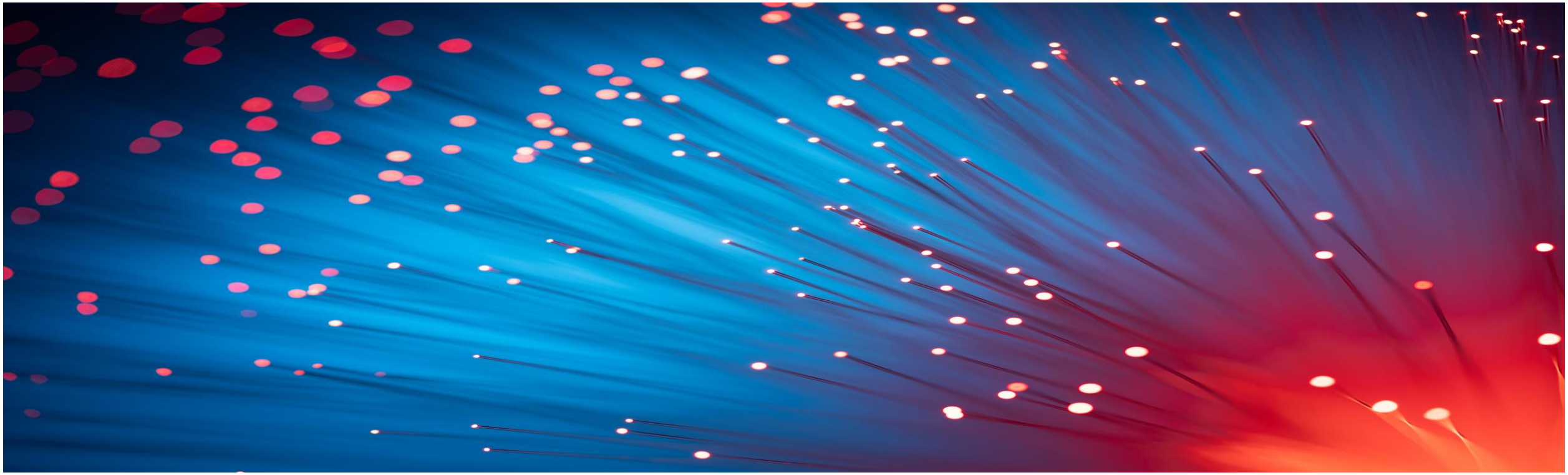
NHAI OFC Ring Architecture

Prioritize high-traffic corridors and urban hubs for maximum impact.



NHAI OFC Ring Architecture –

OFC Ring No.	Major cities	Total (Km)
OFC Ring 1	Ludhiana-Delhi-Jaipur-Bikaner-Bathinda	1,423
OFC Ring 2	Bikaner-Sanchore-Vadodara-Kota-jaipur	1,775
OFC Ring 3	Sanchore-Jamnagar-Somnath-Dholera-Ahmedabad	1,351
OFC Ring 4	Vadodara-Nashik-Jalna-Akola-Indore-Garoth	1,490
OFC Ring 5	Mumbai-Pune-Ahmednagar-Nashik	932
OFC Ring 6	Solapur-Kurnool-Hyderabd-Aurangabad-Ahmedabad	1,585
OFC Ring 7	Mangalore-Kochi-Bengaluru	1,434
OFC Ring 8	Bengaluru Rind Road	280
OFC Ring 9	Madurai-Chennai-Bengaluru-Salem	1,375
OFC Ring 10	Chittor-Thatchur-Chennai	281
OFC Ring 11	Kadapa-Bengaluru-Vijayawada	1,086
OFC Ring 12	Kurnool-Kadapa-Chittor	572
OFC Ring 13	Vijayawada-Kadapa-Hyderabad	574
OFC Ring 14	Hyderabad-Visakhapatnam-Raipur-Durg	1,703
OFC Ring 15	Hyderabad Ring Road	154
OFC Ring 16	Visakhapatnam-Cutak-Ranchi-Durg	2,213
OFC Ring 17	Dhanbad-Varanasi-Gorakhpur-Purnia	2,230
OFC Ring 18	Lucknow-Kanpur-Varanasi-Gorakhpur	921
OFC Ring 19	Kanpur-Lucknow-Bairely-Delhi	1,026
OFC Ring 20	Delhi peripheral Expressway	220
OFC Ring 21	Ambala-Narnaul-Delhi	570
OFC Ring 22	Amritsar-Gurdaspur	272
OFC Ring 23	Sohna-Agra-Jabalpur-Nagpur	2,110
Total		**25,577**



Global Case Study – Canada’s TTC and Montreal Metro

Lessons from Canada: Shared Infrastructure Success

Rogers restricted Toronto's TTC subway mobile access, requiring government intervention to share infrastructure after acquiring BAI Canada.

Telus collaborated with Bell and Videotron from the start in Montreal's Metro, ensuring immediate access for all carriers, highlighting contrasting strategies in ownership versus partnership

Rogers vs. Telus: Underground Mobile Service Comparison

Aspect	Rogers (Toronto TTC)	Telus (Montreal Metro)
Location	Toronto's TTC subway system	Montreal Metro system
Approach	Ownership-focused, initially restricted access	Collaboration-focused, shared infrastructure
Infrastructure Control	Acquired BAI Communications Canada in 2023	Partnership with Bell, Rogers, and Videotron
Collaboration	No (initially restricted, later opened)	Yes (from the start)
Government Intervention	Yes (implied by regulatory pressure)	No
Access for All Carriers	Eventually, after commercial agreements	Yes, from the start
Timeline	Started in 2023, ongoing	Started in 2013, completed by 2020

Thank You