



# TRAIN

## Modernisation



“We are moving with a goal of total transformation of Indian Railways.”

“India has left behind the days of stagnation. Earlier speed was considered a luxury and scale as a risk. Our government has changed this trend. We consider speed as aspiration and scale as the power of India.”

“We have developed Railways not merely as service but also as an asset.”

**Shri Narendra Modi**  
**Prime Minister**



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# Introduction

Modernisation is an ongoing and continuous process in the Indian Railways. A number of steps have been taken up by Indian railways to develop infrastructure, modernize the system and improve operational efficiency. This has been done by way of increasing Capital Expenditure (Capex), introduction of technology, partnership with stakeholders, prioritization of projects, time bound execution, innovative financing and outcome-oriented action.



# Induction of Semi-High Speed Vande Bharat trains

The Indian Government has dedicated significant efforts towards strengthening the 'Make in India' campaign. As an excellent example of the 'Make in India' success story, the Indian Railways launched India's first indigenous Semi High Speed train, Vande Bharat Express.

The Semi High Speed Self Propelled Vande Bharat Train-set have been manufactured by Integral Coach Factory/Chennai with indigenous efforts. Some of the features of the Ultra modern Vande Bharat Trains are:

1. Quick acceleration
2. Substantial reduction in travel time
3. Maximum speed of 160 kmph

4. On-board infotainment and GPS based passenger information system
5. Automatic sliding doors
6. Retractable footsteps and Zero discharge vacuum bio toilets
7. CCTV cameras

Ten Vande Bharat trains are operational till 31.03.2023 over Indian Railways as indicated below:

- i. Two Vande Bharat trains are running between New Delhi – Varanasi & New Delhi- Shri Mata Vaishno Devi Katra since 2019.
- ii. Eight new and improved version of Vande Bharat trains with enhanced safety features and passenger amenities have been introduced recently between Mumbai Central-Gandhi Nagar Capital, New Delhi-Amb Andaura, Chennai-Mysore & Nagpur-Bilaspur, Howrah-New Jalpaiguri, Visakhapatnam-Secunderabad, CSMT-Sainagar Shirdi, Solapur-CSMT.

In near future the Indian Railways has planned to manufacture Vande Bharat trains in its own production units (ICF, RCF and MCF).

In addition to above, Indian Railways has also floated tenders to select technology partners for manufacturing of 400 Energy Efficient Vande Bharat trains based on different technologies in IR Production Units.



# Introduction of Vistadome Coaches

In furtherance to the objective of providing a world class modern travelling experience for passengers, Indian Railways has introduced the Vistadome tourist coach. Vistadome coaches provide panoramic view, through wider body side windows as well as through transparent sections in the roof, thus enabling the passengers to enjoy the scenic beauty of the places through which they travel.

At present, 88 Vistadome coaches are available over various sections of Indian Railways. This includes 39 Vistadome coaches on LHB platform as well. They have several modern features and amenities such as:



1. Observation lounge
2. Transparent larger windows
3. Electrically controlled opalescence glass windows in roof
4. Aesthetically designed FRP interior
5. Ergonomically designed reclining seats with 180 degrees rotating facility
6. GPS based public address cum passenger information system (PAPIS)
7. Automatic sliding doors at compartment entry on both sides
8. FRP modular toilets with pressurized flushing system & bio tanks
9. Aspiration type automatic fire detection with alarm system
10. CCTV system

More Vistadome coaches shall be proliferated in future as well. Manufacture of following Vistadome coaches is underway:

- i. 9 LHB Vistadome coaches at ICF /Chennai.
- ii. 30 NG Vistadome coaches at RCF /  
Kapurthala for Kalka Shimla Railway.
- iii. Conversion of 6 more coaches into NG  
Vistadome coaches for DHR at NFR.
- iv. Conversion of 3 MG coaches into MG  
Vistadome coaches at WR.



# Introduction of Tejas Rajdhani trains

Indian Railways has introduced a new era of train travel experience with enhanced comfort with the conversion of Rajdhani Express coaches with new upgraded Tejas Trains. The introduction of this modern Tejas Sleeper type train on LHB platform for long distance journey is another paradigm shift by Indian Railways for enhancing the travel experience for the passengers.

These ultra modern trains have following major distinguished features:

1. Automatic entrance doors
2. PA / PIS (Passenger Announcement / Passenger Information System)
3. Fire and Smoke detection system

4. CCTV cameras
5. Automatic Coupler
6. Improved lavatory - vacuum assisted flushing with bio-toilets, Superior toilet fittings, touch free soap dispenser, sealed vestibules, LED lights,
7. Aesthetically pleasing colour scheme

The coaches of following 4 Rajdhani trains have been replaced with Tejas Sleeper coaches over Indian Railways so far:

| <b>Train No.</b> | <b>Route</b>  | <b>Zonal Railway</b> |
|------------------|---|----------------------|
| 20501/02         | Agartala - Anand Vihar Rajdhani Express             | NFR                  |
| 12951/52         | Mumbai- New Delhi Rajdhani Express                  | WR                   |
| 12953/54         | Mumbai- Nizamuddin August Kranti Rajdhani Express   | WR                   |
| 12309/10         | Rajendra Nagar – New Delhi (Patna Rajdhani) Express | ECR                  |

Further replacement of coaches of 2 Rajdhani trains with Tejas Sleeper coaches has also been planned.



# Induction of SMART coaches

In view of the latest development in rolling stock technology and increased level of passenger's comfort, Indian Railways has planned for inception of SMART featured enabled coaches with ultra modern features like Smart Public address and passenger information system, Smart HVAC (Heating, Ventilation and Air Conditioning system), Smart security and surveillance system etc. in train service.

These features are further expected to enhance the level of safety and maintenance standards which will further result into reduced maintenance requirements.

Around 100 SMART coaches have been manufactured so far.



# Introduction of NMGHS coaches

There has been increase in demand of Automobile Carrying vehicles over Indian Railways. Accordingly, to capture traffic of automobile movement, there has been increased emphasis for manufacturing of NMG coaches from conversion of existing ICF coaches which are being phased out from train operation gradually.

While NMG coaches have speed potential of 75 kmph, NMGH coaches were introduced with higher speed potential of 110 kmph which shall create more line capacity. Subsequently, NMGHS coaches with speed potential of 110 kmph and



provision of side entry have been introduced.

Till 28.02.23, around 250 NMGH and 483 NMGHS coaches have been converted from existing ICF coaches. More NMGHS coaches are planned to be proliferated in the near future to cater to rising demand.



# Railway Electrification

The Railway Electrification scenario of India till 2014 had been moving at a normal pace. However, since then in the last 9 years, the progress is remarkable & the positive changes have taken place on this subject by Govt. of India. A lot of emphasis has been given to Railway Electrification in recent years with a view to reduce the Nation's dependence on imported petroleum- based energy and to enhance the country's energy security, with a vision of providing eco-friendly, faster and energy-efficient mode of transportation.

Major highlights of achievements in this regard are as below:

1. Highest ever electrification of sections covering 6,565 Route Kilometer (RKM) in single year during 2022-23, surpassing the previous highest of 6,366 RKM achieved in 2021-22.

2. Highest ever electrification of 7,121 RKM in a single calendar year 2022, surpassing the previous best of 6,041 RKM in 2021.
3. More than 6,000 RKM during consecutive 3 years, i.e, 2020-21, 2021-22 & 2022-23 despite Covid restrictions.
4. The latest Broad gauge network of Indian railways is 65,300 Route kilometer (RKM) including Konkan Railway, about 90% have been electrified by 31.03.2023.
5. More than 7 times electrification during last nine years; 37,011 of present Broad Gauge routes have been electrified during 2014-23 against electrification of 4,868 RKM (7% of present Broad Gauge routes) during 2005-14.
6. Out of total 58,812 RKM electrified so far, 29% has been electrified in last three years only.

Indian Railways are all set to electrify its entire Broad Gauge network by 2023-24. This has been made possible due to the policy initiative of Govt. of India. To make the nation Clean & Green under the visionary leadership of Hon'ble PM. It would not only result in a better fuel energy usage resulting in increased throughput, reduced fuel expenditure but also saving in precious foreign exchange. Electrification of balance Broad Gauge railway routes is planned during 2023-24.

# Initiatives to improve Rolling Stock

## **Development & operation of indigenous power head configuration (push pull) train:**

For improving average speed and section capacity, power of locomotive hauled trains will be required to be augmented. This will be essentially required to match with the increased speed potential of the infrastructure and to reduce the differential speeds of trains. Indian Railways have successfully conducted trials of Push-Pull train on NDLS-HEH and NDLS-BCT routes and successfully running one pair of train on NDLS-CSMT since February 2019. Railways plans to upgrade speed of its passenger trains with power head configuration at minimal costs

for safe and higher train speed. This arrangement has the following distinct advantages:

- a. Saving of journey time due to right powering of train.
- b. Availability of HOG load converter (HOG) at both ends (100% redundancy of HOG converter).
- c. Elimination of power cars from the rake is possible in 100% electrified route (due to 100% redundancy of HOG converter).
- d. Generating additional seating capacity of two coaches in lieu of two power cars.
- e. Faster acceleration.
- f. Substantially lower coupler forces resulting into enhanced safety.
- g. Brake application & release takes place from both the locos leading to quick brake application and release.
- h. Negligible additional costs on operation and maintenance.

## **Development of Smart Locomotive**

Indian Railways is developing smart locomotive having Artificial Intelligence (AI) and Machine Learning (ML) based Propulsion system for optimizing the performance of locomotives and reducing the maintenance cost. AI & ML based smart locomotive propulsion system will monitor the health index of equipment through sensors/cameras. Due to timely indication of health of equipment that equipment can be repaired/replaced in time resulting in optimum and effective utilization of locomotive.

## **Development of 9000/12000 HP Freight Electric Locomotive**

State of the art 9000/12000HP locomotive with modern and customized design fit for 4500/6000T freight trains and having features of high haulage capacity, high speed, reliability and high energy efficiency is being developed.

These locos shall have the following new features:

- 1. Energy Optimizer on locomotives:** Artificial Intelligence (AI) and machine learning based Energy Optimizer is an advanced driver advisory system that helps train drivers operate their trains in a smooth and energy-efficient manner. The system offers on-board advice and comes with a back-office application with sophisticated analysis functionality.
- 2. Digital tracking with Smart features for fault diagnostics:** Artificial Intelligence (AI) and Machine Learning (ML) based smart features directs health index of equipment through sensors/cameras. Due to timely indication of health of equipment that equipment can be repaired/ replaced in time resulting in saving maintenance cost besides avoiding failure online.
- 3. Electronically Controlled Pneumatic Brakes/Electro Pneumatic (ECP/EP)**



**Assist** is the new technology to improve the operational efficiency of rolling stocks. Electro Pneumatic brakes will provide benefits under most operational scenarios because of the shorter braking distance and thus the potential for the closer spacing of trains.

- 4. Integrated Vehicle Control Unit:** The Locomotive control will be integrated with modern safety & operational subsystems namely Distributed Power Wireless Control System(DPWCS)/ Kavach/End of Train Telemetry (EoTT) etc.



Ministry of Information & Broadcasting  
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