Session 6.2 Room Fez2
Network planning 2

Moderator : Ms. Petra MOLLET
Vice-President Strategic And International Programs,
APTA, United States

Session 6.2 Network planning 2
Speaker Lists;

1	2	3	4	5
				
Mr.Filip Janowiec	Ms.Helena Matos	Mr. ZHANG Dexiang	Ms.Paige Malott	Mr.Rajendra Prasad
Poland	Portugal	China	United states	India

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11TH WORLD CONGRESS OF HIGH-SPEED RAIL

Marrakech, 7-10 MARCH 2023

Lessons learned for Polish high speed railway projects

PhD Eng. Filip Janowiec
Lecturer, Cracow University of Technology, Poland
Session2-6.2 Network planning 2

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High speed railway lines in Poland

2022 – 224 km HSL

2034 – nearly 2000 km new HSL

Centralny Port Komunikacyjny – Railway Component

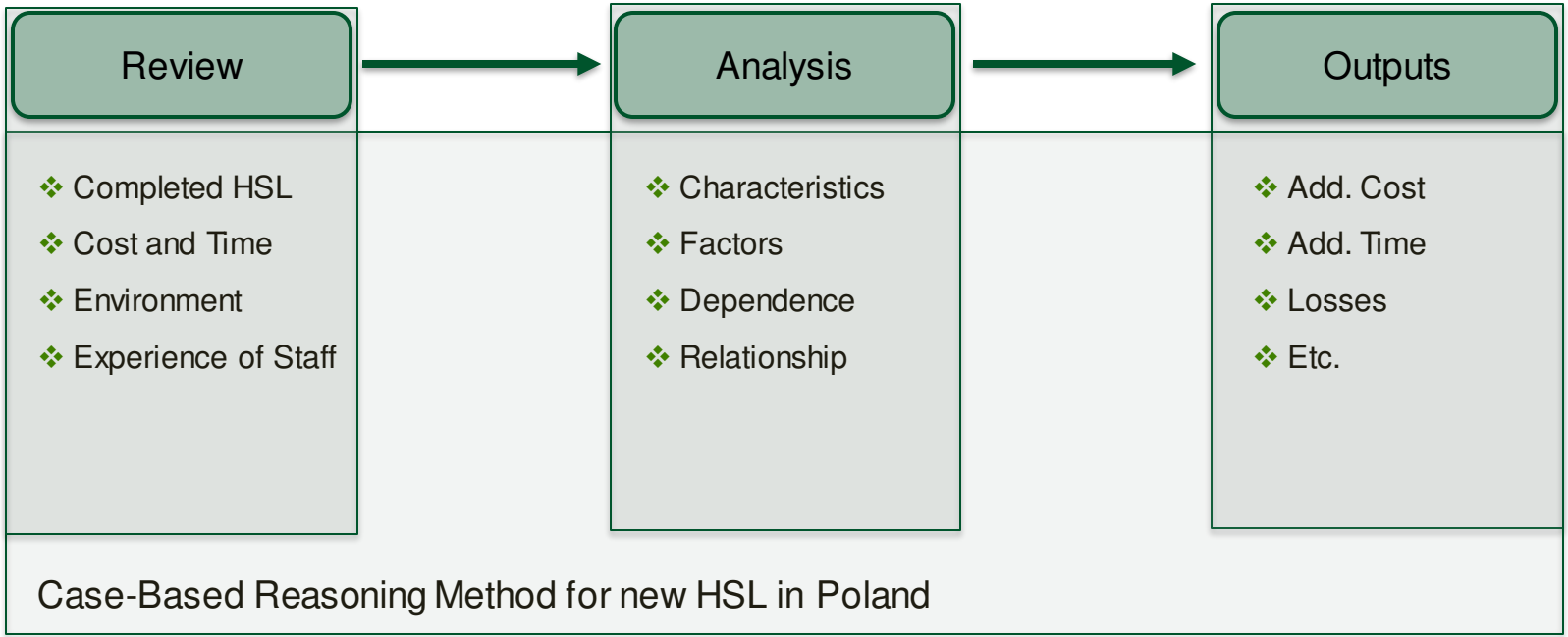
Polish National Transport HUB

Railway Component:

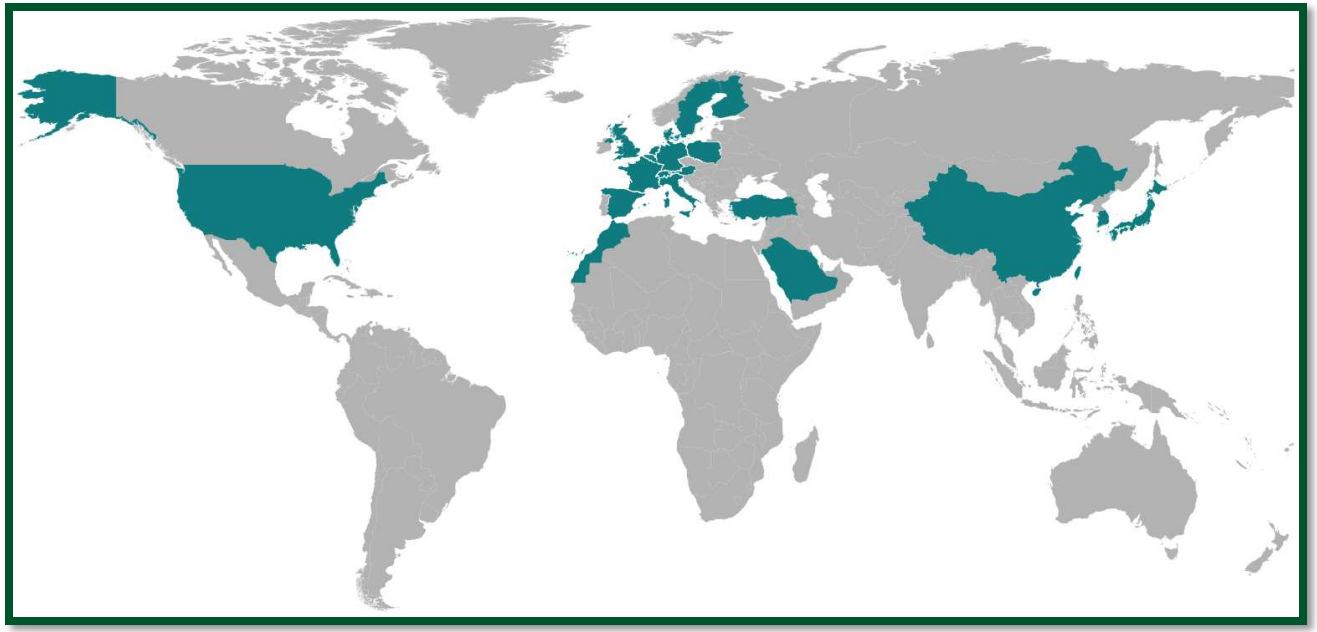
- 12 Spokes (Routes)
- 30 Projects
- Realization: 2020 – 2034
- Costs: 8 000 - 9 000 mln zł (approx. 1 850 – 2 100 mln €)
- Investor: Centralny Port Komunikacyjny Ltd.

2 000 km new HSL in Poland

Lessons Learned



Analysis



58 839 km HSL worldwide

Great variety of completed Projects

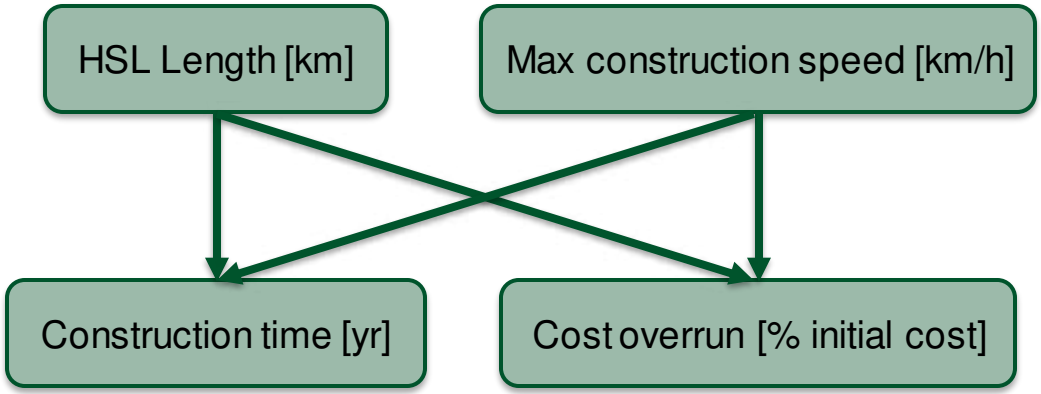
Many different factors

Unique circumstances

BBN Component

Bayesian Belief Network:

- Probabilistic model
- Works with incomplete data
- Determine relationship between variables
- Good model for predictions
- Created network could be learned from new cases
- Visualization of probability results



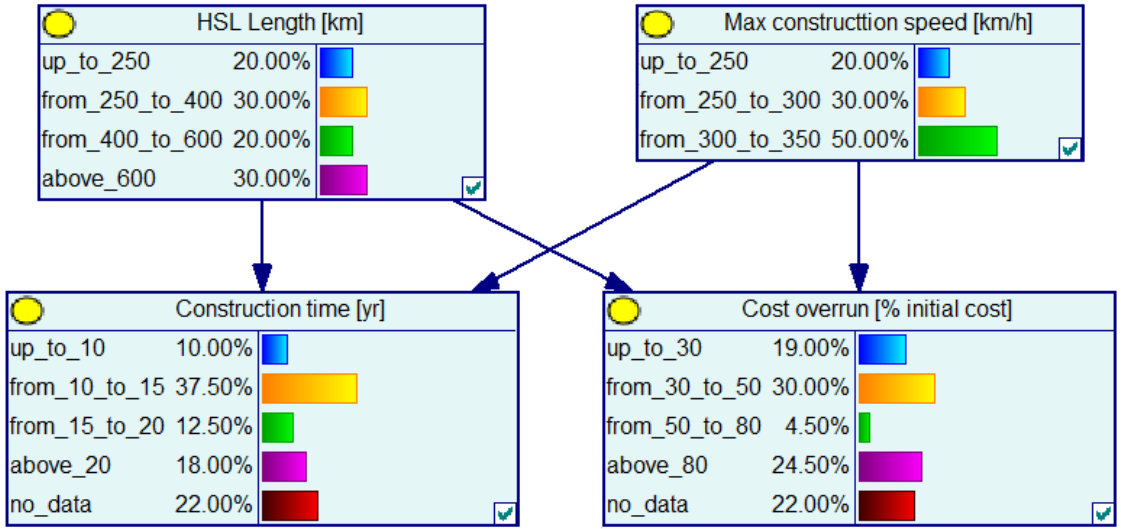
BBN Component

Design the network:

- Define nodes
- Implement obtained data (10 Projects)
- Create CPT
- Run the algorithm

Probability of output events:

- Construction time
- Cost overrun



Application - Example

Line no. 85 Warszawa - Łódź

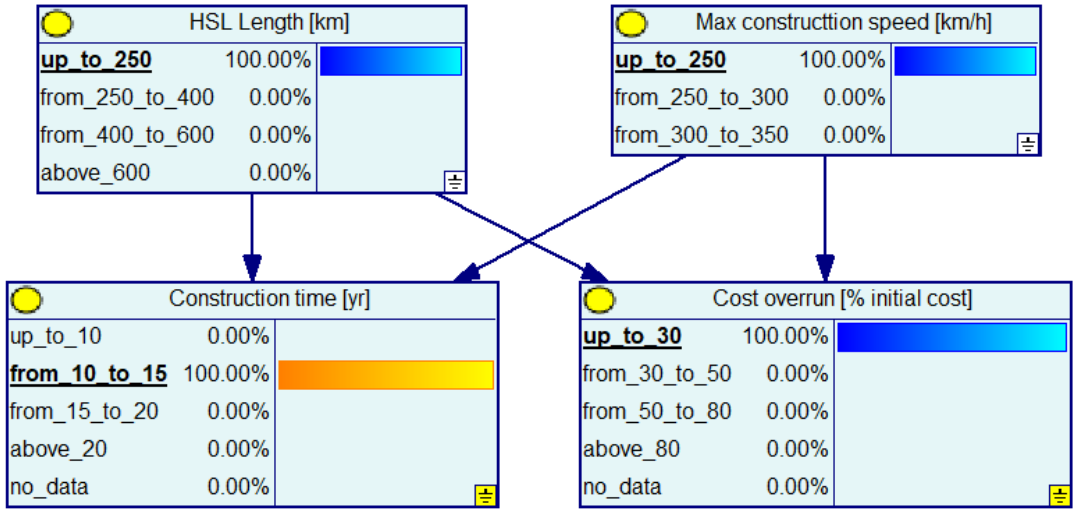
- Part of Spoke no. 9
- Almost 140 km new HSL
- Predicted Cost – 597 mln zł (139 mln €)
- Construction 2023 – 2026 (5 years)

Application - Prediction

BBN Prediction:

	Construction time [yr]	Project cost [mln €]
Planned	6	139
Predicted	15	180,7
Difference	9	41,7

Scenario of planned line no 85



Conclusions

The created method can be applicated to new High Speed Lines planned to build in Poland.

Bayesian Belief Network is good tool for analize and providing the probabilistic outputs.

Investor need to prevent a time and cost change by predict additional budget or time buffer.

Created network should be validated on more cases of completed HSL Projects.

Network could be calibrated with learning from new data.

THANK YOU

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NEW HIGH-SPEED LINE PORTO-LISBON

Helena Matos
Infraestruturas de Portugal, Portugal
Session2-6.2 Network planning 2

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KEY PROJECT FEATURES

New double track line for high speed

Phased development

Investment cost of Phase 1: € 3bn

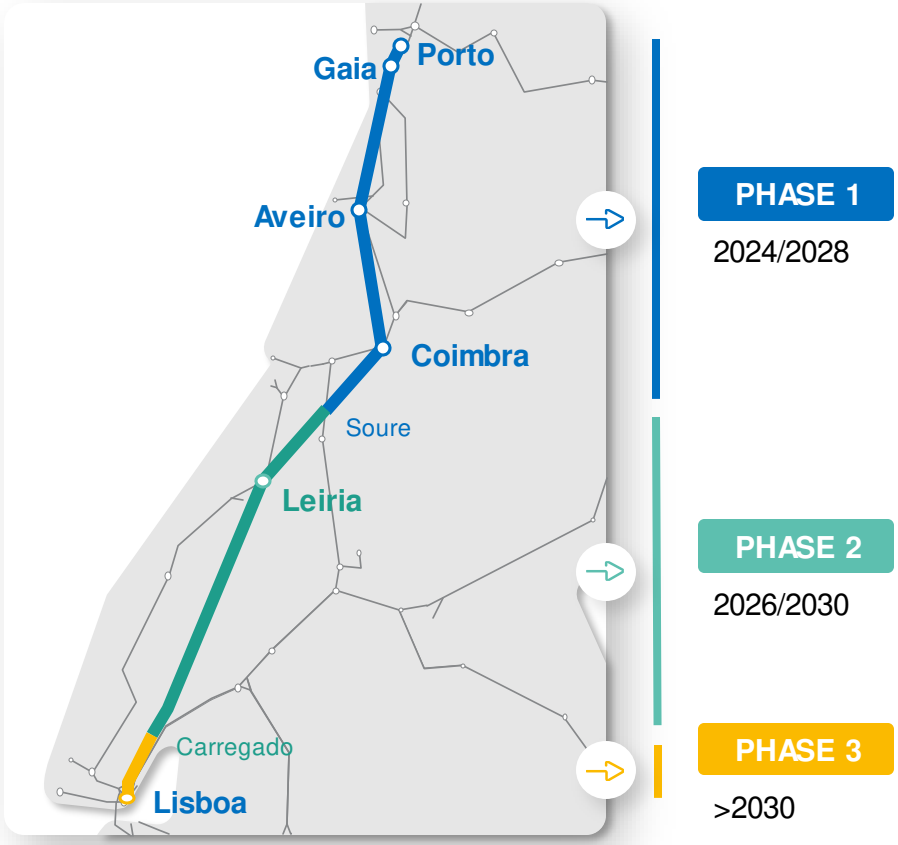
Direct travel time between Porto and Lisbon: 1h15m

Overall reduction of journey times along the corridor

Stations

Existing central stations adapted to HS

New station in Gaia

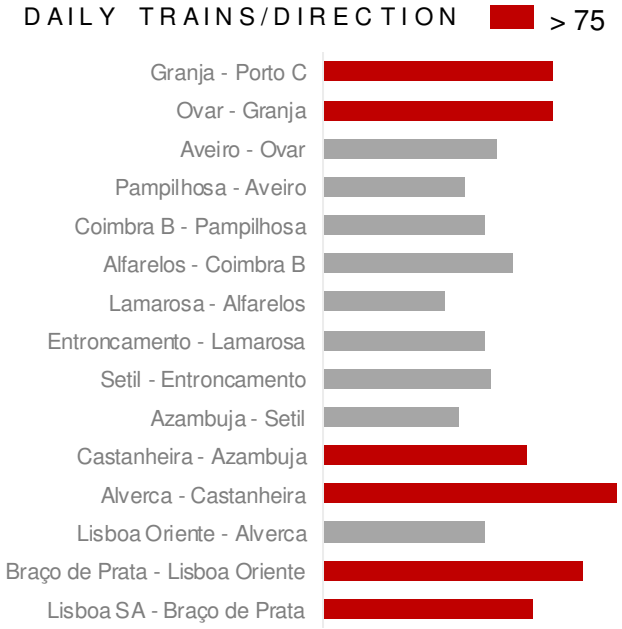


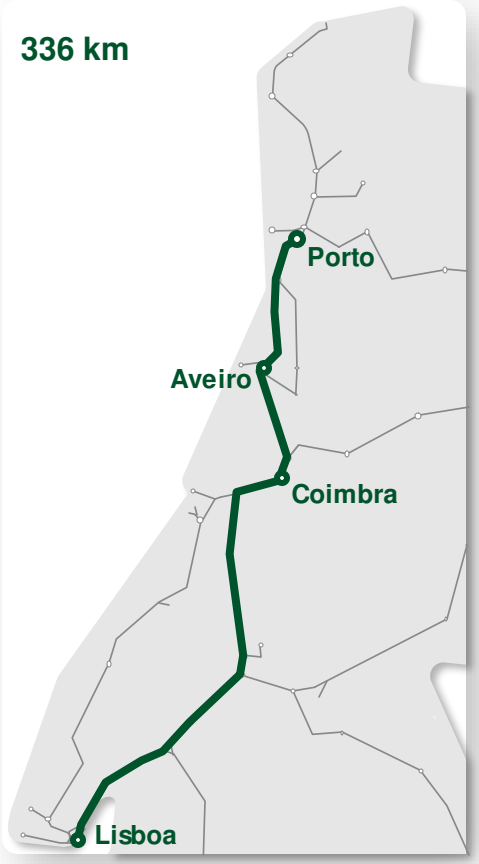
ISSUES ADDRESSED BY NEW HSL: CAPACITY RESTRICTIONS ON THE NORTH LINE

730 **daily trains** run along 'Norte Line'

44% of the **daily trains** running in Portugal

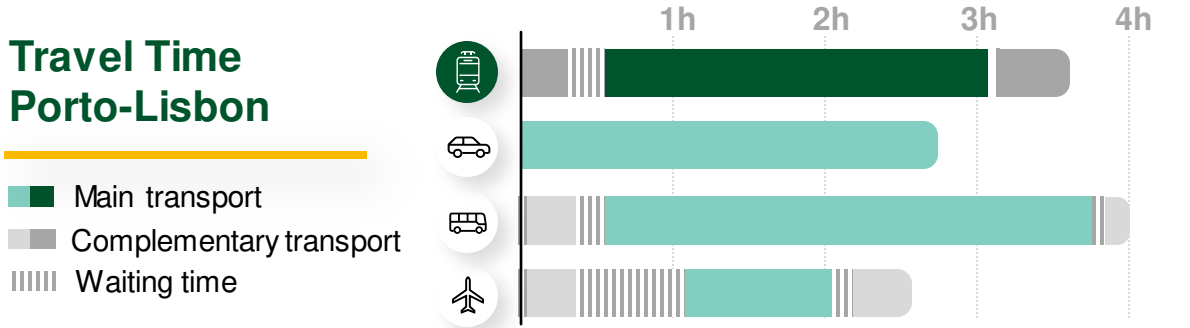
92% of all **freight trains** running in Portugal



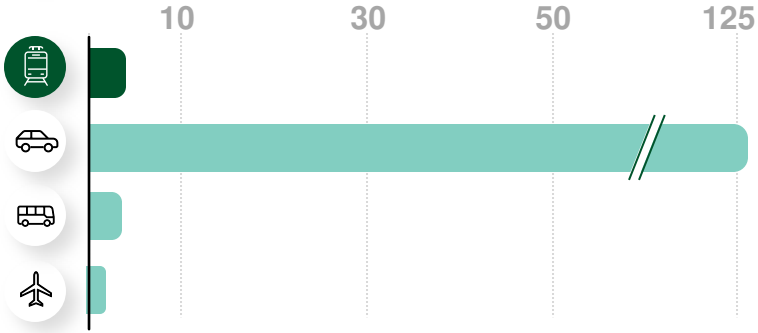


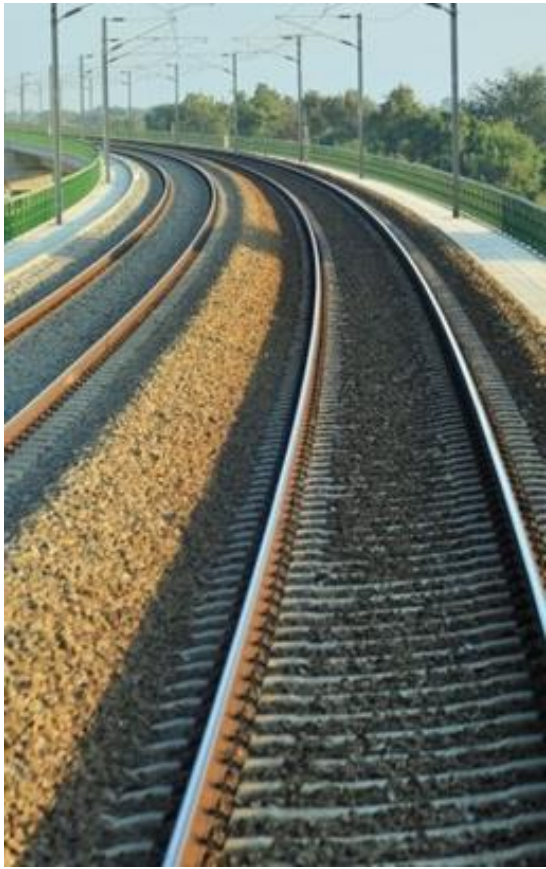
ISSUES ADDRESSED BY NEW HSL: LACK OF COMPETITIVINESS OF THE NORTH LINE

Travel Time Porto-Lisbon

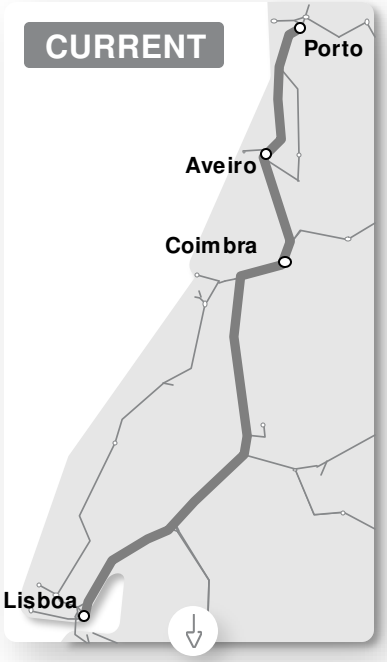


Current Demand axis Porto/Lisbon

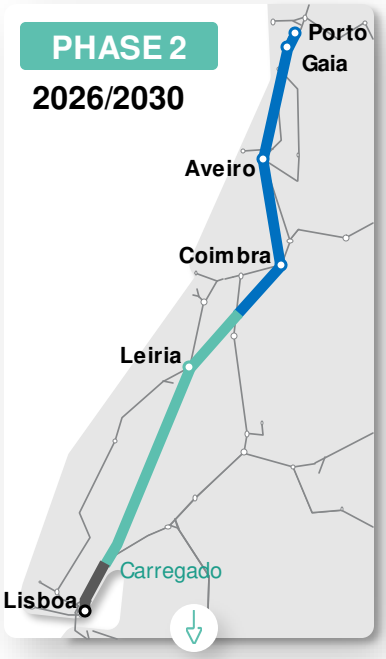




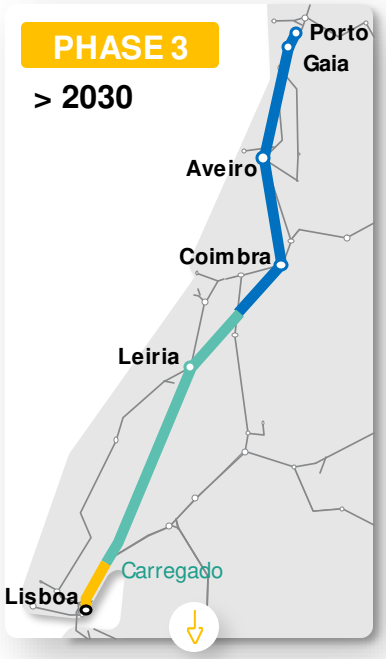
TRAVEL TIMES: PORTO-LISBON



2h49m
3 Stops

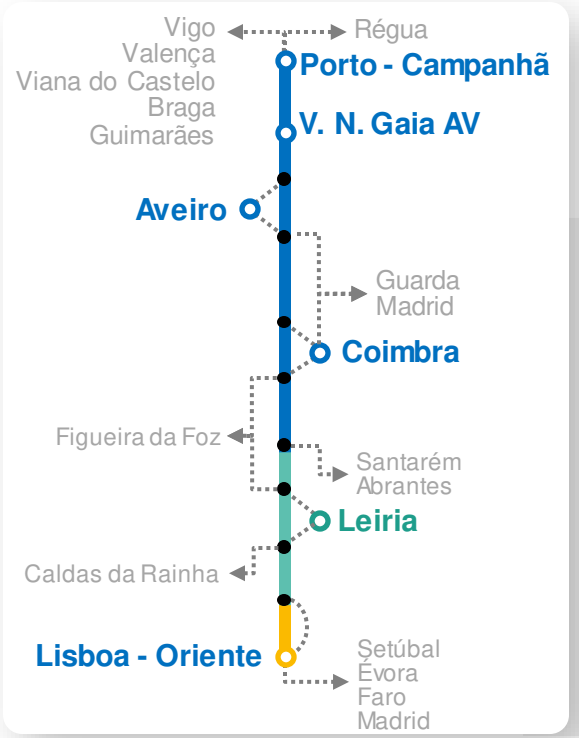


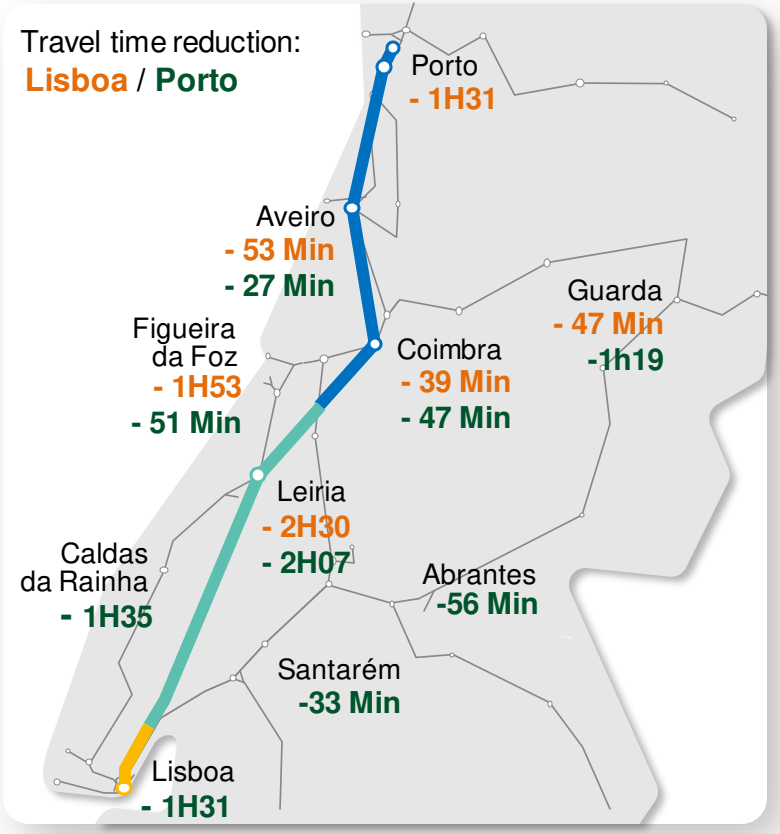
1h19m
Direct



1h15m
Direct

INTEGRATION WITH EXISTING NETWORK

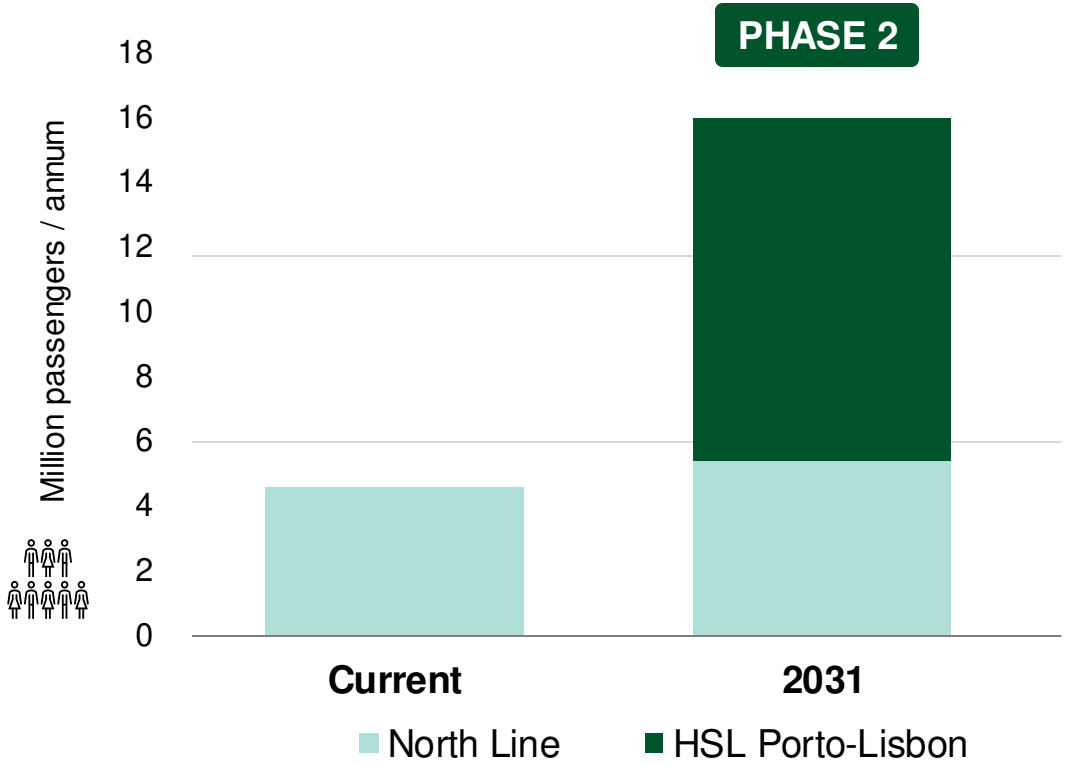




DEMAND FORECASTS: PORTO-LISBON AXIS

SERVICES SCENARIO

60	**Services** on HSL
17/9	**HS Services** Direct/ Stopping
34	**Hybrid Services** HSL - Existing Rail Network
17	**IC Services** Existing Rail Network



OVERALL PROJECT BENEFITS

PERFORMANCE

Unprecedent opportunity to improve our railway system

VIABILITY

Planned project phasing adapted to available national financing sources and EU financing

CAPACITY

Increment of regional and freight **service slots**

ANTECIPATION

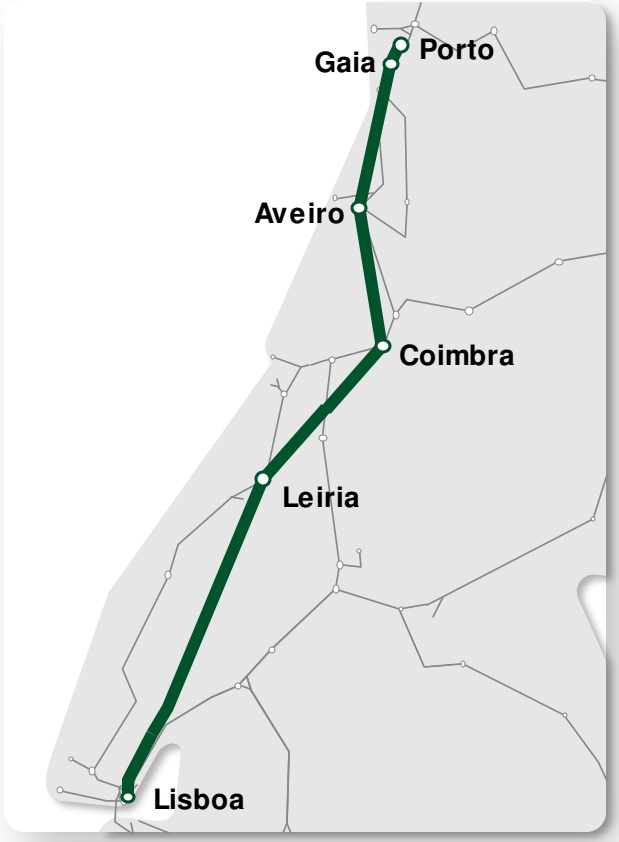
Planned project phasing allows for **project benefits** to be **materialised earlier**

CONNECTIVITY

Project benefits extended way beyond the metropolitan areas of Lisbon and Porto

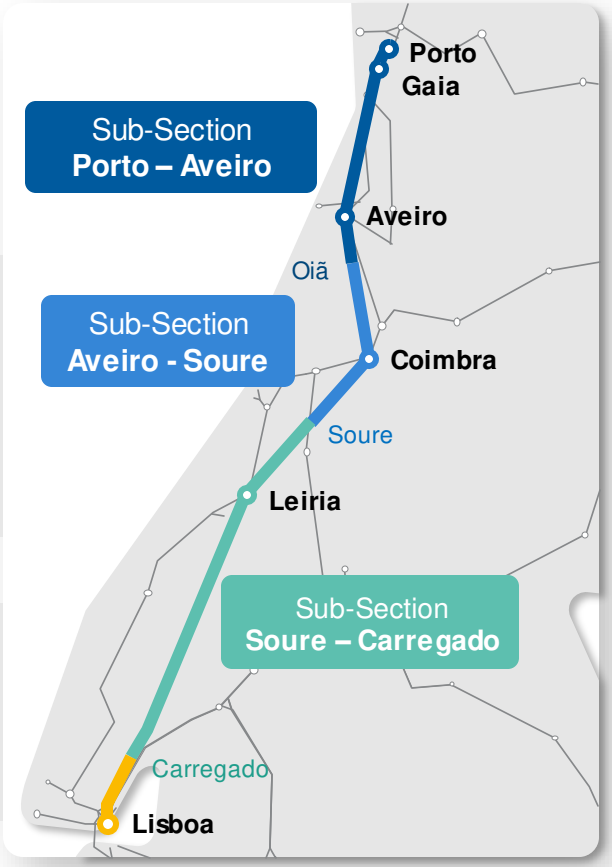
SUSTAINABILITY

Decarbonisation of the transport sector and reduction of road fatalities

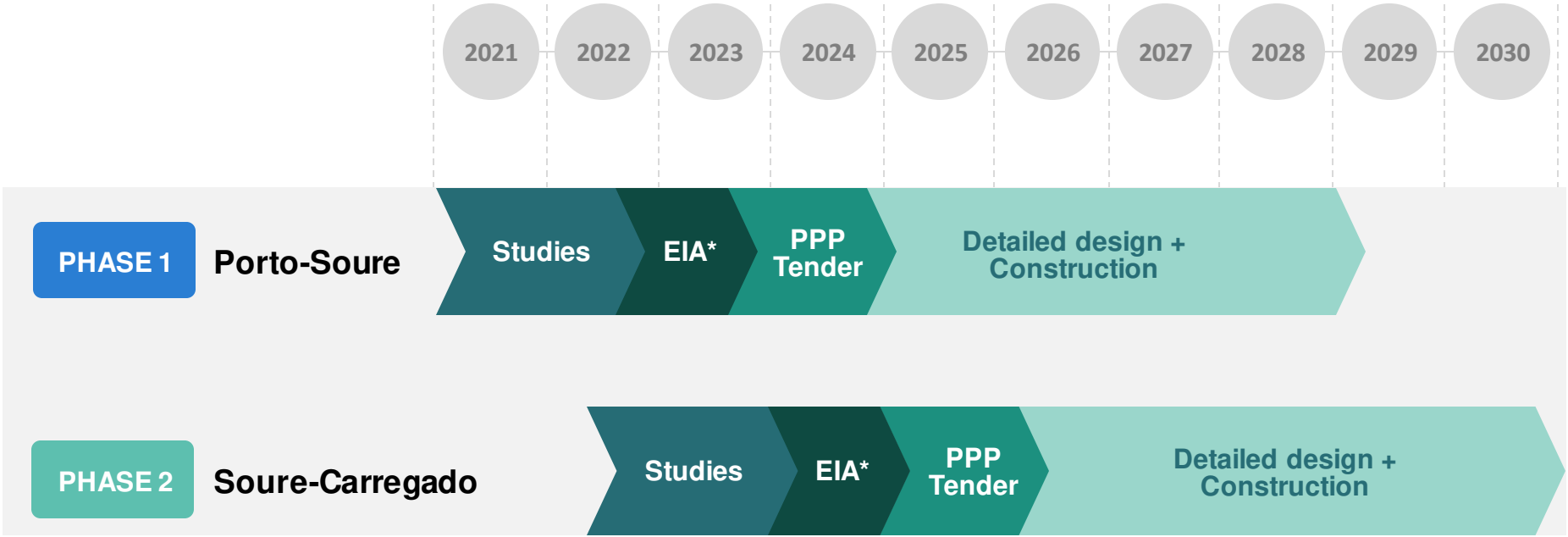


PROPOSED CONTRACTING MODELS

	SCOPE	RATIONALE
Substructure / Superstructure	**3 Design, Build, Finance & Maintain (DBFM) PPP contracts**	**Reduced** project life cycle costs **Optimisation** of available resources **Adjusted** risk allocation
Signalling & Telecommunications	**Design, Build & Maintain (DBM) contract**	**High technological risks** and reduced asset lifespan **Limited number** of system suppliers



PROJECT SCHEDULE



*Environmental Impact Assessment

THANK YOU

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Overview on Key Technologies of China High-speed Railway

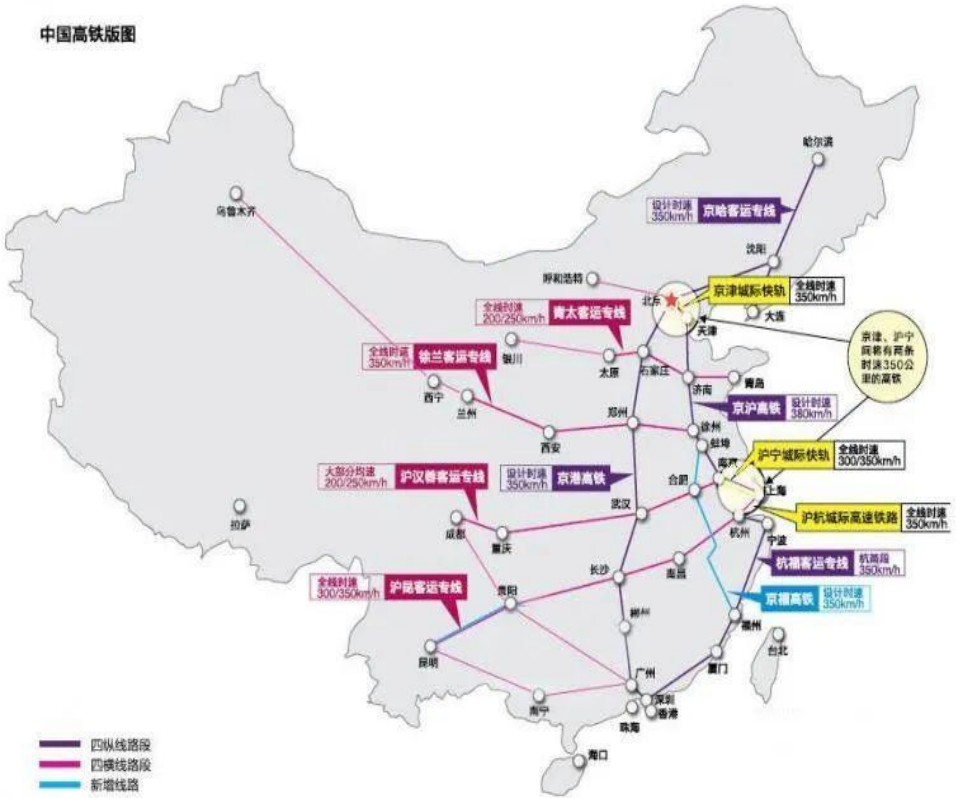
Dexiang, Zhang
Deputy, Translation Center, CCECC, CHINA
Session2-6.2 Network planning 2

ONCF UIC

1 Brief Introduction

Figures & challenges:

- Largest network in the world;
  29000km; 2/3 of the world in 2018;
  Over 42000km in 2022;
  50,000 km in 2025.
- Climate & terrain challenges:
  Frigid zone;
  Tropic zone along coast with typhoo;
  Gobi desert & plateau;
  Tunnels & bridges in high mountains;
- General trend: CR going global



2 Key technologies of China high-speed railway

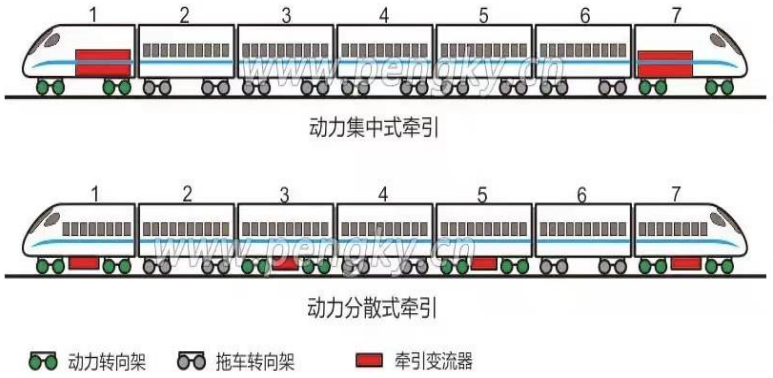
2.1 Permanent way:

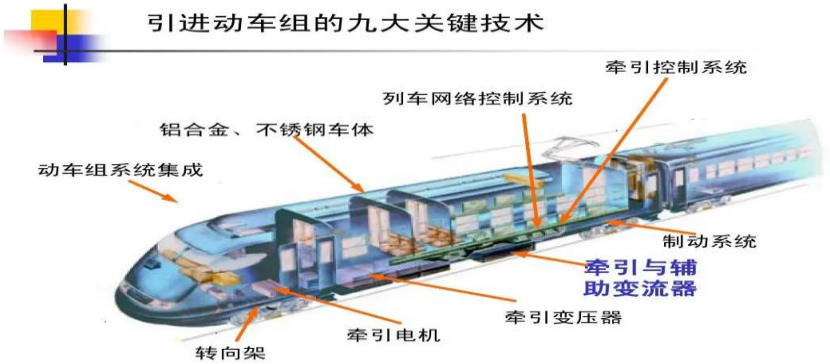
- Railway track:
  ballastless track/turnout/CWR;
- Railway subgrade:
  settlement control/construction workmanship;
- Railway bridge:
  structure type selection/vibration-noise reductrion;
- Railway tunnel:
  tunnel portal/disaster prevention & rescue

2 Key technologies of China high-speed railway

2.2 High speed train:

- China EMU type:
  power concentration
  power dispersion: being the trend;
- EMUs' 9 key techs:
  EMU assembly/car body/bogie/traction converter/ traction transformer/traction motor/traction control/ network control/brake system

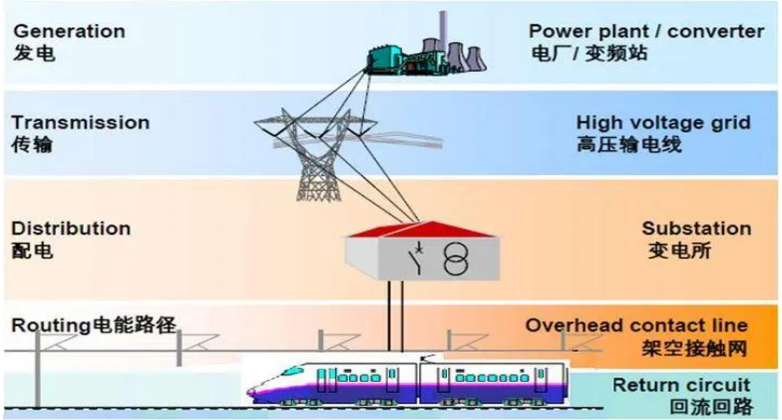


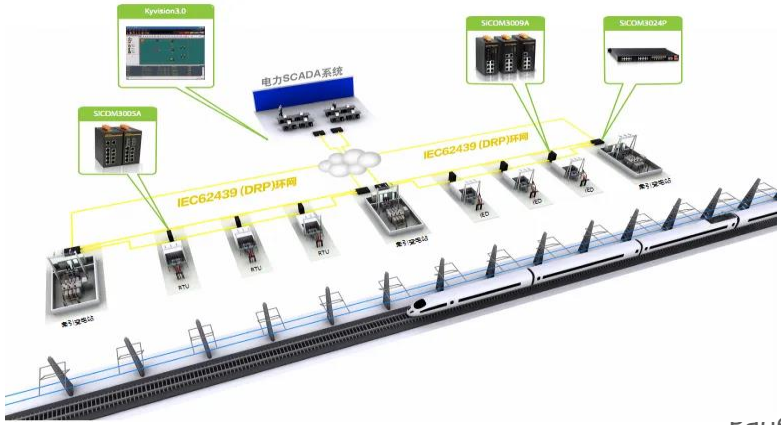


2 Key technologies of China high-speed railway

2.3 Traction power supply:

- External power supply: electricity generated by power plants being transmitted to traction substations
- Traction substation:electric energy conversion & control/traction network:supplying electric energy to the running train;
- SCADA: realizing remote monitoring and control management of power supply facilities

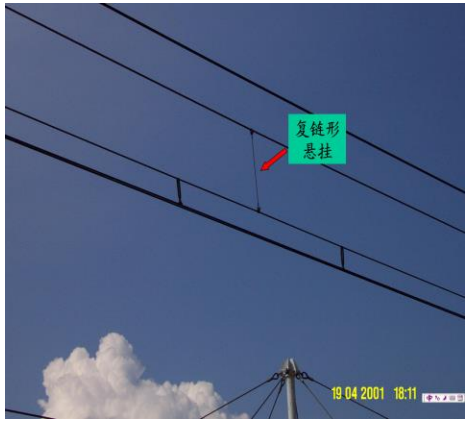


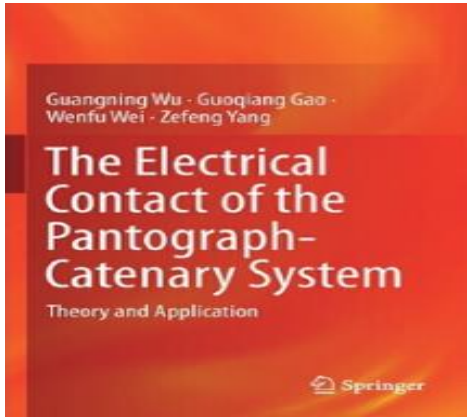


2 Key technologies of China high-speed railway

2.4 OCS tech:

- OCS:
  overhead contact system: masts, supports,
  contact wires, messenger wires, droppers, etc.
- Pantograph-OCS current collection tech:
  power: AC
  voltage level: 25kV
  tension of contact wires: as per the train running speed





2 Key technologies of China high-speed railway

2.5 Operation control:

- Composition:

  wayside euipment, onboard equipment,

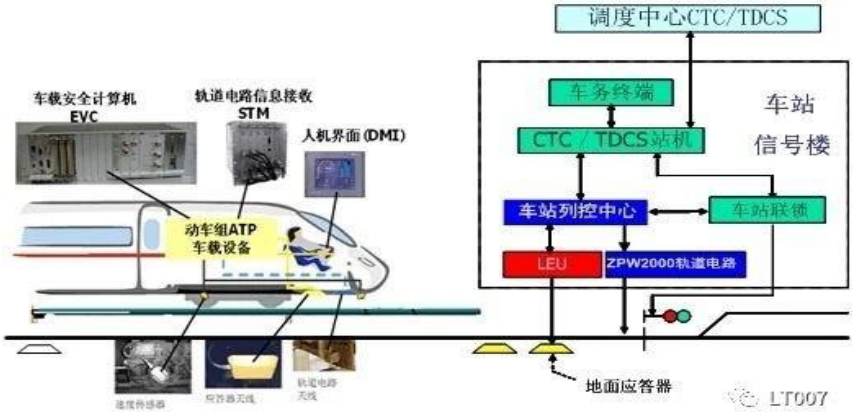
  signal data transmission network,

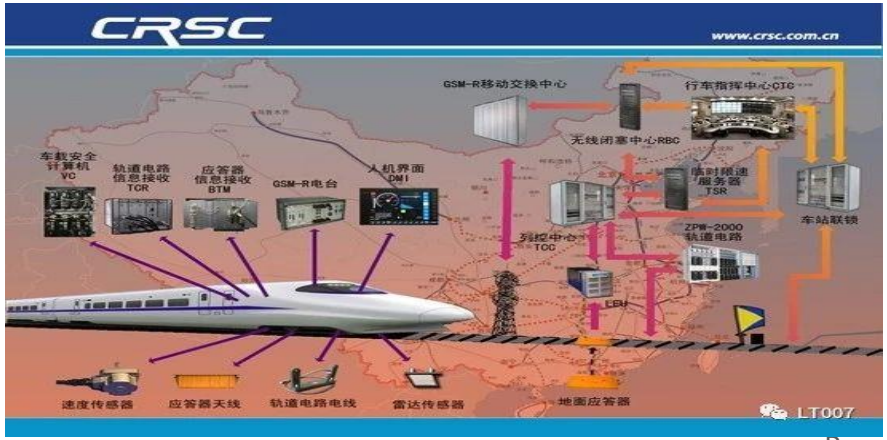
  wayside-onboard information transmission equipment
- Features:

  networked operations (nationwide one-network principle)
- Wayside-onboard information transmission:

  wired & wireless dispatching communication
- Running speed monitoring:

  onboard equipment braking priority

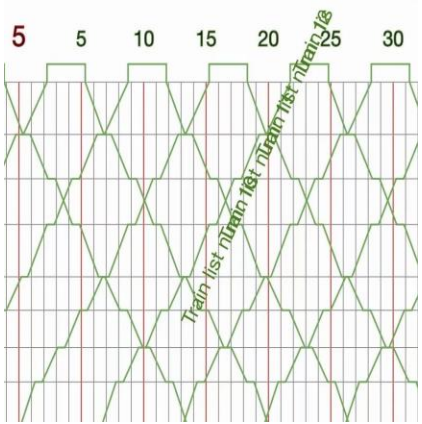




2 Key technologies of China high-speed railway

2.6 Transport organization:

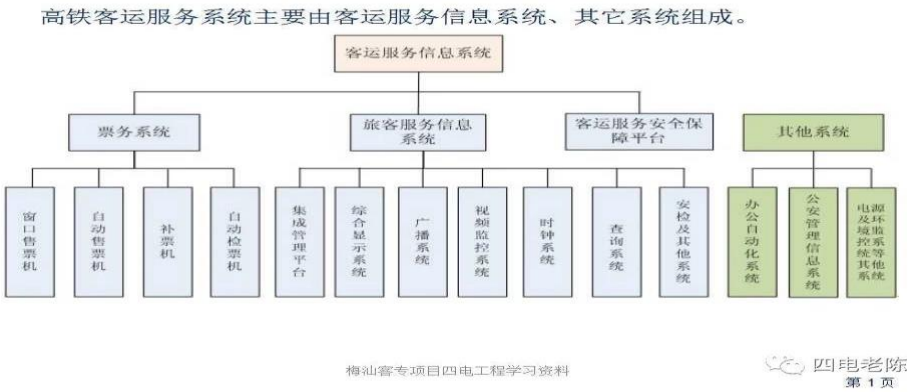
- Composition:
  passenger flow survey & forecast analysis/
  train transportation planning/
  daily production dispatching command
- Features:
  centralized command:
  3-level commanding organization
  train working diagram:
  comprehensive planning doc for railway transport production
  bus service mode:
  Beijing-Tianjin/Shanghai-Nanjing/Guangzhou-Shenzhen

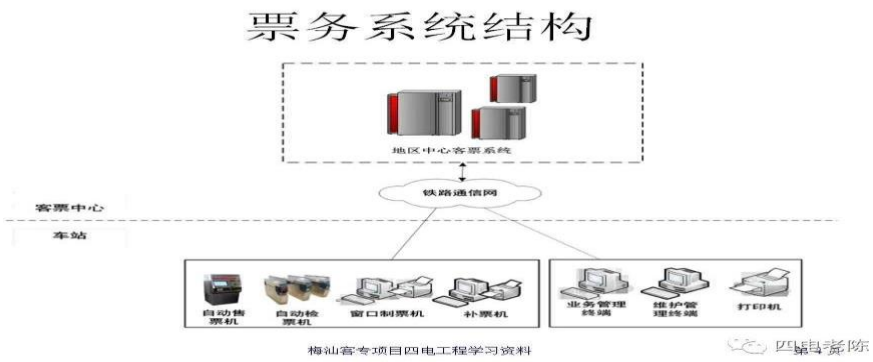


2 Key technologies of China high-speed railw

2.7 Passenger service:

- Composition:
  passenger service system/ticketing system
- Passenger service system:
  management software being to uniformly allocate the equipment at the station and on the train
- Ticketing system:
  providing passengers with various means to purchase t

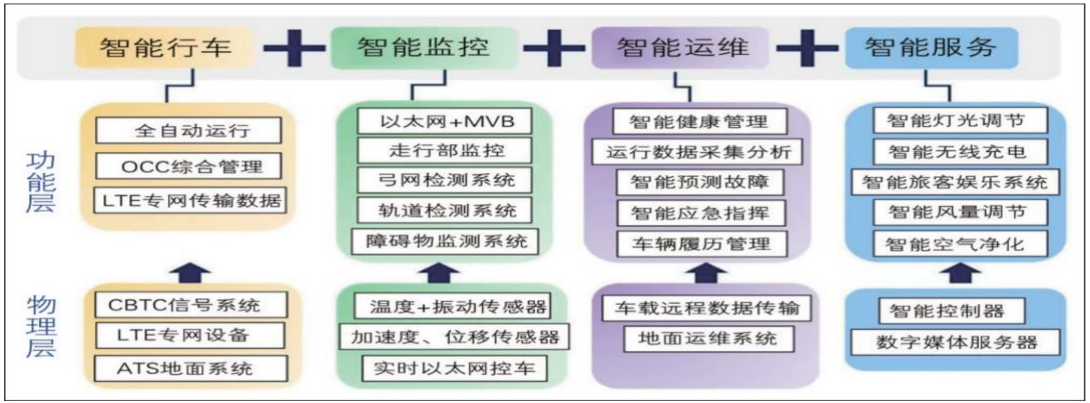


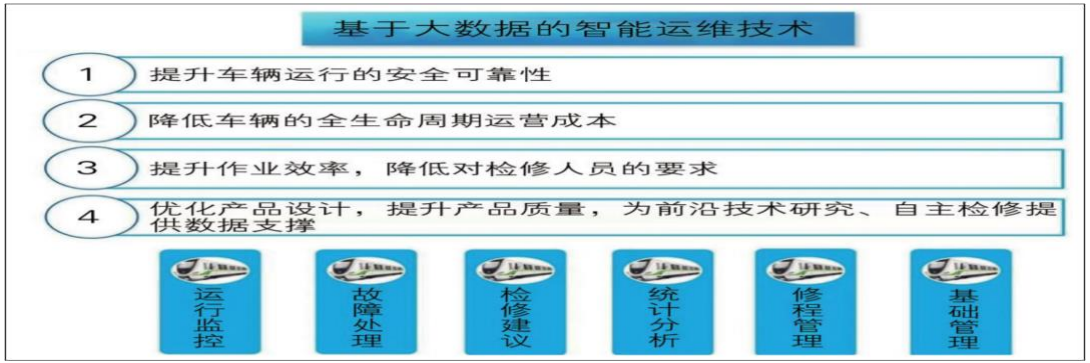


2 Key technologies of China high-speed railway

2.8 Operation & maintenance:

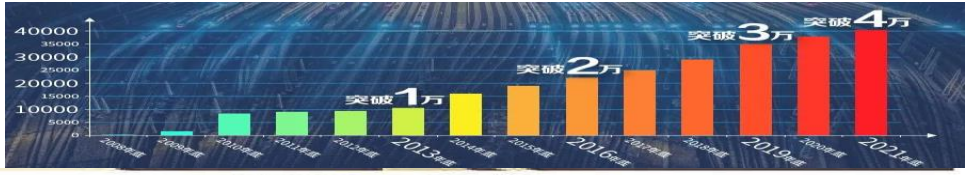
- Composition:
  maintenance and repair of high-speed trains
- Maintenance method:
  parts replacement/main parts being subject to "professionalized & centralized repair")
- Maintenance system:
  5-level repairs with each level maintenance requirement specified

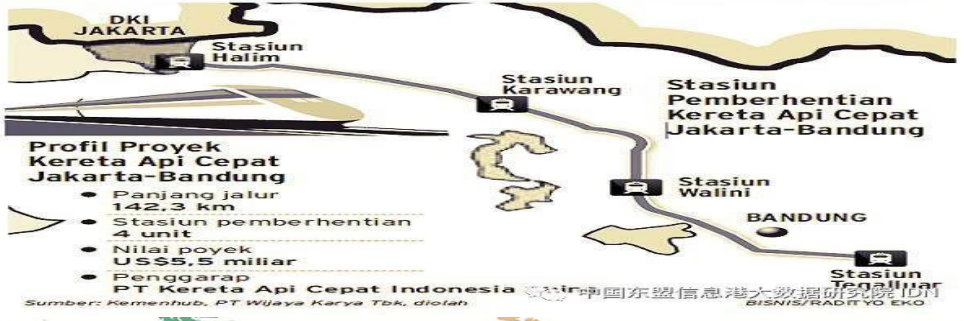




3 Conclusion

- Brilliant achievements; great significance;
- Carry out "high-speed rail diplomacy";
- Organize international high-speed railway summit forums just like this one;
- Hold high-speed railway expos;
- Hold high-speed railway culture exhibitions, etc.
- A must to promote key techs to the rest of the world;
- By building high-speed railways in BRI countries, accelerate China's railway standards going global;





THANK YOU

Contact information:
Dexiang Zhang, Translation Center, CCECC, CHINA;
Add: No.4, Beifengwo, Haidian, Beijing, P.R.China;
Postcode: 100038;
Email: 417983936@qq.com

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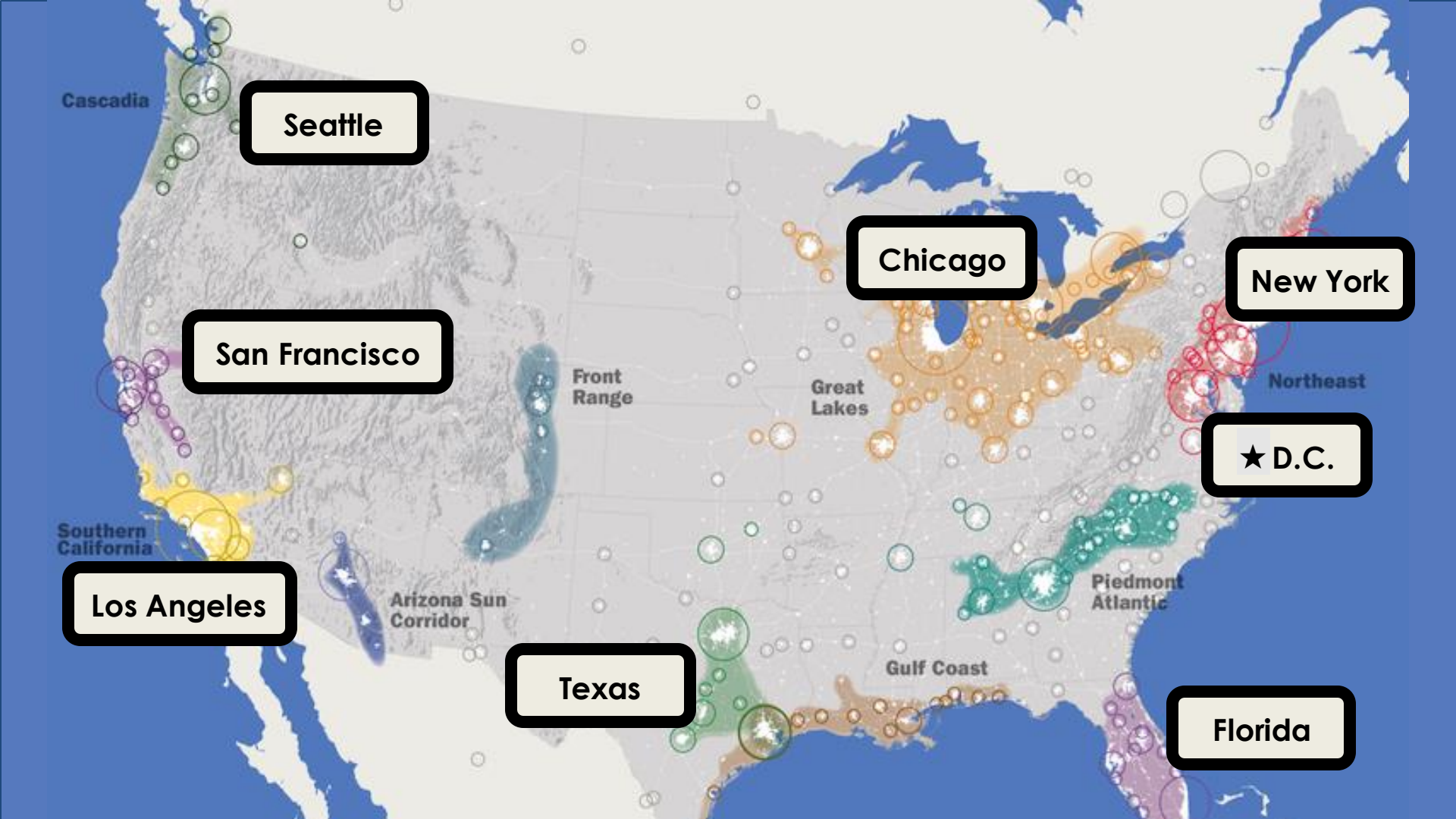
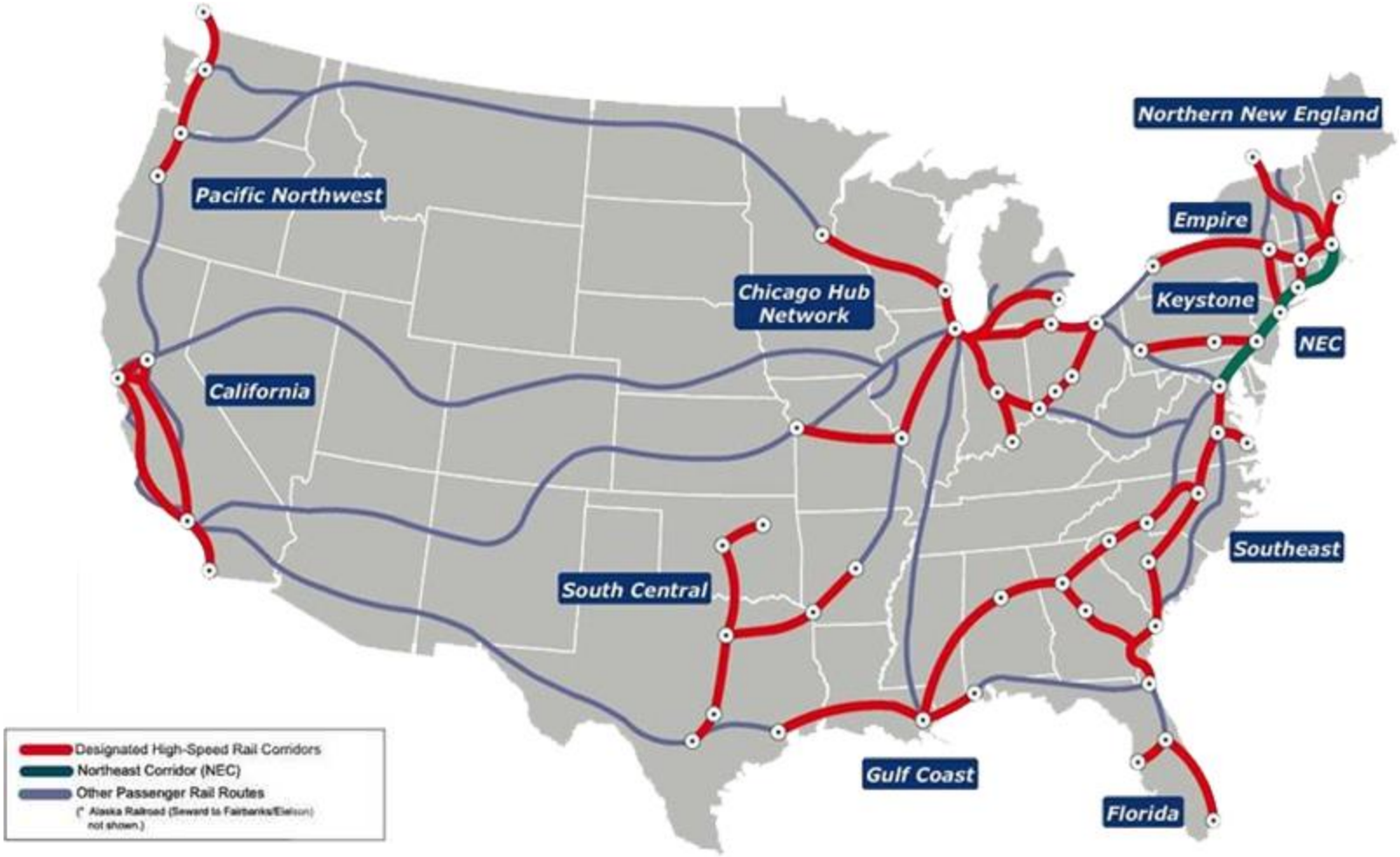
THE BENEFITS OF BUILDING HIGH SPEED RAIL AT AIRPORTS

Paige Malott
San Jose State University, USA

The Benefits of Building High Speed Rail at Airports

ONCF UIC


Cascadia
Seattle
San Francisco
Chicago
New York
Front Range
Great Lakes
Northeast
★ D.C.
Southern California
Los Angeles
Arizona Sun Corridor
Piedmont Atlantic
Texas
Gulf Coast
Florida


Northern New England
Pacific Northwest
Empire
Chicago Hub Network
Keystone
NEC
California
Southeast
South Central
Gulf Coast
Florida
Designated High-Speed Rail Corridors
Northeast Corridor (NEC)
Other Passenger Rail Routes
(* Alaska Railroad (Seward to Fairbanks/Elelson) not shown.)


Cascadia
Northwest
Northern New England
Empire
Chicago Hub Network
Keystone
NEC
Northeast
Northern California
California
Front Range
Great Lakes
Southern California
Arizona Sun Corridor
South Central
Southeast
Piedmont Atlantic
Texas Triangle
Gulf Coast
Florida
Gulf Coast
Florida

SEATAC AVIATION GROWTH STUDY

- **9th busiest** in the U.S. and **9th highest flight emissions** per passenger in U.S.

- 105% - 137% increase in **passenger demand** by 2050

- 49.8 million passenger enplanements (2018) to **111.2 million** passenger enplanements (2050)

- **Climate Goal:** reduce emissions 50% by 2030

- Study proposed:
  - electric airplanes, which seat 11 passengers
  - using 10% renewable jet fuel
  - jet fuel airplanes in use for next 30 years

2027

$6B near-term expansions complete

Over capacity by
3.1 million
passenger enplanements

2034

Long-term expansions complete

Total capacity of
33 million
passenger enplanements

2037

Over capacity by
6.9 million
passenger enplanements

PROPOSED SITES FOR NEW AIRPORT

- 4 possible sites for new airport
- Land Use: **4,670 acres**
- **87% larger** than existing airport
- Impacts to rural communities
- Community opposition to all proposed locations
    - **79% objected** to building more airports
    - Noise and environmental impacts
    - **67%** of residents **support building high speed rail** to connect the region


Vancouver
Surrey
Bellingham
Mount Vernon
Everett
Seattle
Spokane
Tacoma
Olympia
Ellensburg
Centralia
Yakima
Kelso
Tri-Cities
Portland
Salem
Albany
Eugene
North–South Corridor
Major stations
Major airport
Local service
East–West Route
Route option
CASCADIARAIL

ECONOMIC COMPARISON

- **$31 billion** in economic activity
- 209,000 jobs
- Airport Land Use: **4,670 acres**
- No data on environmental benefits

- **$355 billion** in economic activity
- 200,000 construction jobs
  800,000 jobs in other industries
- Station Land Use: **4 acres**
- **6 million metric ton reduction** in carbon emissions

High-speed trains provide a **sustainable alternative** to regional ai travel

CONCLUSIONS

- **1 hour** competitive travel time
- Generates **11X more economic activity**
- Fraction of land use (4 acres per station / 4,670 acres for airport)
- Lower construction costs, environmental impacts

- Integrate high speed rail station at SeaTac Airport to manage growth

- **Plan aviation and rail projects together** to strengthen:
  - economic competitiveness
  - investment opportunities


YOU ARE CLEAR TO DO WHATEVER...

PAIGE MALOTT

San Jose State University, USA

LinkedIn: /paigemalott

UIC HIGHSPEED Morocco 2023
HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET
Under the High Patronage of his Majesty King Mohammed VI

11TH WORLD CONGRESS OF HIGH-SPEED RAIL

Marrakech, 7-10 MARCH 2023

Planning and Execution of High Speed Rail in India

Rajendra, Prasad
Managing Director,
National High Speed Rail Corporation Limited, India
Session2-6.2 Network planning 2

ONCF UIC

BACKGROUND OF MAHSR PROJECT

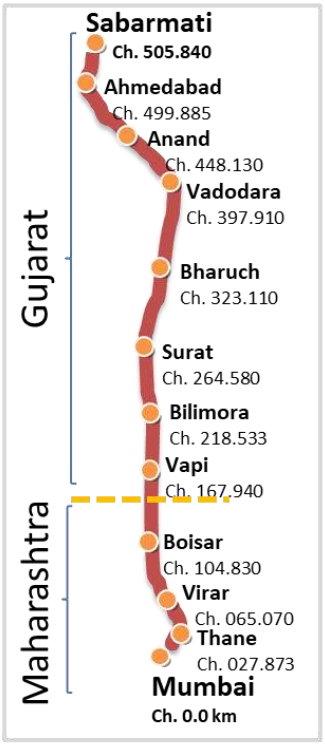
- Joint Feasibility Study completad by JICA and MoR in July, 2015
- **Sanctioned Cost** : JPY 1997 billion **(Rs. 1,08,000 crore)**
- **Japanese loan to fund 81 % of the Project cost**
- **Loan Component – Rs. 87,500 crore; Equity – Rs. 20,000 crore**

- **Project Implementation Agency: National High Speed Rail**
  - A Special Purpose Vehicle (SPV), incorporated in **February 2016**
  - Details of Equity Ownership and Amount Received:

SN	Particulars	Equity Ownership (%)
1	Ministry of Railways (MOR)	50%
2	Government of Gujarat	25%
3	Government of Maharashtra	25%

PROJECT OVERVIEW

Total Length: 508.17 Km



- **465.38 Km** Viaducts (**91.58%**)
- **9.82 Km** Bridges (**1.93%**)
- **26.22 Km** Tunneling (**5.16%**)

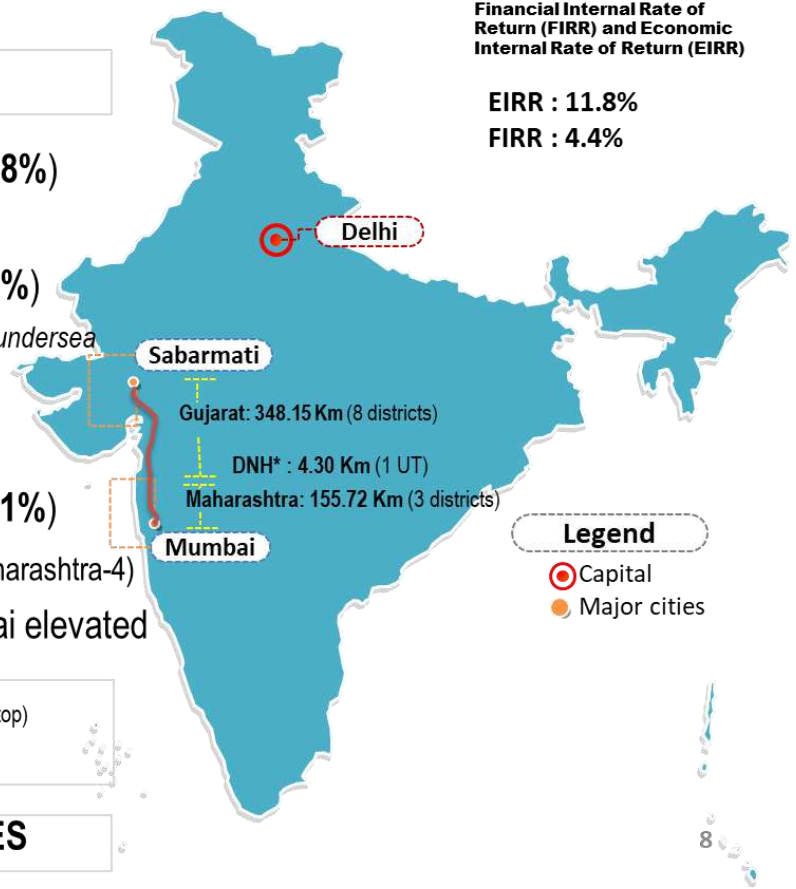
  Longest Tunnel: 21 Km with 7 Km undersea
- **3.9 Km** Bank (**0.77%**)
- **1.3 Km** Cut (**0.26%**)
- **1.55 Km** Cut & Cover (**0.31%**)
- **Stations:** 12 (Gujarat-8, Maharashtra-4)
- All Stations except Mumbai elevated

Travel Time: 2.07 Hr (limited Stop)
2.58 Hr (all stop)

COST: Rs. 1,08,000 CRORES

Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR)

EIRR : 11.8%
FIRR : 4.4%

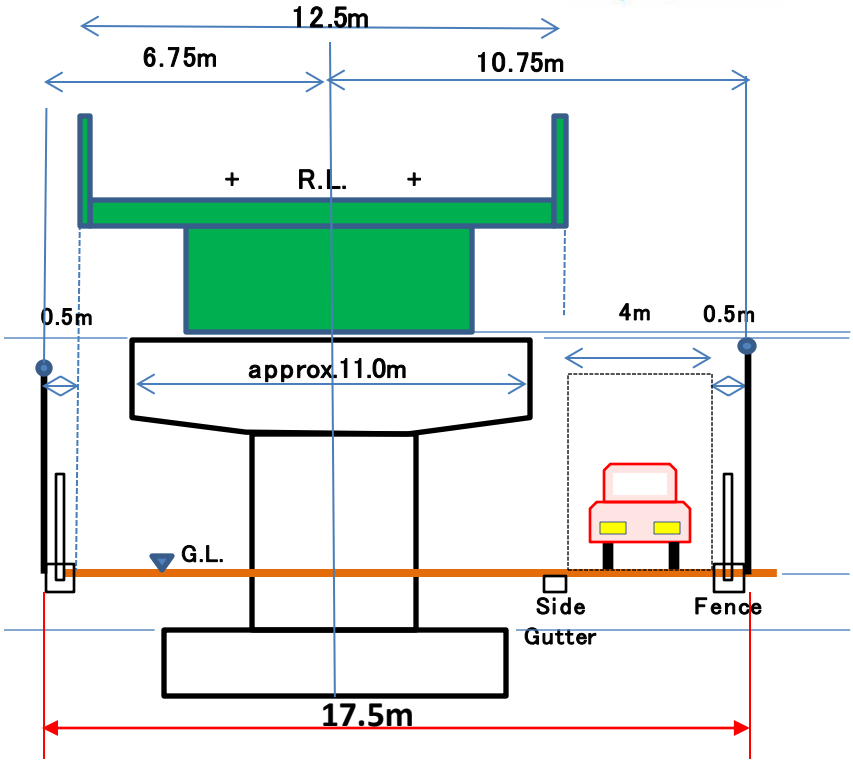


SALIENT FEATURES OF MAHSR

- **Total stations-** 12 (Maharashtra- 4, Gujarat- 8)
- **Maximum operating speed:** 320 kmph,
- **Design speed:** 350 Kmph,
- **Travel Time:** 2:07 hrs (limited stops), 2:58 Hrs (all stops),
- **Classes of coach:** 3 types (*Standard, Business, First Class/Gran Class*),
- **Seating capacity:** 730 passengers in 10 car train, 1250 in 16 car train,
- **Class wise seating capacity**: 15 in Gran class, 55 in Business class & average 66 in Standard class,
- ***Train Acceleration:*** *0 to 320 Km/h in 310 s (distance - 18 Km*),
- For Track, Electrical and Rolling Stock, Japanese system was chosen.

ELEVATED CORRIDOR (VIADUCT)

- As per feasibility report - 60% alignment on embankment
- As per latest design - 92% alignment changed to Viaduct structures
- Benefits of elevated corridor:
  - Reduces requirement of land (17.5 m width against 50 m).
  - Greatly improves safety and security perception against external interference
- Net Reduction in Land Acquisition – 3,600 acres
- In addition, saving of fertile area on account of borrow pit– 20,000 acres
- Full Span Launching Method (FLSM) of superstructure launching is planned for expeditious construction



(Typical Cross-section of HSR main-line for the purpose of Land Acquisition)

WHY SHINKANSEN OF JAPAN

- **Shinkansen** adopted on following considerations:
  - **Safety-** Shinkansen's record of "Nil passenger fatalities" in more than 57 years of operation.
  - Most **Energy efficient.**
  - Least formation width.
  - Highest Passenger Capacity.
  - Average **delay time** per trip < **one minute.**
  - Attractive financial assistance package offered by Japan.

TENDER PROGRESS

- Total 28 packages - 18 awarded.
- All Civil tenders including Track in the entire length of Gujarat State (352 km) already awarded.
- Civil tenders for Maharashtra State (3 Packages 156 km) invited in Oct'22. Delayed due to Land acquisition.
- Longest Tunnel of 21 Km will be done by 3 TBM's of 13.5 m dia.
- Tenders under invitation:
  - Rolling Stock
  - System
  - Electrical

STATUS OF OVERALL LAND ACQUISITION

- **Land Requirement:** 1396 Ha.
- **Land Acquired**: 1376.55 Ha
- **Land Acquisition** done through Consent as per latest Govt. Laws. If the land owner gives Consent, he's paid 25% extra over the land value.
- **Environmental clearances:** Received for entire project including forest and wildlife clearance (Alignment Passing through Mangrove area and Wildlife Sanctuary).

GUJARAT: PROGRESS STATUS – Commencement Date– Dec'2020 for 352 Kms.

SN	Activity	Scope (km)	Progress upto date (km)
1	Foundation	352	246
2	Pier	352	130
3	Girder Casting	352	40
4	Girder Erection		23

- Out of 8 Stations, for 2 stations Construction has reached up to Track level.
- 28 Steel Bridges are planned where Span is more than 60m due to Highway/ Railway crossing.
- 4,00,000 Direct jobs and total 9,00,000 jobs will be generated by the project.

MAHSR: FULL SPAN LAUNCHING METHOD

- Full Span Launching Technique 7 times faster than conventional Segmental Erection technique.
- 8 FSLM LG and 3 Segmental LG are working at present.
- Girders weighing up to 970 T are being casted and launched first time in India (India among only 5 countries in the world to implement this technique).
- 4 out of 8 Launching Gantries (LG) developed indigenously giving boost to “MAKE IN INDIA” initiative.
- In Gujarat portion, FSLM is being used for 300 km and Segmental method for 50 km where FSLM cannot be used due to site constraints.

OTHER POTENTIAL HSR CORRIDORS UNDER EXAMINATION

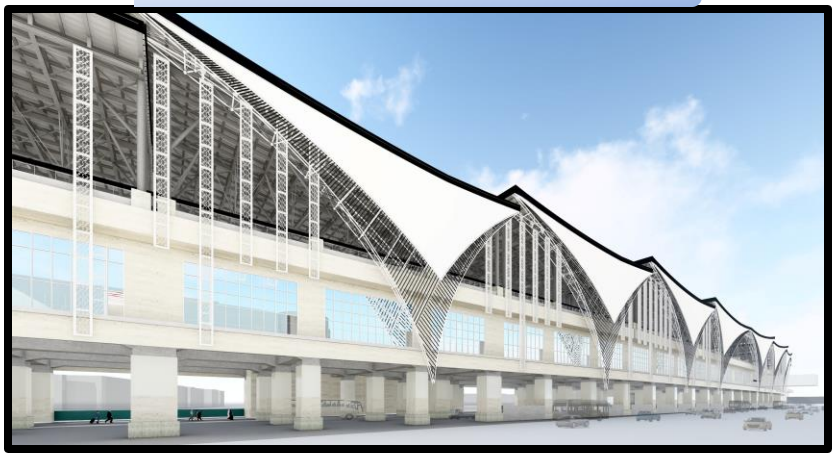
S No	Section	RKM
1	Delhi –Lucknow-Varanasi	865
2	Varanasi-Patna-Howrah	760
3	Delhi – Jaipur – Udaipur – Ahmedabad	886
4	Delhi – Chandigarh – Ludhiana – Jalandhar – Amritsar	459
5	Mumbai – Nasik – Nagpur	753
6	Mumbai – Pune – Hyderabad	711
7	Chennai – Bangalore – Mysore	435
TOTAL		**4,869**

MAHSR PROGRESS – VIDEO

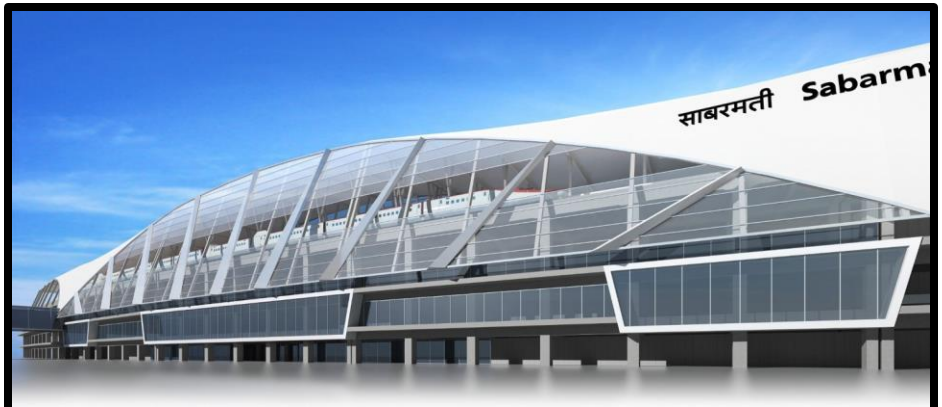
Progress Video will be shared Separately

Anand/Nadiad Station

VADODARA STATION



SABARMATI STATION



BKC STATION