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Rolling Stock Technologies and Solutions for India

Presented by : Mangal Dev, HITACHI Rail Systems Company

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1. Hitachi Group and Rail System Company profile

1-1. Hitachi Group - Revenue by Segment

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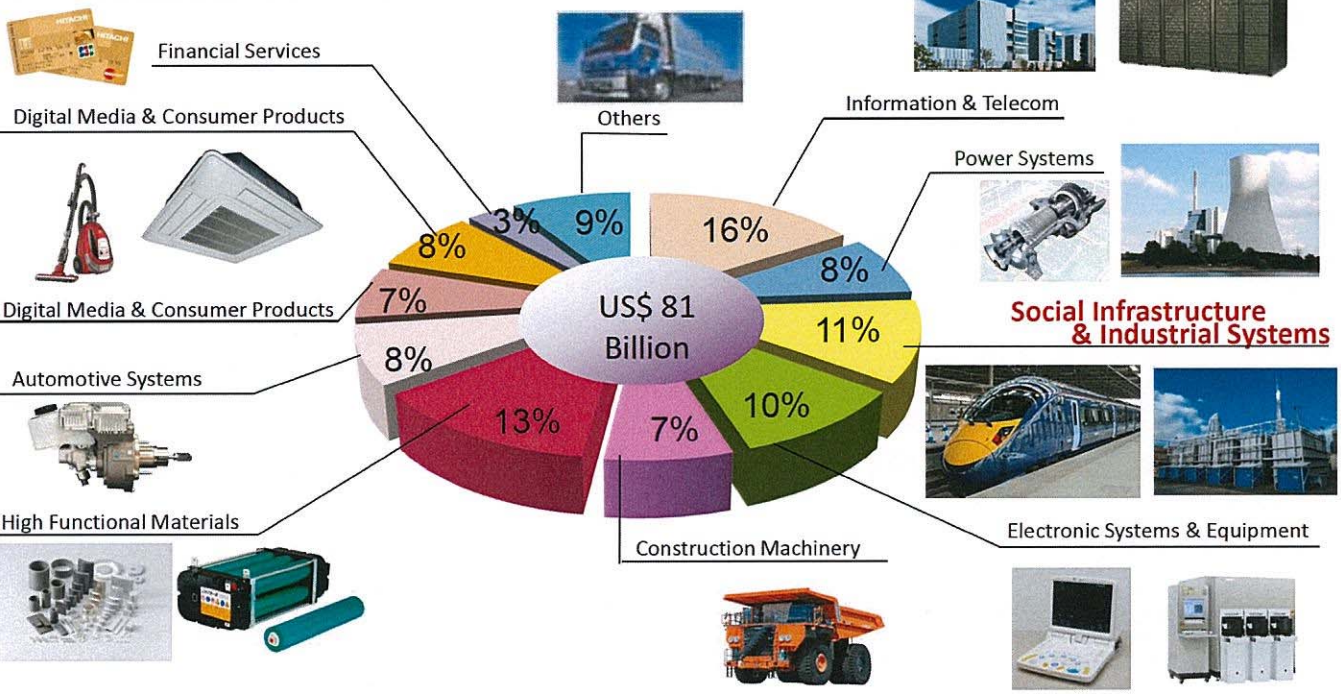
Foundation	1910	Capital	JPY 458B (US$3.8B)
Employees	336,670	Annual Sales	JPY 9,774B (US$81.4B)

Revenue by Industry Segment:



1-2. Hitachi : A Total Rail Systems Solution Provider

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2. Rolling Stock, Trainsets, Monorail Systems

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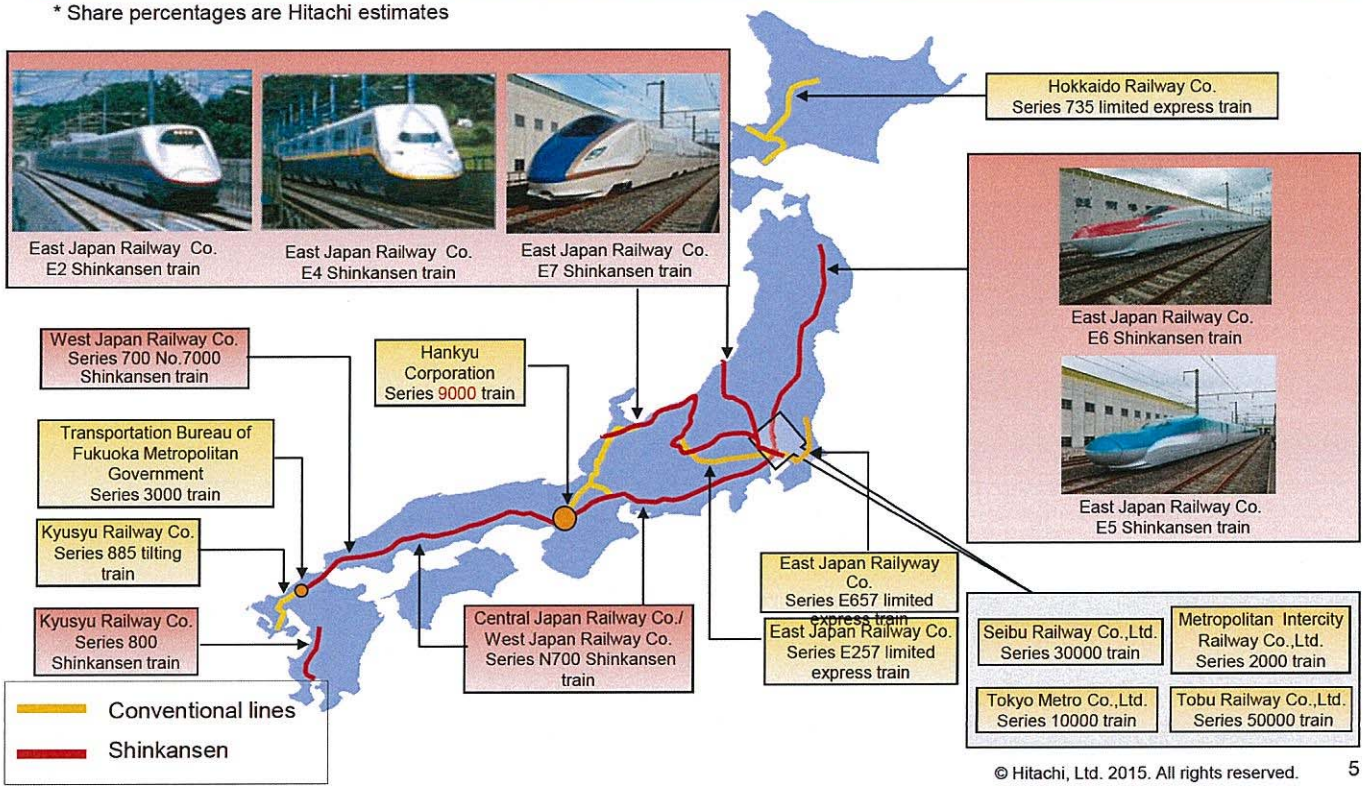
2-1. Long Experience within Japan

Share of rolling stocks:23% Share of electrical components :30%

* Share percentages are Hitachi estimates



2-2. Impeccable Records of Shinkansen in Japan

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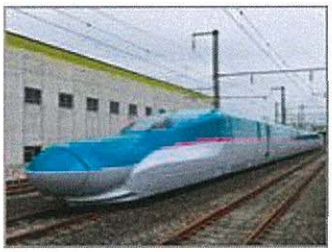
Series E7 (260km/h)

Series E6 (320km/h)



Series E5 (320km/h)

More than 2,500 cars delivered since 1962

Series E954(360km/h)

Series E4 (240km/h)

Series E2 (275km/h)

2-3. Over 1000 "A-Trains" in service in Japan

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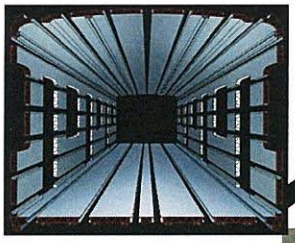
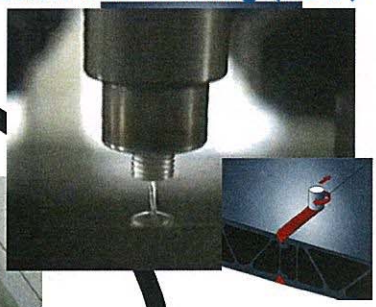
"A-Train" incorporates number of concepts and features characterizing the next generation railcar system: *Advanced, Amenity, Ability & Aluminum*



Aluminum double skin structure

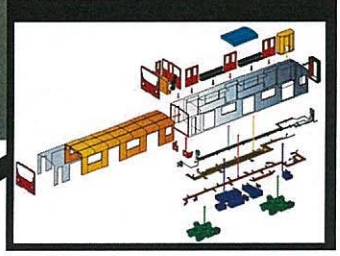
Aluminum car body

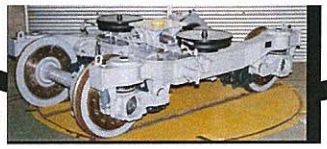
Friction Stir Welding (FSW)



Traction System & HVAC systems

Modular Mfg. concept





Bogie

2-4. Evolution of car body to Aluminum technology

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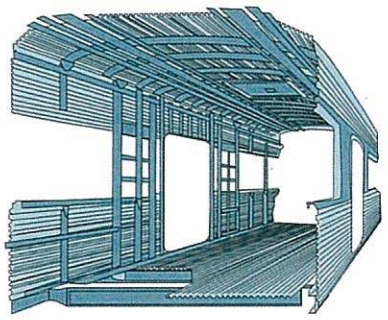
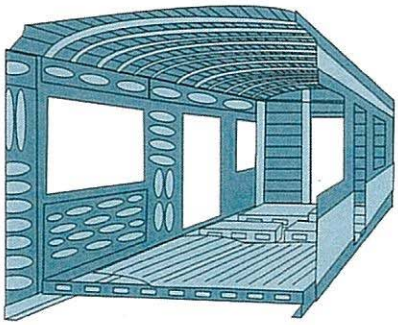
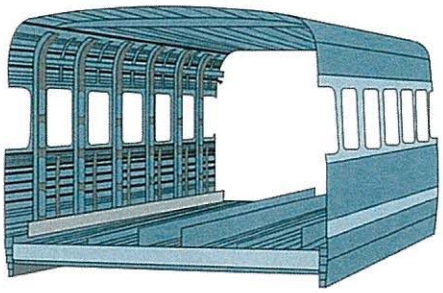
Carbody Structure technology trend



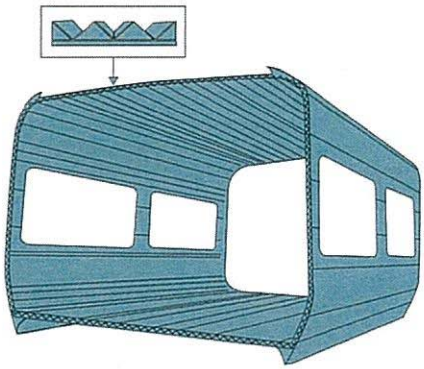
a) Semi-Stainless carbody



b) Latest Stainless carbody



c) Aluminum Single-skin carbody



d) Aluminum Double-skin carbody

2-5. Merits and Advantages of Aluminum car

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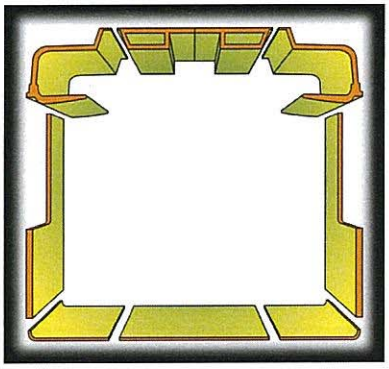
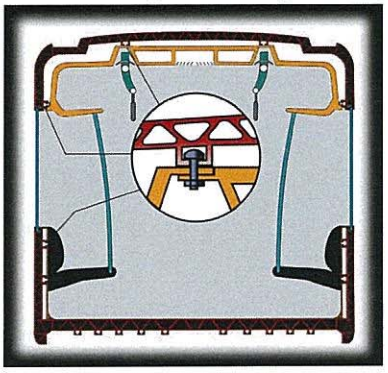
- Better strength, improved safety and longer life - double skin hollow Aluminum Extrusions technology with trusses & flexible cross-section profile
- Improved passenger comfort - Superior Heat & noise insulation; low vibrations
- Smoother Surface Finish & Appearance – no painting, corrosion free for life
- Lower Life cycle cost – energy saving, light weight, lesser brake & rail wear tear
- Modular deign for maximum Flexibility for different types of interior arrangement; Easy Interior Refurbishing,
- Sustainable rail transport – easy recycling, enery saving, lesser CO2 footprint

Double skin structure hollow aluminum extrusions

Fully self-support interior panel module



Fastening of interior modules using Mounting rail



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3. Different Models of project Execution

3-1. Model 1: Supply of Rolling stock & Traction

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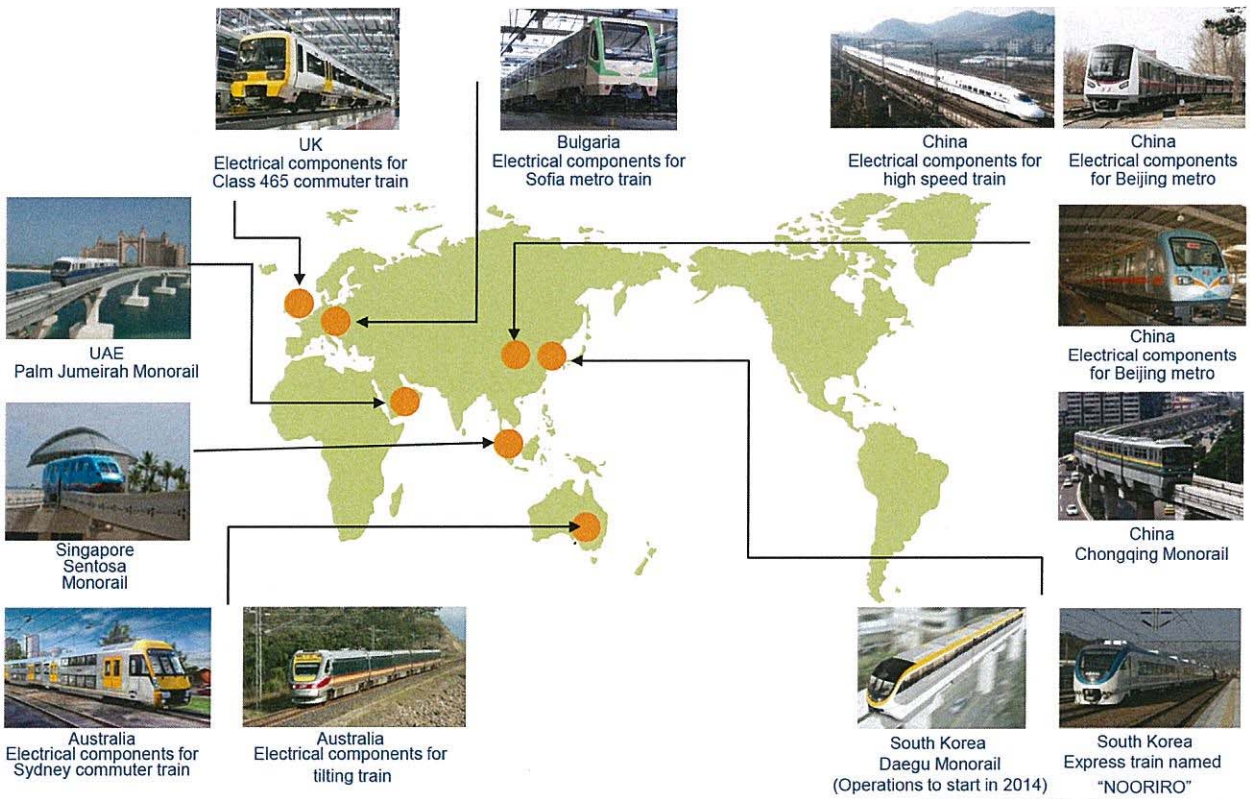
Rolling Stock and Propulsion system



3-2. Model 2: Rail system Turnkey system

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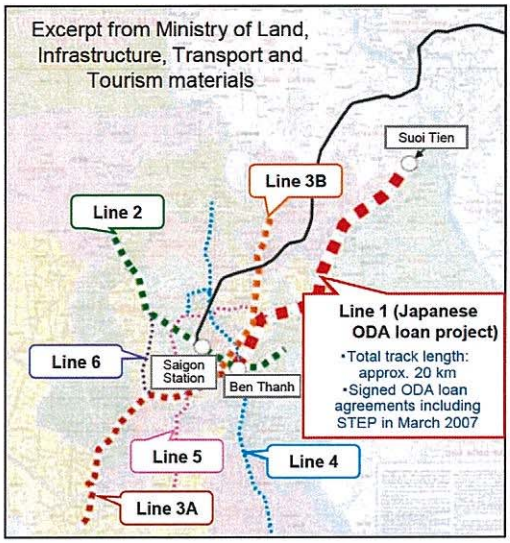
Ho Chi Minh City Line-1 project

Turn-key contract for "Urban Railway Line 1" in Ho Chi Minh City, Vietnam (June 11, 2013)

Project Overview

A new line that is scheduled to become operational in early 2018.
19.7 km line includes both underground and elevated tracks connecting Ben Thanh in the center of Ho Chi Minh City with Suoi Tien, a bus terminal to the northeast of the city.

- Customer : Management Authority for Urban Railways of the People's Committee of Ho Chi Minh City
- Finance : Japanese Government Loan
- Contract scope : 17 train sets (total of 51 cars), CBTC signaling, train control and telecom system, power supply system, , platform **screen** doors & depot facilities Maintenance for five years
- Delivery date : 2016 (first series of train sets)
- Contract value : approx. 37 billion yen



Meanings for Hitachi

Leverage experience for expanding business in the urban transport railway business in Southeast Asia and India

3-3. Model 3- Rolling stock and Maintenance

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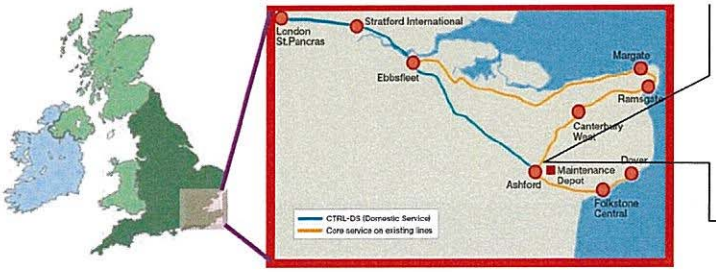
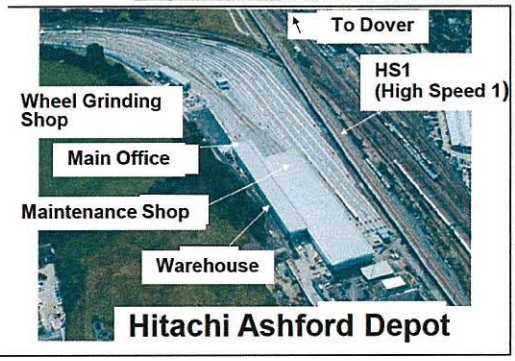
Class 395 High Speed Trains for UK Railways

- ✓ Providing total solution service of rolling stock including depot build & maintenance
- ✓ Delivered highly reliable train ON TIME
- ✓ Started passenger service 6 months ahead of contract obligation in June 2009
- ✓ European regulation compliant train
- ✓ Long term commitment to UK train industry & job creation

- Operator: South Eastern; Max. speed: 225km/h
- Q'ty: 29 trains (6 vehicles per train)
- Depot: Hitachi design, constructed on turnkey basis by 3rd party, funded and leased by leasing party
- Maintenance: Max. 35 yrs with initial period of 7 yrs
- Service: Official service started in December 2009





3-4. Model 4 - Leasing of Rolling stock & Maintenance

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IEP (Intercity Express Program) for UK Railways

A very innovative model involving;

- to replace High Speed trains of age over 30 yrs
- to operate on the Great Western Main Line and East Coast main Network of UK Railways.
- Train manufacturing by Hitachi - 596 cars + option 270 cars (866 cars)
- Type of trains - EMU trains and Bi-mode trains with diesel engine
- Maintenance of fleet for RAMS and passenger comfort for 27.5 years maintenance 11 depots (include 4 new build)

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4. Make in India Discussions – Railway Sector

4-1. Value Chain: Need for Innovation & Manufacturing

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In the coming decades, India will need to transform itself from "copy paste" manufacturing to innovation driven manufacturing

In Railway sector, this will be most challenging and needed to support the much needed IR modernisation and urbanisation of cities with urban transport (metros & monorails)

Research & Development → Design and demonstration → Production and deployment

Hitachi is already focussed on several such initiatives in India.

- Hitachi R&D Centre at Bangalore a part of the global R&D set up
- Hitachi Social Innovation: Commitment to create a better society. Through innovative technologies and total solutions for sustainable urban development
- Hitachi Manufacturing : 13 manufacturing units in India in diverse areas & 17 business units having deployment infrastructure in India

Hitachi
SOCIAL INNOVATION FORUM 2015
In partnership with NDTV

NDTV

4-2. Hitachi manufacturing in India

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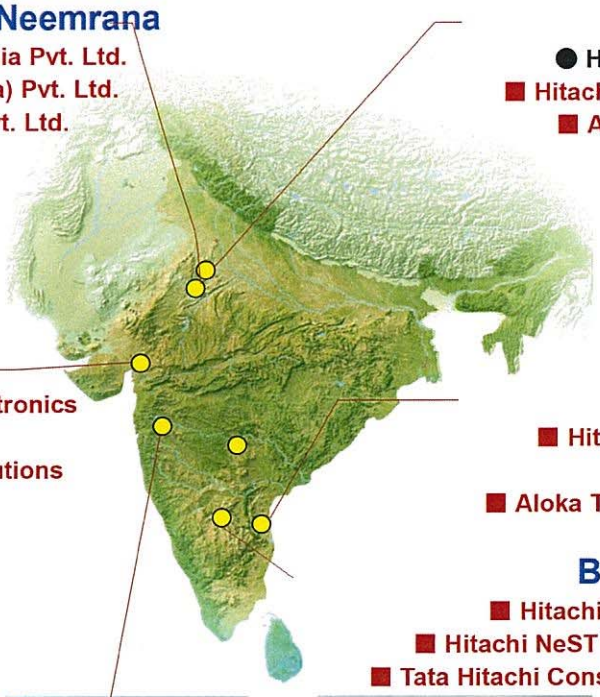

Gurgaon/Manesar/Neemrana
- Hitachi Chemical India Pvt. Ltd.
- Hitachi Metals (India) Pvt. Ltd.
- HNV Casting Pvt. Ltd.

Delhi
- Hitachi India Pvt. Ltd. - HQ
- Hitachi India Rail System Company
- Allied JB Friction Pvt. Ltd.

Ahmedabad
- Hitachi Hi-Rel Power Electronics Pvt. Ltd.
- Hitachi Home & Life Solutions (India) Ltd.

Chennai
- Hitachi Automotive Systems (India) Pvt. Ltd.
- Aloka Trivitron Medical Technologies

Bangalore
- Hitachi Koki India Pvt. Ltd.
- Hitachi NeST Control Systems Pvt. Ltd.
- Tata Hitachi Construction Machinery Company

Pune
- Hitachi Automotive Systems Pune (India) Private Limited

● Corporate ■ Manufacturing・Sales・Service

HQ Locations (As of July, 2015)

4-3. Typical Stages of a Railway project

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- Design and Engineering
- Procurement from the Supplier base
- Factory for production / manufacturing
- Installation, construction, testing and commissioning
- Homologation, RAMS validation & Warranty management
- Maintenance and After sales support
- Repair and refurbishment

1. Human Resources
   - System experts; Engineering resources;
   - Project/construction/Quality/Contract managers;
   - Skilled technicians & manpower
2. Factory & Supply Chain:
   - Land, Capex for factory, Railway turnkey factory construction companies
   - Quality Suppliers base to be local
   - Workload to sustain (Installed capacity vs demand)

For Railway Rolling stock (Metro as well as Indian Railways) – all these areas have unique challenges

4-4. Issue and Challenges: Metros & Urban transport

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Demand for Rolling stock for Metros/Urban transport in cities is not continuous and stable for various reasons even though

- The MoUD policy is very encouraging for cities with more than 1 million population to plan for urban transport system
- Funding models are available – Multilateral/bi-lateral, Govt funded, PPP

→ Implementation speed is slow due to other reasons – project development, approvals, fund commitments / mobilisations, RoW availability ; land acquisitions issues

→ There is no major standardisation in the technical specifications of the rolling stock due to unique nature of existing cities leading to different designs

→ Skilled resources are not getting added in the system due to nil or poor educational and training infrastructure for railway stock design engineers

→ Excess installed capacity. There are already 3 rolling stock factories with an installed capacity of 1000 vehicles p.a VS expected project pipeline of 400 per annum. How to justify 4th Rolling stock factory in India ?

- Need to accelerate the investment & implementation of urban transport sector projects to boost the Make in India
- Set up skill development institutions to develop required skills → Skill India

4-5. Issue and Challenges: Indian Railway

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- Indian railway have in-house manufacturing of all type of rolling stock.
- Private sector manufactures: only wagons, older EMUs, non-railway rolling stock, components for IR in-house manufacturing. No long term procurement policy

➔ No major boost to private sector to set up state of art technology rolling stock factories.

- In 2015, bids received for two projects for electric locomotives, diesel locomotives based PPP with long term offtake commitments for 800 and 1000 units → International companies submitted price bid
- IR also tendered for 315 cars Trainset project as Make in India from prequalified (international RS companies) → Mandatory factory to be set up in India, however, no long term offtake commitment provided in the project

IR to review the Rolling stock procurement policy as per of their Modernisation Plan

Provide long term offtake commitments to facilitate set up the factory – Make in India

Leverage size and volume of IR to set up R&D and Skill development institutions in India

Hitachi is already focussed on several such initiatives in India.

- ❖ Hitachi R&D Centre at Bangalore a part of the global R&D set up
- ❖ Hitachi Power electronics for railway RS inverters, components only
- ❖ Hitachi to progressively manufacture Signalling equipment to support DFC etc.
- ❖ Hitachi is prequalified for the TRAINSET project, however, challenge to set up the factory without long term offtake commitments → Sustainability of the factory is an issue

4-6. Key Recommendations for railway sector

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Make in India required an enhanced approach to protect the future competitiveness & sustainability of Indian manufacturing

Thanks you !!

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Contact HITACHI Rail System Company for details

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