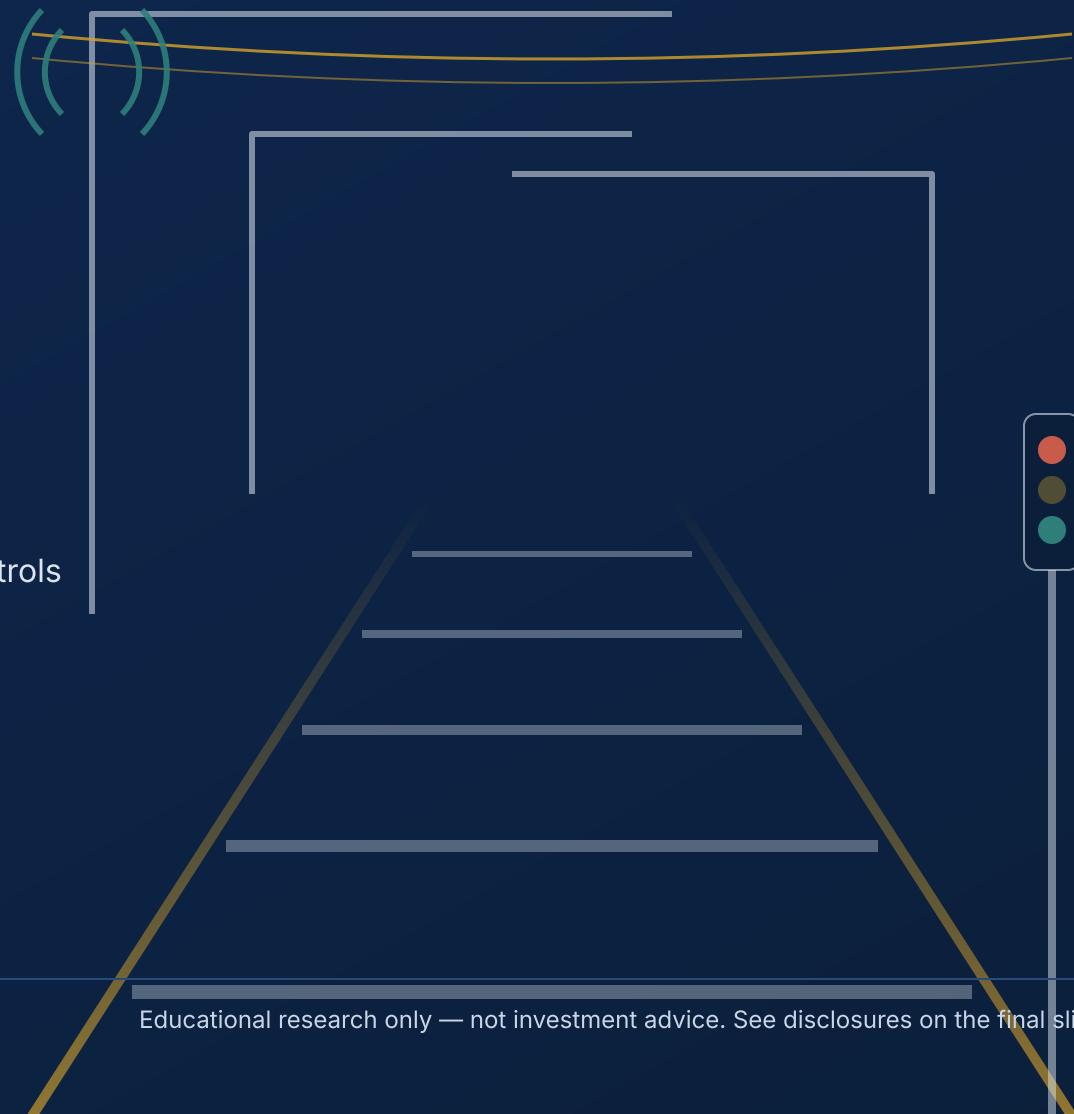


SECTOR: RAILWAYS & RAIL EQUIPMENT

Railway Modernisation

Beyond Electrification

With ~99.6% of broad gauge electrified, value now sits in what runs on and controls the network — traction, signalling, Kavach and telecom. The question is who converts sanctions into commissioned systems and cash.



Contents: from wires to working systems

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99.6%

Broad gauge electrified (70,002 of 70,271
rkm, 31 May 2026)

₹2,93,030 cr

FY27 planned railway capex incl. EBR; ~39%
spent by July 2026

2,633 rkm

Kavach 4.0 commissioned vs 21,794 rkm
taken up (31 Jul 2026)

135 → 16

Consequential train accidents, 2014-15 to
2025-26

01 EXECUTIVE SUMMARY

The electrification build-out is done; the control layer is where value now accrues

India's railway story is no longer about stringing overhead wires. What matters is what runs on and controls that network — and who can convert sanctioned works into approved equipment, commissioned systems, daily use and cash.

Exhibit 1 Five market signals and what they tell us

Market signal	What it tells us
~99.6% of broad gauge electrified (31 May 2026)	The build-out is largely done; other modernisation layers warrant attention
₹7,500 cr signalling & telecom vs ₹5,000 cr electrification (FY27 BE)	The budget mix is tilting from wires to control systems
Kavach 4.0 live on 2,633 rkm vs 21,794 rkm taken up (31 Jul 2026)	Different deployment stages, not a matched completion ratio
Kavach trackside on 7,726 rkm; 6,290 locos fitted	Installation and commissioning measure different stages
40 of 1,200 9000 HP locos dispatched (31 Mar 2026)	Assess delivery pace against contractual milestones

Source: Ministry of Railways, PIB, Union Budget 2026-27, Siemens; Alpha Room Research

99.6%

Broad gauge electrified

₹7,500 cr

FY27 BE signalling & telecom

2,633 rkm

Kavach 4.0 commissioned

40 / 1,200

9000 HP locos dispatched

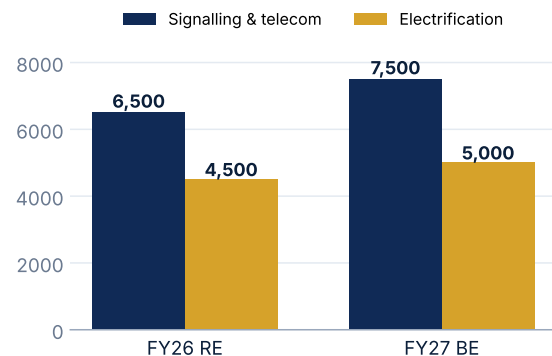
Key finding: the opportunity is structurally attractive, but value capture is uneven across the stack.

Evaluate the sector through vendor approvals, commissioning, fleet fitment, delivery and cash conversion — not headline route-km sanctions or order-book size.

02 STORY IN CHARTS

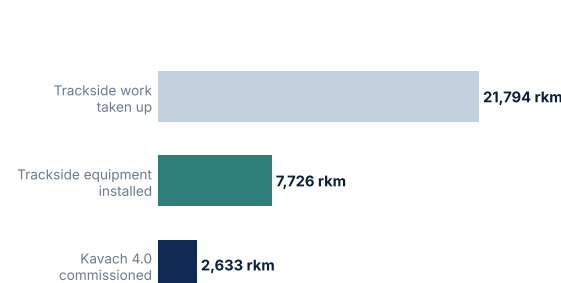
Money is moving to control systems, but deployment is still early-stage

Ex 2 Budget tilts to S&T (₹ cr)



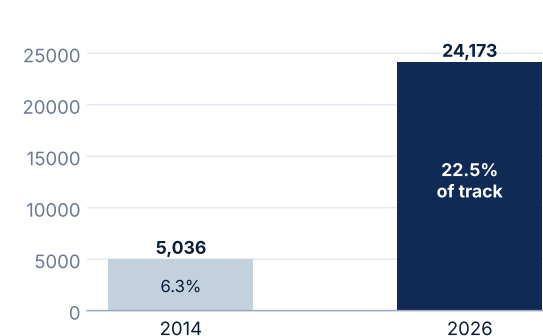
Source: Union Budget 2026-27

Ex 3 Kavach: three stages, not one ratio



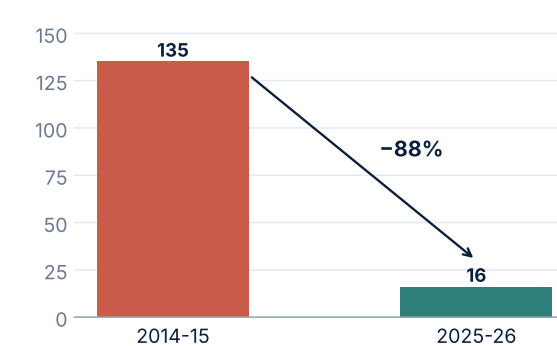
As at 31 Jul 2026. Source: PIB, Ministry of Railways

Ex 4 Track fit for ≥130 kmph (track-km)



Source: Ministry of Railways, PIB (Aug 2026)

Ex 5 Consequential train accidents



Source: PIB (29 Jul 2026)

Wires → control

FY27 BE puts ₹7,500 cr into signalling & telecom against ₹5,000 cr for electrification — the mix has flipped to the control layer.

Sanctioned ≠ protected

21,794 rkm taken up, 7,726 rkm with trackside equipment, 2,633 rkm commissioned. Each is a different stage of deployment.

Faster and safer

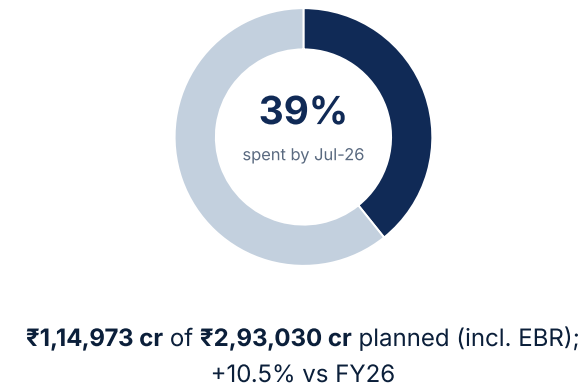
Track fit for 130 kmph+ rose from 6.3% to 22.5%; accidents per million train-km fell from 0.11 to 0.01.

03 SECTOR OVERVIEW

Indian Railways is both the planner and the buyer

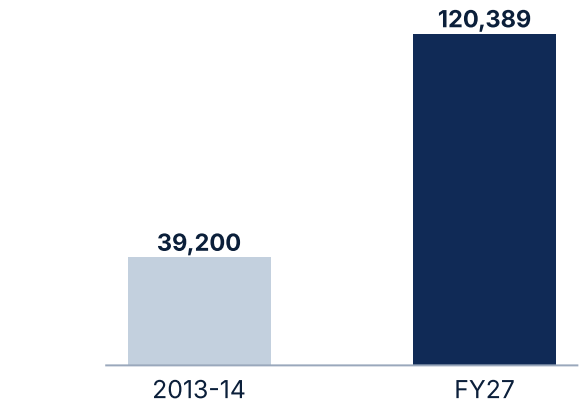
Electrification is close to complete — 70,002 of 70,271 broad-gauge rkm, leaving 269 rkm across five states. Modernisation is now about making the electrified network faster, safer and denser; Delhi–Mumbai and Delhi–Howrah are being upgraded for 160 kmph under Mission Raftaar.

Ex 6 FY27 capex used



Source: Ministry of Railways (Aug 2026)

Ex 7 Safety-related spend (₹ cr)



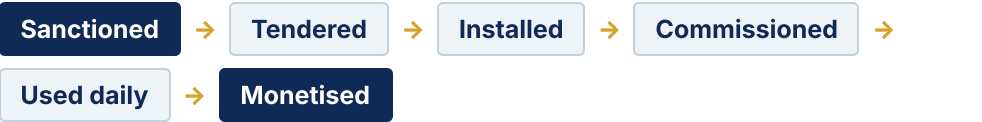
Source: Union Budget, PIB

Ex 8 Sizing the Kavach layer — illustrative arithmetic

Component	Unit cost	Scope	Implied ₹ cr
Trackside & station	~₹50 lakh / rkm	21,794 rkm taken up	~10,900
Onboard (loco)	~₹80 lakh / loco	~13,480 locos	~10,800
Spent to June 2026	Actual expenditure		3,875

Unit costs: PIB (Dec 2025). Alpha Room arithmetic — not an official estimate or remaining order opportunity; includes existing and in-progress scope.

THE CRITICAL GAP



A sanction demonstrates intent. On its own, it does not establish vendor revenue or a safer network.

04 RAILWAY MODERNISATION VALUE CHAIN

Four layers, four different risk profiles — one buyer

Each layer carries a different mix of capital intensity, approval risk, execution risk and cash-conversion risk. Indian Railways' zones and production units sit at the end of every chain as the buyer.



HOW THE LAYERS CONNECT

Electrified network → Electric rolling stock (Traction) → EI / ABS (Signalling) → Kavach ATP on track + loco → OFC / towers / LTE (Telecom) →

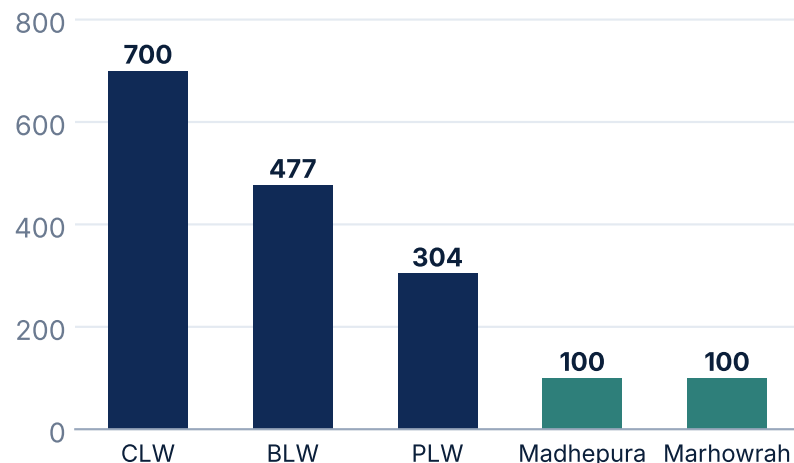
Safer, faster, denser operations

Kavach 4.0 supports relay-based interfaces and a direct EI interface, and uses OFC for station-to-station links — so the layers are interdependent: value in one layer is realised only when its neighbours are live.

05 LAYER 1 · TRACTION

Electrified track earns its return only when electric rolling stock runs on it

Ex 9 Record 1,681 locomotives produced in FY25, by unit



FY26 all-unit production 1,674; BLW alone 572 (up from 477). Source: PIB, Swarajya

ECONOMIC CHAIN



1,681

Locomotives produced in FY25 — a record

1,674

All-unit production in FY26

572

BLW output in FY26, up from 477

~€3 bn

Siemens 9000 HP order incl. 35 years of maintenance

THE DYNAMIC

Most locomotives are built in Indian Railways' own factories, so private value sits mainly in **propulsion sub-systems, components and long-term maintenance**.

The 9000 HP programme is the larger private contract: Siemens is to supply **1,200 locomotives over 11 years**, assembled at the Dahod plant, with **35 years of maintenance** — an order Siemens valued at about **€3 billion**.

Ex 10 Siemens 9000 HP: delivery progress



Source: Siemens Ltd FY26 analyst meet (28 May 2026)

Key metric: locomotives delivered and fleet availability — not contract headline value.

06 LAYER 2 · SIGNALLING

Signalling progress is brownfield, division-by-division — and site-heavy

3,954

Stations on Electronic Interlocking (30 Jun 2026)

7,464 rkm

Automatic Block Signalling coverage (30 Jun 2026)

WHAT IT IS

Electronic Interlocking replaces relay-based control of points and signals at a station with computer-based control. **Automatic Block Signalling** lets several trains run between two stations at a safe distance, adding line capacity without new track.

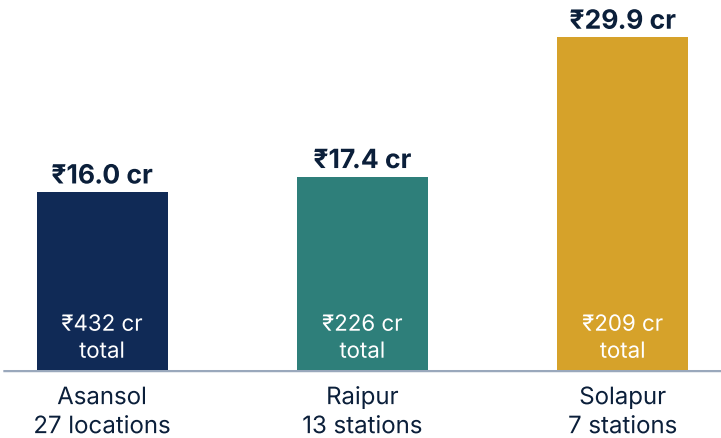
WHY IT MATTERS

EI is a key signalling layer. Kavach supports relay-based interfaces and a direct EI interface, and ABS and Centralised Traffic Control are being sanctioned on the same high-density routes.

ECONOMIC CHAIN



Ex 11 Recent EI sanctions: implied project cost per location



Asansol (Jun-26), Raipur (Jul-26), Solapur (Sep-26). Per-location values are Alpha Room calculations across differing project scopes — not standard equipment prices. Source: PIB

Key metric: stations cut over to EI and ABS route km commissioned — not works sanctioned.

07 LAYER 3 · KAVACH

Kavach value is network-dependent, not unit-dependent

India's indigenous SIL-4 Automatic Train Protection brakes automatically if the loco pilot misses a signal or speed limit. Protection exists only where compatible trackside *and* onboard systems are both operational.

Ex 12 Kavach 4.0 commissioned: 2,633 rkm (31 Jul 2026)

Corridor	Commissioned rkm
Delhi – Mumbai	1,423
Delhi – Howrah	1,210
Total	2,633

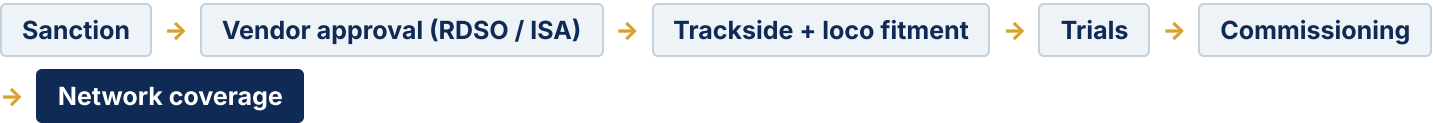
Source: Indian Infrastructure, PIB (Aug 2026)

Ex 13 Onboard fitment: locomotives



Plus installation works on 1,200 EMU/MEMU units. Source: PIB

ECONOMIC CHAIN



Ex 14 Kavach milestones

Date	Milestone
Jul 2020	Kavach adopted as national ATP
16 Jul 2024	RDSO approves Version 4.0 specification
May 2025	HBL receives first Version 4.0 approval; supplier base widening beyond 3 original vendors
May 2026	₹1,714 cr CLW loco Kavach order to HBL (ex-18% GST), due within 12 months
31 Jul 2026	2,633 rkm commissioned; trackside on 7,726 rkm
FY27	₹2,066 cr allocated; trackside on all GQ, GD & high-density routes

Source: RDSO, PIB, HBL Engineering NSE filings

Key metric: commissioned rkm with a Kavach-fitted fleet running on it.

08 LAYER 4 · TELECOM

Fibre and towers are moving; the train-radio layer is slower

The communications spine — optical fibre, towers, station data centres and eventually LTE-based Mobile Train Radio. Kavach 4.0 uses OFC for station-to-station links, and EI, traffic control and remote asset monitoring ride on the same network.

11,547 km

Optical fibre cable in place under the Kavach programme (Jul 2026)

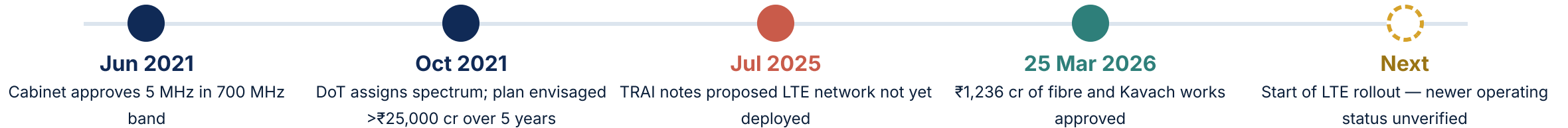
1,721

Telecom towers in place (Jul 2026)

1,009

Stations with data centres (Jul 2026)

Ex 15 LTE Mobile Train Radio: from spectrum to (not yet) deployment



Source: PIB, TRAI (Jul 2025; Feb 2024)

ECONOMIC CHAIN

OFC + towers → Station data centres → Kavach / EI data links → LTE train radio →

Data-driven operations

Key metric: live fibre and towers carrying safety traffic — and the start of LTE rollout.

09 VALUE-CHAIN ECONOMICS

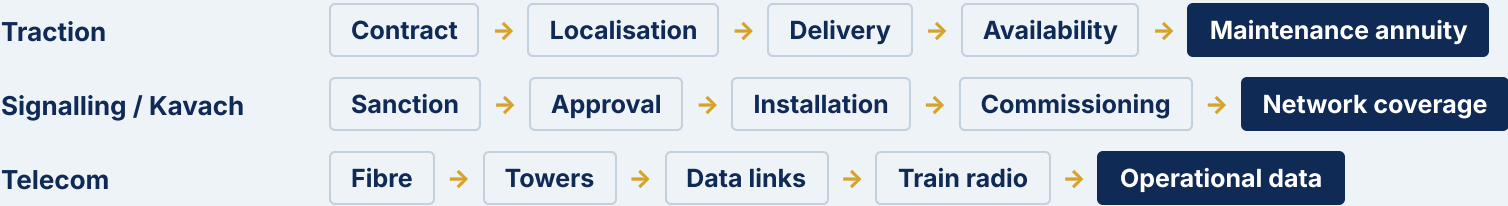
1,000 rkm “taken up” is not 1,000 rkm of protected railway

Ex 16 Capital intensity, primary risk and what to track — by layer

Layer	Capital intensity	Primary risk	What to track
Traction	High; long-cycle contracts	Delivery schedule + localisation	Locos delivered, availability
Signalling (EI / ABS)	Moderate; site-heavy works	Traffic blocks + cut-over	Stations cut over, ABS rkm
Kavach (ATP)	Moderate equipment; working capital	Vendor approval + lumpy orders	Commissioned rkm, fitted locos
Telecom (OFC / LTE)	Network capex; low per km	LTE decision + project margins	Live fibre km, LTE start
Indian Railways (buyer)	Budget-funded	Pace of fund release	Capex used vs budget

Source: Alpha Room Research

FOLLOW THE VALUE CHAIN STAGE BY STAGE — THE GREATEST WEIGHT ON APPROVAL, COMMISSIONING, FITMENT AND CASH



10 CROSS-COMPANY VIEW · VALUE-CHAIN LENS

Same modernisation stack, three different capital models

The companies below illustrate how different positions on the stack carry different capital models, risks and proof-points. The comparison is structural, not financial.

Ex 17 Siemens vs HBL Engineering vs RailTel

Dimension	Siemens Ltd	HBL Engineering	RailTel Corporation
Value-chain position	Traction: 9000 HP locos, propulsion	Kavach: loco + trackside equipment	Telecom backbone + Kavach / ICT projects
Where value is today	40 of 1,200 locos dispatched (Mar-26)	FY26 consol. revenue ₹3,303 cr; Kavach ~50% of sales (mgmt)	FY26 operating revenue ₹4,277 cr; Jul-26 order book ₹11,747 cr
Near-term catalyst	Delivery ramp at Dahod	Execution of ₹1,714 cr CLW loco order	Conversion of Kavach and project orders
Capital intensity	Moderate; IR-owned plant, Siemens kit	Working-capital heavy, order-led	Network assets + project working capital
Key risk	Delivery pace; commodity / FX on margin	Order lumpiness; Q1 FY27 consol. PAT down ~24% YoY	Margin dilution from project mix
Best KPI	Locos delivered, fleet availability	Order-to-revenue, segment margin	Order-to-cash, telecom vs project mix
Core question	Can an 11-year contract become a steady annuity?	Can Kavach revenue outlast the current wave?	Can project growth keep margins intact?

Source: company filings, analyst meet and results (May-Jul 2026). Illustrative only — not investment advice.

Company comparison is secondary to value-chain maturity: ask what stage of value conversion — delivery, commissioning or order execution — has already been achieved.

11 BOTTLENECK → OPPORTUNITY

Electrification removed one constraint; five new ones have taken its place

The new constraints sit in approvals, commissioning, fleet fitment and communication. Each bottleneck can itself become a value pool for those able to clear it.

01

Commissioning

Trackside equipment on 7,726 rkm vs Version 4.0 commissioned on 2,633 rkm. Not a matched backlog measure.

Value pool: testing, trials, integration

02

Fleet fitment

ATP needs compatible trackside and onboard systems; 6,290 locos fitted, works taken up on 7,190 more.

Value pool: loco Kavach kits

03

Vendor approval

Version 4.0 approvals arrived one supplier at a time; capacity broadens only as vendors clear RDSO and ISA.

Value pool: approved suppliers

04

Communication spine

TRAI reported no LTE deployment in July 2025; a newer status is unverified. Fibre, towers and data centres come first.

Value pool: OFC, towers, LTE

05

Track access

EI cut-overs and ABS works need traffic blocks on the busiest routes — exactly where line capacity is scarcest.

Value pool: execution capability

The pattern

Constraint



Scarce capability



Pricing power / order share



Value pool for those who clear it

12 GOVERNMENT POLICY SUPPORT

Policy is funding the control layer — and outcomes are already visible

Ex 18 Policy levers and status

Lever	What has been committed	Status signal
Capex	FY27 total planned capex (incl. EBR) of ₹2,93,030 cr, up 10.5% from FY26 BE/RE	~39% used by July 2026
Budget mix	Signalling & telecom ₹7,500 cr (from ₹6,500 cr FY26 RE); electrification ₹5,000 cr (from ₹4,500 cr)	Mix tilting to control systems
Safety	Safety-related spend of ₹1,20,389 cr in FY27 vs ₹39,200 cr in 2013-14	~3.1x over the period
Kavach	National ATP since July 2020; ₹2,066 cr allocated for FY27; trackside on all GQ, GD and high-density routes	2,633 rkm commissioned
Speed	Mission Raftaar: 160 kmph on Delhi–Mumbai and Delhi–Howrah	Kavach trials at 160 kmph done with Vande Bharat
Spectrum	5 MHz in 700 MHz band for LTE Mobile Train Radio (approved Jun 2021; assigned Oct 2021)	Deployment pending (TRAI, Jul 2025)
Outcome	Consequential accidents 135 (2014-15) → 16 (2025-26); per million train-km 0.11 → 0.01	Safety improving

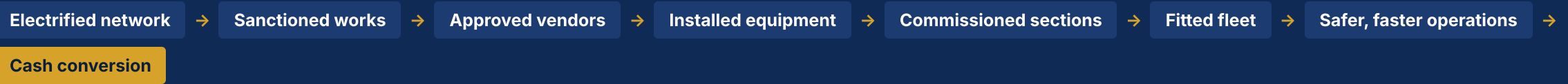
Source: Union Budget 2026-27, Ministry of Railways, PIB, TRAI. “~3.1x” is an Alpha Room calculation.

13 THE ALPHA ROOM VIEW

Sanctions create potential demand. Commissioned systems create safety and capacity. Executed, paid-for orders create economic value.

The opportunity is structurally attractive but uneven. The most important distinction is between sanctioned scope and working systems — Kavach that is commissioned, interlocking that is cut over, locomotives that are delivered and available, and fibre that is live.

FINAL CHAIN

**DON'T ASK ONLY**

How many route km have been sanctioned? How large is the order book?

ASK INSTEAD

How much has been approved, installed, commissioned, fitted on the fleet, used in daily operations — and paid for?

14 SOURCES, DISCLOSURES & AUTHOR

RESEARCH SOURCES

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6. Union Budget 2026-27 — Railway capex and plan-head allocations
7. PIB — 1,681 locomotives produced in FY25 (2 Apr 2025)
8. Swarajya — BLW produces 572 locomotives in FY26 (2 Apr 2026)
9. Business Today — BLW record month; FY27 target (3 Aug 2026)
10. Siemens Limited — FY26 Analyst Meet presentation (28 May 2026)
11. Siemens Mobility — €3 billion 9000 HP locomotive order
12. HBL Engineering — RDSO approval for Kavach 4.0, NSE filing (14 May 2025)
13. HBL Engineering — ₹1,714 cr CLW order, excluding GST (28 May 2026)
14. HBL Engineering — Results for quarter ended 30 June 2026
15. RailTel — FY26 audited results, exchange filing (1 May 2026)
16. RailTel — Management call transcript; order book (31 Jul 2026)
17. TRAI — Response on additional spectrum to Indian Railways (4 Jul 2025)
18. PIB — Cabinet approval of 5 MHz in 700 MHz band (9 Jun 2021)
19. PIB — EI and ABS coverage as of 30 June 2026 (23 Jul 2026)
20. PIB — ₹226 cr Electronic Interlocking, Raipur Division (1 Jul 2026)
21. PIB — ₹432 cr Electronic Interlocking, Asansol Division (30 Jun 2026)
22. PIB — ₹209 cr Electronic Interlocking, Solapur Division (19 Sep 2026)
23. PIB — Kavach & fibre works approved (25 Mar 2026)
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26. PIB — FY26 review; 1,674 locomotives produced (4 Apr 2026)
27. TRAI — Spectrum consultation; DoT assignment dated 22 Oct 2021 (7 Feb 2024)
28. RDSO — Kavach Version 4.0 site acceptance scheme; relay/EI interfaces

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