

The background of the advertisement is a composite image. In the foreground, there are blurred, curved lines representing a high-speed train track or a highway, suggesting motion. In the background, a city skyline is visible at dusk or dawn, with several skyscrapers illuminated. A prominent green digital overlay is present, consisting of a network of lines and nodes, resembling a data or communication network, with a location pin icon on the right side.

# SIEMENS

## **Moving beyond**

Transport solutions driven by a passion for mobility

# With digitalization, we enable mobility operators worldwide to...



**... make trains and infrastructure intelligent**



**... increase value sustainably over the entire lifecycle**



**... enhance passenger experience**



**... guarantee availability**

## India economic growth – Mobility a key driver

India has emerged as the fastest growing major economy in the world and is expected to be one of the top three economic powers of the world over the next 10-15 years, backed by its strong democracy and partnerships.

With significant economic growth expected over the next two decades, India's cities face the challenge of raising productivity and efficiency of their transport systems. There is however, a need to safeguard urban mobility and ensure a multi-modal, well integrated transport system to match the pace of urbanization.

As urbanization increases, so do the demands on mobility, in both, passenger and freight sectors. A rising number of goods and people need to be transported – cost-effectively and efficiently, with minimal natural resources and harmful emissions. This increase in demand has led to a rise in the technological possibilities.

Digitalization has fundamentally transformed the mobility industry: It is providing travelers with new, highly attractive and seamless mobility options to get from point A to point B that were inconceivable only a few years ago.

With our digitalization portfolio, our know-how, and expertise can enable transport operators in increasing throughput, reduce energy costs and increase value sustainably over the entire lifecycle.

Across the globe cities are the economic engines for development and growth. Planning and developing smart cities and their infrastructure is essential to enable the success of India's economy.

The intercity movement of goods and passengers, also demand effective and efficient operations as well as intelligent infrastructure and transport enable speedy throughput, environmental friendly mobility and transit clever.

At Siemens, we leverage our expertise and know-how in automation, digitalization, and intelligent electrification to meet the need for smart mobility solutions with state-of-the-art manufacturing capabilities. Our expertise includes comprehensive domain and turnkey expertise that enables us to service the entire mobility spectrum – from operation controls for rail and road traffic, rail electrification systems, rolling stock, and electric buses to parking management and tolling solutions.



A multimodal and integrated transport system is critical for any nation. It directly impacts the nation's environment, quality of life, and economic growth.

With advanced technological progress in automation, digitalization, and intelligent electrification solutions, we are committed to transform India's mobility sector – for greater sustainability, efficiency, and reliability.

**Tilak Raj Seth**

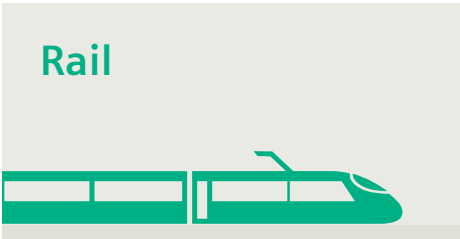
Head - Mobility, Siemens Limited.



# Global megatrends lead to increased traffic volumes



Cities are growing by **2 inhabitants per second**  
People and goods in the cities are growing and must be moved - primarily by rail and road




**By 2030:** Rail-passenger-travel in India is likely to grow from the current **1,098 billion km/day** to **5,765 billion km/day**  
**By 2030:** Freight output in India is likely to grow from the current **692 billion NTKM** to **6,559 billion NTKM**




The average speed in major cities is **less than 20 km/h**, and it is set to fall further by 2030 due to car density.


## Focus



Increasing capacity



Protecting the environment



Guaranteeing safety

## Indian railways



# Our strengths



## Nagpur

Our Nagpur facility is a first of its kind facility in India to provide end-to-end quality solutions for assemblies and testing of modular aluminum cantilevers components, droppers and jumper assemblies. It is also the first facility in India to have in-house testing capability to conduct "Factory Acceptance Tests" on modular aluminum cantilevers, jumpers and droppers.

## Nashik

Our state-of-the-art facility in Nashik manufactures a wide product range such as converters, inverters, railway signaling controls and traction motors.

## Bengaluru

Our Bengaluru center manufactures Electronic Interlocking products for railway signaling locally and includes design, installation, commissioning and service of Electronic Interlocking product. Since 2008, approximately 350 stations and critical junctions have been secured for fail-safe operations with Electronic interlocking solutions supplied from this Bengaluru center since 2008.



Approx. **400**  
safe mandays since August 2018

Approx. **3.8 mn**  
safe manhours in 2018-19  
(till August 2019)

**11**  
EHS community across sites



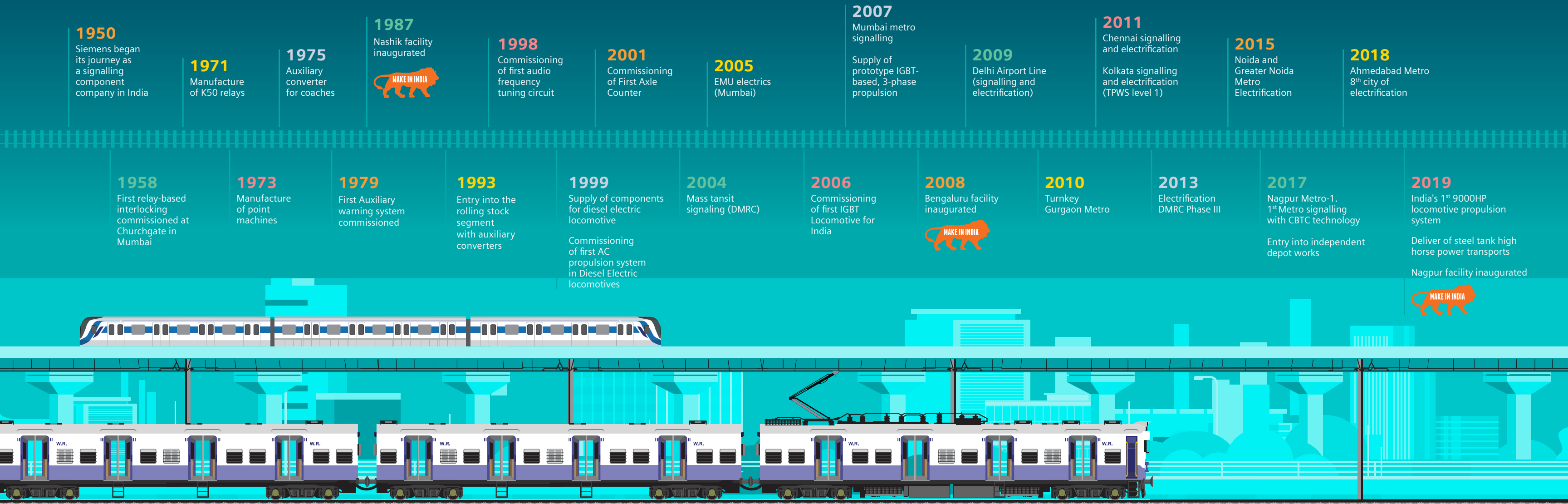
# Partnering India since 1950

Today Siemens is a leader in the area of Signalling, Electrification and Rolling Stock in India with local state-of-the-art manufacturing capabilities, strong research, engineering know-how and cutting-edge technology solutions.

Siemens realizes solutions on the basis of tested products that are setting standards in terms of technology, economic efficiency, and quality.

The result: efficient, sustainable, and reliable technology.

## Key Milestones of Siemens Mobility in India

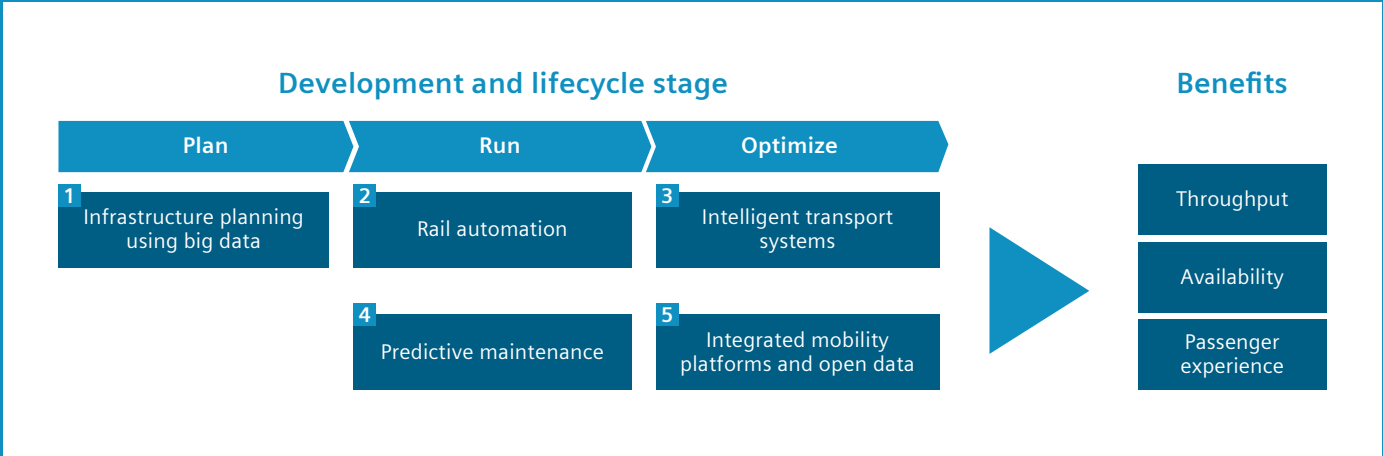




# Shaping connected mobility with digitalization

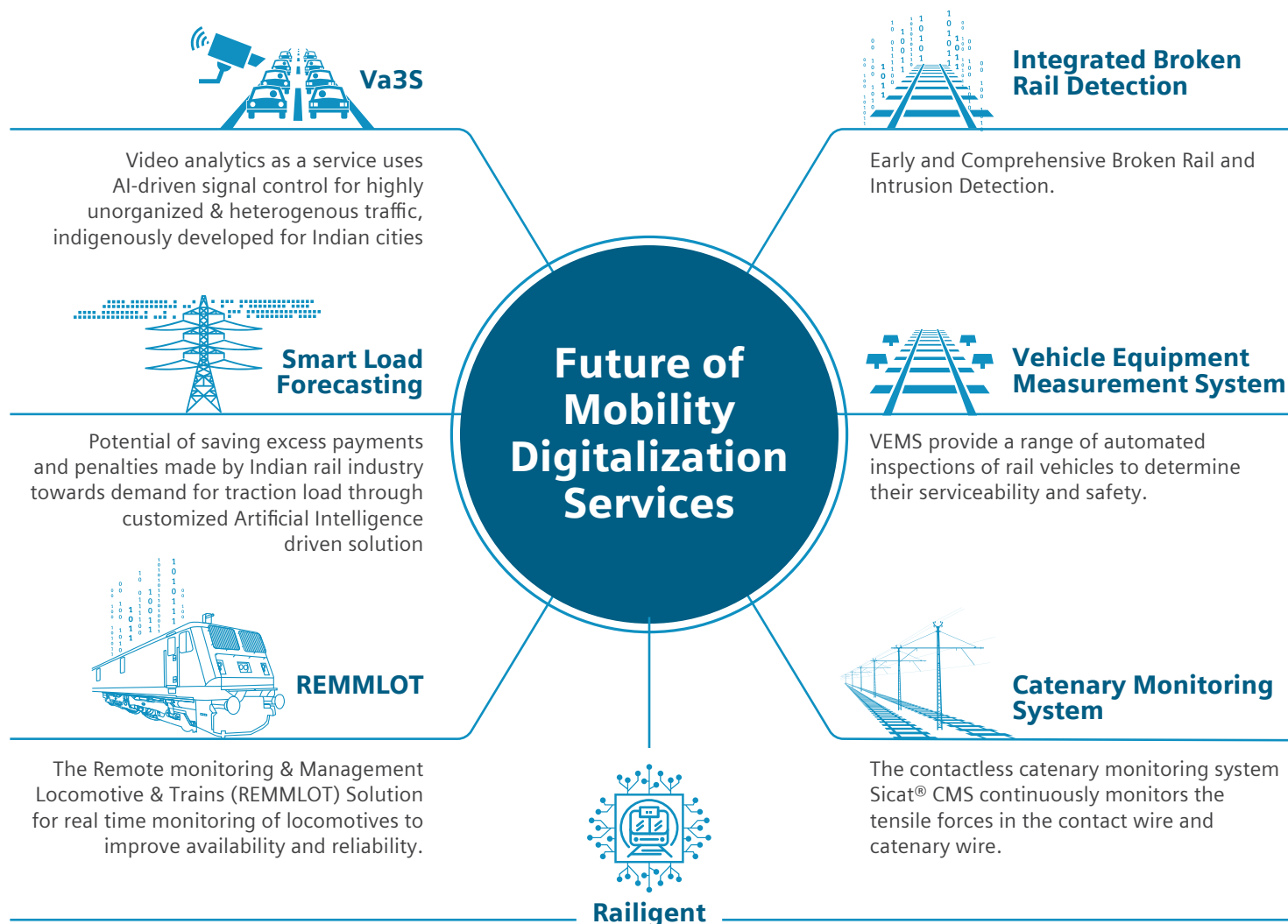
With digitalization, we enable operators worldwide to make trains and infrastructure intelligent, increase value sustainably over the entire lifecycle, enhance passenger experience, and guarantee availability. And we do this together with our customers.

True to our motto “Shaping connected mobility”, we offer new, intelligent solutions that will make rail transport more efficient, safer and more reliable.



**Maximizing potential with complete rail and road portfolio enhanced with digitalization.**





With our open ecosystem Railigent we combine deep rail domain know-how with state-of-the-art data analytics AI and IoT to create added value for our customers: 100% system availability & operations optimization!  
Fewer delays & more reliable train services: Thanks to industrial AI and IoT, we can predict equipment failure 10 days in advance and prevent breakdowns.



## Smart ticketing solution: Bytemark

Bytemark, a Siemens-owned company is a leading platform for smart ticketing solutions and intermodal mobility. Together with Siemens Mobility and HaCon, Bytemark provides a unique and holistic ecosystem of digital services and solutions: from trip planning across passenger communication to mobile ticketing, payment and comprehensive Mobility as a Service (MaaS). Solutions, from fleet management to train planning systems and mobility data analytics; we share one common goal: enhancing the passenger experience – with our combined power for mobility.



# Service assistance and capabilities


The fast-moving world requires equally capable systems to manage, organize, and maintain processes seamlessly, especially in the mobility industry. In India, with its complex rail network, it is needed more than ever. Siemens Mobility Services encompass the entire range of services for rail and road transportation.

We join hands with our partners in keeping the world running. We provide expert maintenance, spare parts, assistance, upgrade, qualification, and operation services for both metro and mainline systems.


When it comes to efficiency, sustainability, and reliability of your systems, we have the right answer. That is because we define ourselves by what we do – every day, every hour, every minute.



Wide service network across  
**95 cities covering  
200+ sites**



Resolution time of  
**5–6 hours**



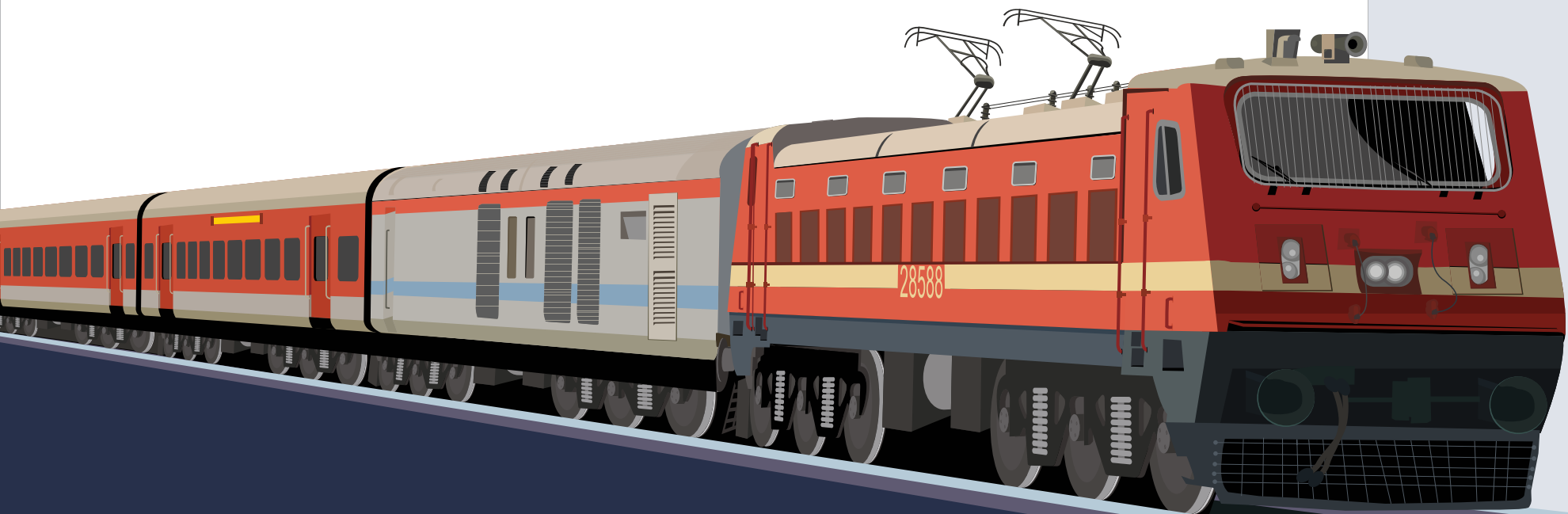
400+ strong service  
**team working 24 x 7**



Increasing value  
**sustainably**  
over the entire lifecycle



Train availability of  
**more than 99%**



● ROAD ● RAIL ● ROAD & RAIL

## Reference: Mumbai Locals







**8 million** passengers per day, with a density of **15 people** per square meter



Maintaining the over-**2,300** train services across close to **465** kilometers



More than **99%** train availability



Only **2hrs** of daily maintenance

# Rolling Stock

Indian Railways is fourth largest rail network in the world, transporting 83 billion passengers and over 1 billion tonnes of freight traffic annually.

Siemens is committed to providing the Indian rail industry with innovative rolling stock technology.

Siemens has a portfolio of future-ready locomotives that allows customers to operate economically – while at the same time reducing environmental impact and conserving resources.

In India, Siemens introduced the Insulated Gate Bipolar Transistors

(IGBT)-based propulsion and is also a pioneer in energy-saving products such as hotel load converter.

Commuter trains for the Mumbai EMU line and metro trains for Gurgaon Metro are some of the key contributions of Siemens in the area of rolling stock in India.

***Our rolling stock is distinguished by excellent driving characteristics, minimum wear, maximum convenience, and a flexible modular design, coupled with energy efficiency and reuse.***

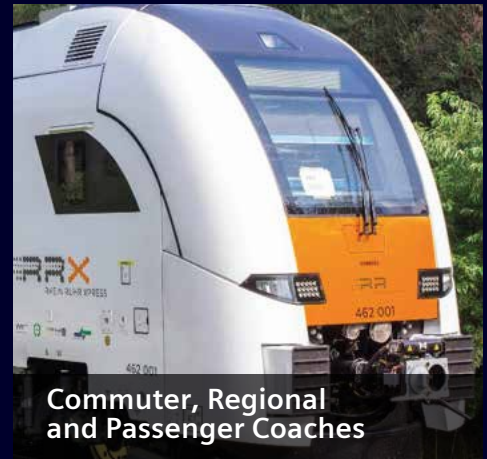
## Portfolio



Locomotives



High Speed and Intercity



Commuter, Regional and Passenger Coaches



Metros



Light Rail and VAL



Traction Drives


# Components


|   |   |  |   |
|---|---|--|---|
|  |  |  |  |
| Hotel load converter  | Converter for WAG 9 and WAG 6 locomotive  | WAG 9 traction motor   | WAG 9 traction transformer  |

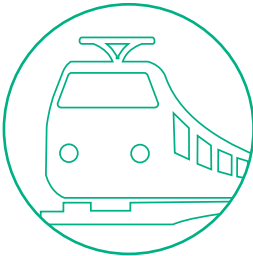
# References



**MRVC – Mumbai EMU**  
Propulsion for EMUs / MEMUs


 IGBT based propulsion systems for 131 EMUs


 Strong localised manufacturing of entire propulsion chain with end-to-end customer service



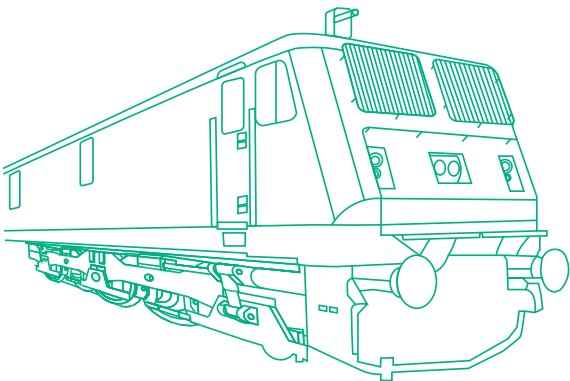
**Trusted partner to Indian Railways**  
Supplied over 10,000 traction motors and over 929 traction converters till date

 India's first IGBT based hotel load converter

 Supporting Make in India initiative

 283 locomotives connected for remote monitoring and maintenance of trains (as on Sept 19)

# India's 1<sup>st</sup> 9000HP Electric Locomotive



- Traction Propulsion System
- 180 KVA static inverter
- Hotel load converter



**Continuous remote monitoring** of traction converter



Traction converter for **9000HP Locomotive**



About **50% more** traction capacity



# High Speed Train: Velaro Novo



Aerodynamic  
excellence



Reduced  
total costs



Intelligent  
motion



Variable  
train



Proven  
technology



Invest - **20%**



Capacity  
+ **10%**



Energy  
consumption  
- **30%**



Maintenance  
- **30%**



Mass - **15%**



Flexible speed  
**250 - 360**  
km/h



# Commuter and Regional Train : Mireo



## Energy efficiency along the entire line

- Lower weight
- Enhanced design
- More effective



## Faster response time

- Shorter construction times
- Optimized components
- Greater functionality



## Uncompromising flexibility

- More space
- More freedom of movement
- Greater adaptability



## Planned profitability

- More tests
- More precise analyses
- More detailed information





# Rail Infrastructure

In India, Siemens is a front runner in rail signaling and has been increasing its footprint in the electrification segment through a number of mass transit projects.

We also offer services such as system simulations and detailed calculations, thus providing the best possible advice for each customer during each phase of the project.

Today more than ever, speed, reliability, and convenience are the decisive factors for ensuring the desirability of modern mass transit

railways – and therefore for their commercial success. The key to meeting these criteria is optimum line utilization through railway automation.

***Our infrastructure solutions ensure safe, reliable, and efficient rail operations while providing energy efficient robust automation solutions for signaling and electrification systems.***

## Portfolio

### Signaling Products and Systems



- Digital Axle Counter
- Relays
- Point Machines
- Auxiliary Warning System
- Train Protection and Warning System
- Interlocking systems
- Audio Frequency Track Circuit
- Level Crossing Protection
- GSMR Cab Radio
- CTCs / Train Management System
- CBTC for metro applications

### Electrification – Rail Electrification Products and Systems



Contact Line Systems for Mass Transit and Mainline Railways for both AC and DC Systems.

#### Products:

- Cantilevers
- Tensioning Equipment
- Insulators
- Section Insulators and Neutral Section
- Disconnectors
- Rigid Catenary
- Earthing and Protection Equipment
- Catenary Monitoring Systems, etc.

### Traction Power Supply – AC Traction Power Supply



- DC and Medium Voltage Switchgears
- Line Equipment (Stray Current Monitoring System, DC Surge Arrestors)
- Energy Storage Systems
- SCADA Systems





## Mainline references

### Siemens Train Protection Warning System




Siemens Train Protection Warning System (TPWS) offers mature, proven systems and products for high performance and capacity augmentation of existing infrastructure. TPWS meets the most stringent safety requirements and complies with the Technical Specifications for Interoperability (TSI).

**Features:**

-  High operational reliability
-  Increase capacity
-  Low lifecycle costs

### Smart track vacancy detection for cost-effective rail services

Multi Section Digital Axle Counter (MSDAC) track vacancy detection systems provide reliable information on the clear and occupied states of track sections, thereby making smooth railway operations a reality.

-  **9000+**  
MSDAC sold (in FY'18)
-  Fail-Safe operations  
(more than **99%** reliability)
-  **HTML based communication**  
for configuration & diagnostics

### Interlocking systems

Interlockings ensure safety. They check that rail sections are free, determine routes, and provide information on movement requests and train speeds. With the Trackguard portfolio, Siemens supplies modern, compliant interlocking solutions for all needs. The Trackguard product family consists of various interlocking solutions used in different rail networks across the world. Common hardware components alongwith joint research and development benefit all interlocking systems leading to costs saving and technological advances.

**Benefits:**

-  Increased Railway capacity
-  Economical
-  **1/10** 1/10<sup>th</sup> of the Indian railways stations commissioned by Siemens

 [manish.agarwal@siemens.com](mailto:manish.agarwal@siemens.com) | Manish Agarwal

 [anupam.arora@siemens.com](mailto:anupam.arora@siemens.com) | Anupam Arora

# Metro references

## **Delhi Metro**

- Signalling and rail communication for 58 km of Line 3
- Executing electrification for 85 km stretch, 59 stations and 5 sub stations for Phase III of DMRC project



## **Delhi Airport Metro**

Delivered railway electrification, one-stop signalling systems, train control systems and baggage handling systems



## **Ahmedabad Metro**

39.2km Metro express link and new double track metro line



## **Mumbai Metro**

- 11.4km length
- Commissioned Automatic Train Protection and automated signaling



## **Rapid Metro Gurgaon**

- Connecting Gurgaon Cyber City business and residential district to the city metro network
- 7 metro trains, signaling and communication system, railway electrification, service depot and system integration
- 99.9% availability



## **Kolkata Metro**

- India's first ETCS application for metro commissioned in 2013 for 27 kms line. In service with **highest SIL4** (safety integrity level) rating
- Electrification for 16.6 km stretch east-west corridor



## **Nagpur Metro**


- Siemens supplied CBTC signalling technology to enable headways of 90 seconds or less for 38.2 kms





## **Chennai Metro**


- Installed and commisioned Power supply systems, Overhead equipment (OHE) signalling, Telecom and platform screen doors



 Signaling

 Electrification

 Rolling Stock

 Depot Equip.

# Turnkey solutions

With our turnkey rail transport solutions, Siemens Mobility offers a holistic concept for developing infrastructure. From planning the integrated solution and providing the latest technology and related rolling stock, arranging the financing right through to maintenance: Siemens Mobility is by your side throughout the entire project.

We ensure on-schedule completion, reliable operation, low-emission technology, low life-cycle costs, passenger safety, and adaptability to the city's dynamic growth. As a part of our turnkey solutions, we provide Rail Electrification System, Signalling System and state-of-the-art rolling stock, depot, and workshop equipment. The entire end-to-end process includes design, system integration, interface management, and maintenance of the E&M systems.

## Reference: Gurgaon Metro



Connecting the Gurgaon Cyber City business and residential district to the city metro network, with a line length of approx. 12 kms



Maximum speed:  
**approx. 80 km/h**



Capacity of about 30,000 passengers per hour with about 1000 passengers per train



Peak headway:  
**120 second intervals**



Includes 12 metro trains, signaling and communication system, railway electrification, service depot, and system integration



**99.9% availability**



[manish.agarwal@siemens.com](mailto:manish.agarwal@siemens.com) | Manish Agarwal



[souvik.bhattacharya@siemens.com](mailto:souvik.bhattacharya@siemens.com) | Souvik Bhattacharya



# Road Transport

As the global leader in traffic technology, Siemens can look back on almost 100 years of unique experience in the implementation of suitable technologies and solutions. We take innovation seriously: our systems are continuously redeveloped so that they correspond to state-of-the-art technology. As far as sustainability is concerned, it goes without saying for us that new technology can be combined easily with already existing installations.

Integrated Traffic Management solutions covering the complete value chain including on-street equipment, sensors and monitoring, urban traffic systems, inter-urban, telematics, systems, and support.



GPS-based  
Tolling



Tunnel  
systems



Central Traffic  
Management  
system



Traffic Control  
system and centres



Parking  
systems



Field  
Equipment



Smart Guard  
(Cloud-based  
Urban Traffic system)



e-highway

## Intelligent Traffic Systems

The digital world opens up countless new opportunities. Siemens Intelligent Traffic Systems (ITS) have the capability and capacity to leverage these opportunities to the customers' benefit: with innovative software concepts for making tomorrow's mobility systems even safer, efficient and eco-friendly.

### India's biggest cities may be losing billions annually to traffic congestion and its commuters are bearing the burden...



300-500 billion

The cost of congestion on the basis of fuel burned and productivity loss, including man-hours, opportunity cost, pollution, and health costs incurred on an annual basis.



1.5 hours more

Travelers in our metro cities spend more on their daily commute than their counterparts in other asian cities during peak traffic times.

Source: Bloomberg



## Video analytics as a service (Va3s)

### Benefits of our solution in the Indian context:

- Video based traffic sensing requires minimal infrastructure changes.
- Existing CCTV's or low cost cameras can be used, irrespective of the camera OEM.
- Under direct purview of 'Make in India'.
- Accurate sensing in chaotic conditions with unorganised and heterogeneous vehicles, at intersections and road segments.
- Provides reliable data to facilitate road infrastructure planning and optimized signal plans.



arko.chatterjee@siemens.com | Arko Chatterjee



dn.vaidya@siemens.com | Deepak Vaidya

**Published by and copyright © 2019:  
Siemens Ltd.**

Birla Aurora, Level 21,  
Plot No. 1080,  
Dr. Annie Besant Road,  
Worli, Mumbai – 400030

**[www.siemens.co.in](http://www.siemens.co.in)**



All rights reserved.

Trademarks mentioned in this document  
are the property of Siemens AG, its affiliates,  
or their respective owners.

Subject to change without prior notice.

The information in this document contains  
general descriptions of the technical options  
available, which may not apply in all cases.