



INTERNATIONAL UNION  
OF RAILWAYS

*unity, solidarity, universality*

# High speed rail in Europe Lessons learned and experiences

UNECE

Geneva, 25 October 2013

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*Director of the Passengers and High Speed Department*

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# Agenda

UIC & High speed

High speed rail principles

Some facts & figures

HS in Europe and around the world

The future of high speed

Concluding remarks

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## UIC & High speed

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# What's the UIC?

The UIC is a professional organisation serving the needs of rail transport through international cooperation at the global level



Since 1922

230 members on all continents

Members are:

Railways

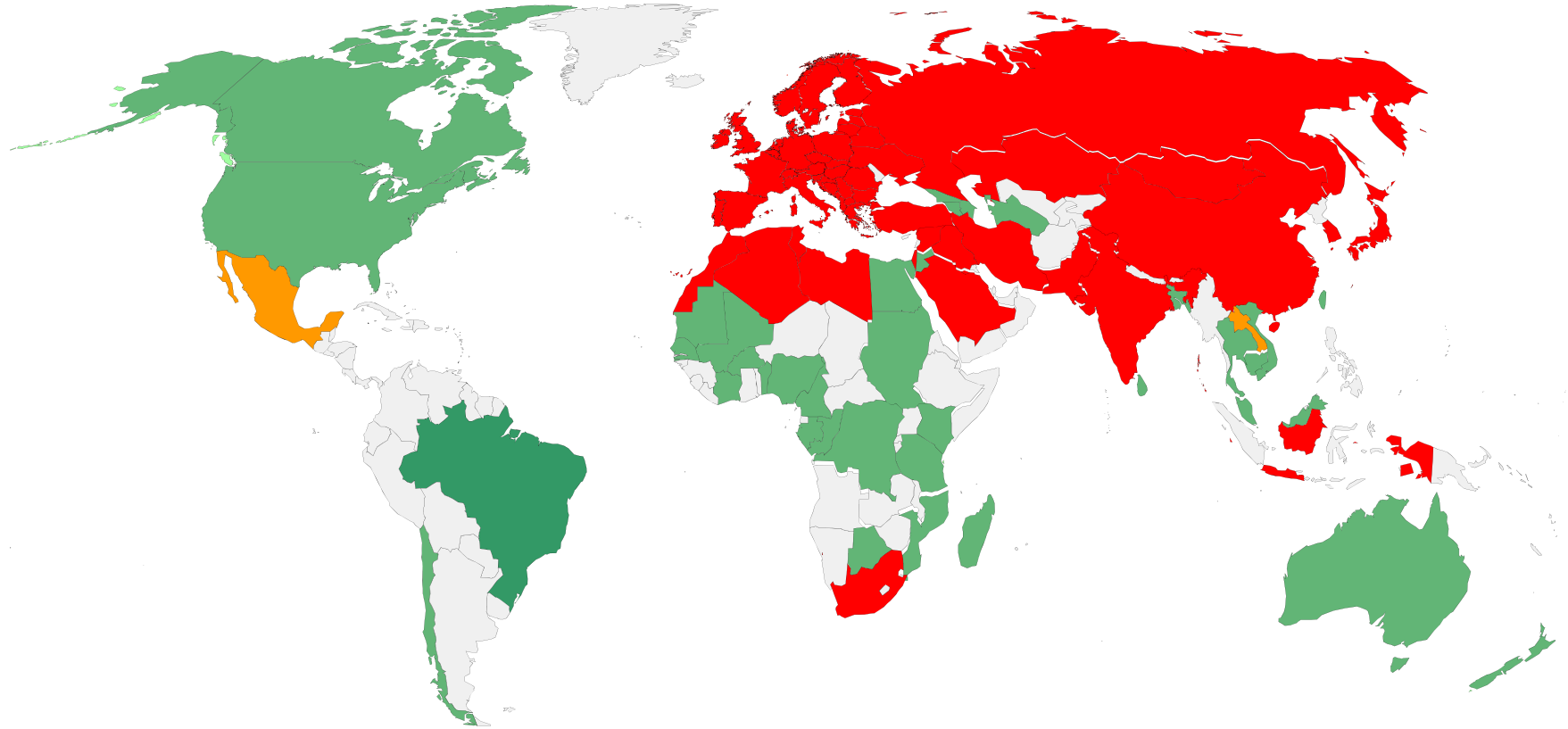
Rail operators

Infrastructure managers

Railway service providers

Public transport companies

# UIC in 2013



Members ■ Active ■ Associate ■ Affiliate

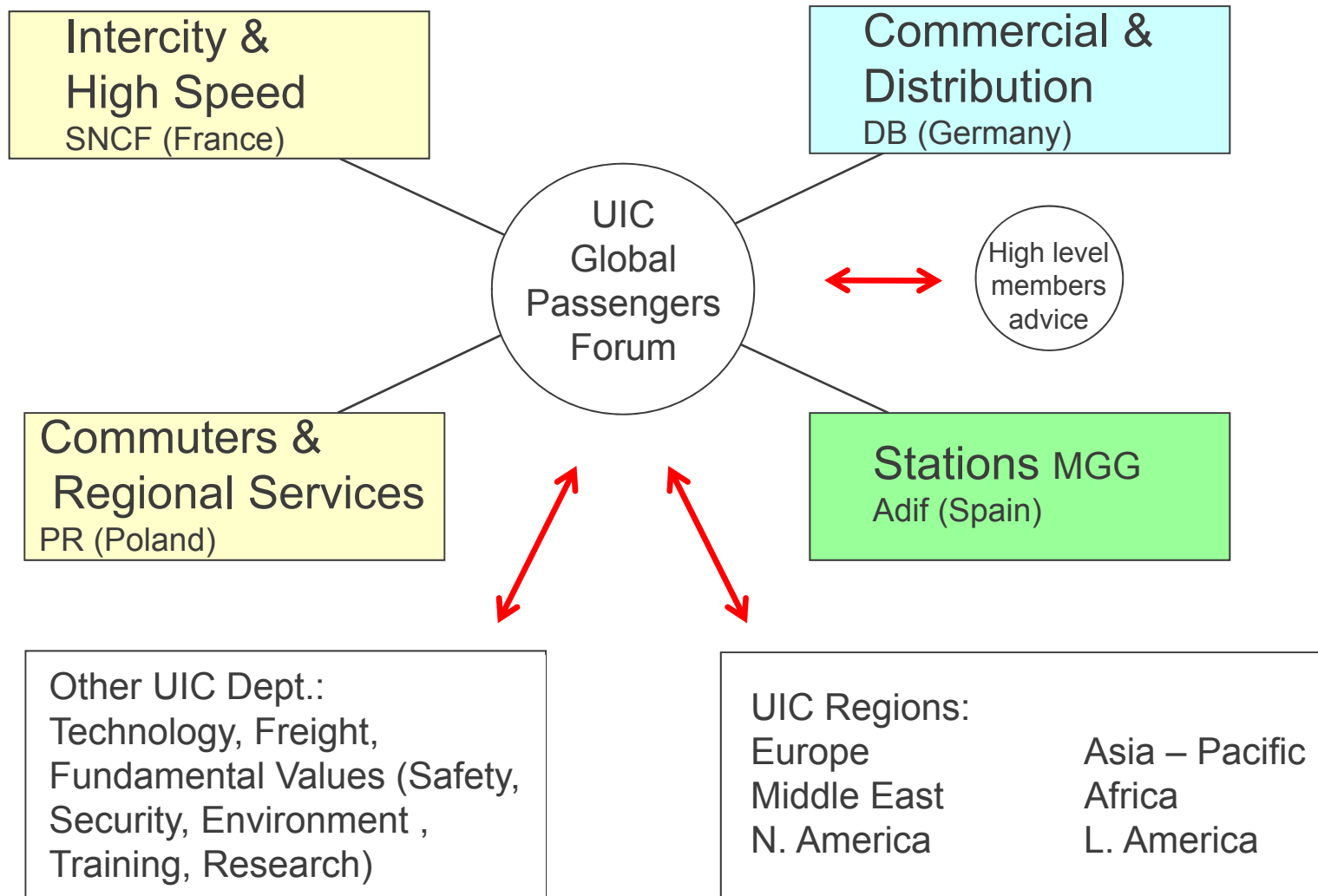
[www.uic.org](http://www.uic.org)

# UIC Mission

Promoting the development of rail transport  
at world level,  
in order to meet challenges  
of mobility and sustainable development

# UIC Passengers activities

# Structure of the Passengers Department





# UIC – Intercity & High Speed

Working group in activity since 1995

Studies on strategic issues

[www.uic.org/highspeed](http://www.uic.org/highspeed)

High Speed:

- Systems in operation
- Future developments



# UIC – Intercity & High Speed

Some examples of recent reports:

- High speed and the City
- High speed and territory management
- High speed contribution to sustainable mobility  
(including a specific report on Carbon balance)
- **High speed handbook**
- Handbook for Optimisation of Time Travel on Conventional Lines
- High speed under extreme natural conditions
- Optimal speed on high speed systems
- Infrastructure cost for Intercity & High speed services
- Night trains
- ...

Full Library of studies & reports available in our website:

[www.uic.org/highspeed](http://www.uic.org/highspeed)

# High Speed Handbook



[www.uic.org/highspeed](http://www.uic.org/highspeed)

Phase	Stages
Feasibility studies	<ul style="list-style-type: none"> <li>• Stage 1. Feasibility studies</li> <li>• Stage 2. Environmental Assessment</li> <li>• Stage 4. Financial &amp; Economic Analysis</li> <li>• Stage 5. Multicriteria Analysis</li> <li>• Stage 6. Preliminary Design</li> <li>• Stage 7. Empowerment</li> </ul>
Design phase	<ul style="list-style-type: none"> <li>• Stage 8. Operation and Maintenance Planning</li> <li>• Stage 9. Detailed design (including empowerment to continue)</li> </ul>
Construction phase	<ul style="list-style-type: none"> <li>• Stage 10. Construction Planning</li> <li>• Stage 11. Construction</li> <li>• Stage 12. Testing &amp; Commissioning (including authorization to open to revenue service)</li> </ul>
Operation phase	<ul style="list-style-type: none"> <li>• Stage 13. Operation and Maintenance</li> <li>• Stage 14. Ex-post evaluation</li> </ul>

Introduction - Stages

Summary of the objectives of each stage

Stage	Title	Objectives
0	EMERGENCE	To give the development of high speeds on a network every chance of success by confirming the advisability of embarking on a project.
1	1.1. RIDERSHIP FORECASTING AND TRANSPORT SERVICES DELIVERY	To estimate future demand for each of the alternatives corridor, from a transport demand model that represents the current mobility.
	1.2. PLANNING AND MASTER PLAN	To develop the first approach of the corridors for the new High Speed System and a first cost estimation.
2	FEASIBILITY STUDIES	To identify the most effective high speed rail options, with the level of patronage that would be compatible with an economically, competitive and viable project with feasible technology.
3	ENVIRONMENTAL ASSESSMENT	To make allowance for environmental issues as a key factor in project design and to prepare an environmental management plan.
4	FINANCIAL & ECONOMIC ANALYSIS	To estimate the profitability of the project to assess if it needs financial support (Financial Analysis). To estimate the profitability of the project to assess if the society is better off with the project (Economic Analysis).
5	MULTICRITERIA ANALYSIS	To contribute to the choice of a solution that reconciles the various requirements on the basis of shared criteria.
6	PRELIMINARY DESIGN	To create the high-level design project

# UIC – Intercity & High Speed

## **Tourist OPportunities on Rail Transport (TOPRAIL)**

New activity to explore and promote the potential of traffic on rail for leisure: High Speed, seasonal, charter, safety on vintage trains, cruise trains,...

New chairmanship (Catalonian Railways)

# UIC – Intercity & High Speed

- **Benchmarking and system analyses**
- **Organisation of technical workshops and training programmes**
- **World Congress on High Speed**

# Training on High Speed Systems

One week (5 days) Training Seminar, in which all the elements involved in a high speed system are analysed

10<sup>th</sup> **THSS**: June 2014, in Paris

[www.uic.org/highspeed](http://www.uic.org/highspeed)



# World Congress on HS Rail WCHS



July 2015 in Tokyo, Japan  
Organized by the UIC & East Japan Rail

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# Definition of high speed

Is a “new transport mode”, fully compatible with classic rail (SNCF, 1981)

High speed means at least 250 km/h

But the definition is not unique  
(EU Categories I, II and III)

High speed & high performances

# Thresholds

Operating at more than (+/-) 200 km/h requires:

- special trains (train sets)
- special dedicated lines
- in-cab signalling

...and much more

# Understanding high speed rail 1

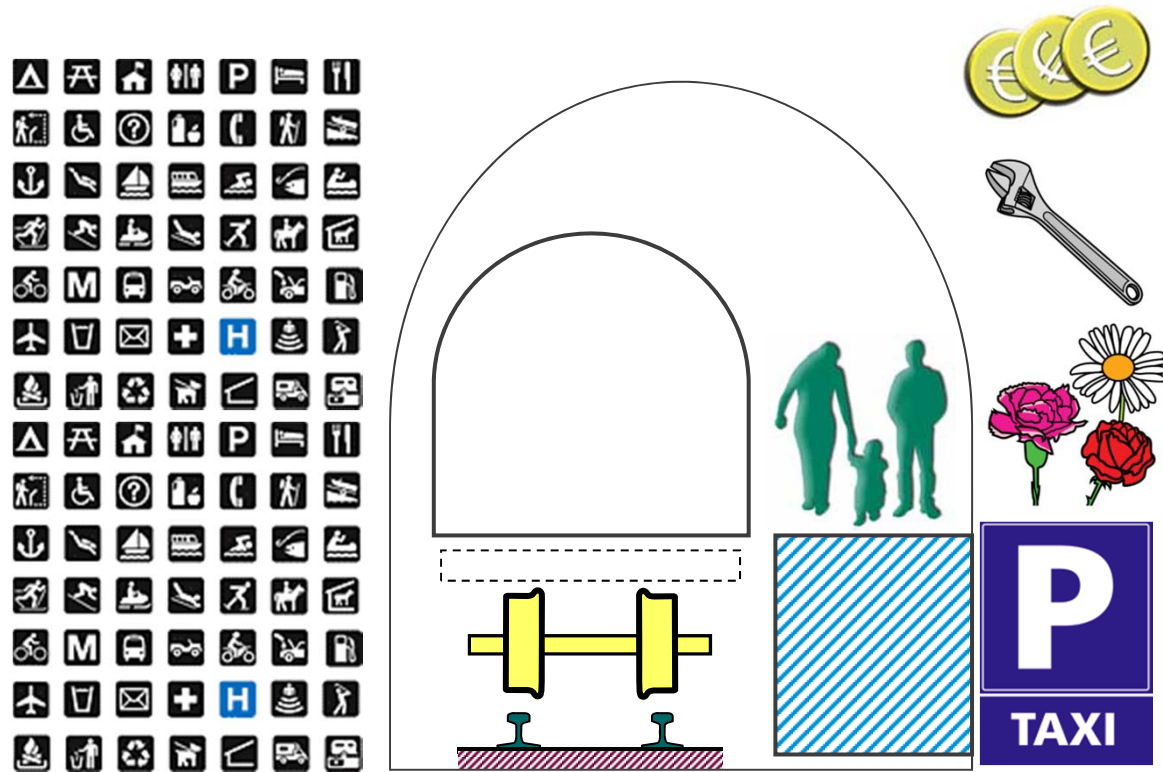
## High speed is a system

A very complex system, comprised by the state of the art of:

- Infrastructure
- Station emplacement
- Rolling stock
- Operations rules
- Signalling systems
- Marketing
- Maintenance systems
- Financing
- Management
- Legal issues
- ...

Considering all of them is fundamental

# High Speed is a system



# Understanding high speed rail 2

## High speed is not unique

- Many different commercial concepts of high speed (including services to customers, marketing, etc.)
- Many different types of operations (maximum speed, stops, etc.)
- Different ways to operate classic trains (in particular, the impact on freight traffic)
- Capacity and cost vary in each case

# High speed advantages for society

- Offers a high capacity of transport
  - Up to 380 000 passengers per day, Tokyo – Osaka
  - Permits reducing traffic congestion
  - Helps economic development
  - Shapes land-use
- Offers sustainability

# High speed contribution to sustainable mobility

- **Environment**

  - Land take

  - Energy consumption

  - CO2 emissions

- **Social aspects**

  - Reliability

  - Comfort

  - Impacts on health

  - Safety**

- **Economic aspects**

  - Green jobs

  - External costs

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# High speed world network

World network ( $V \geq 250$  km):

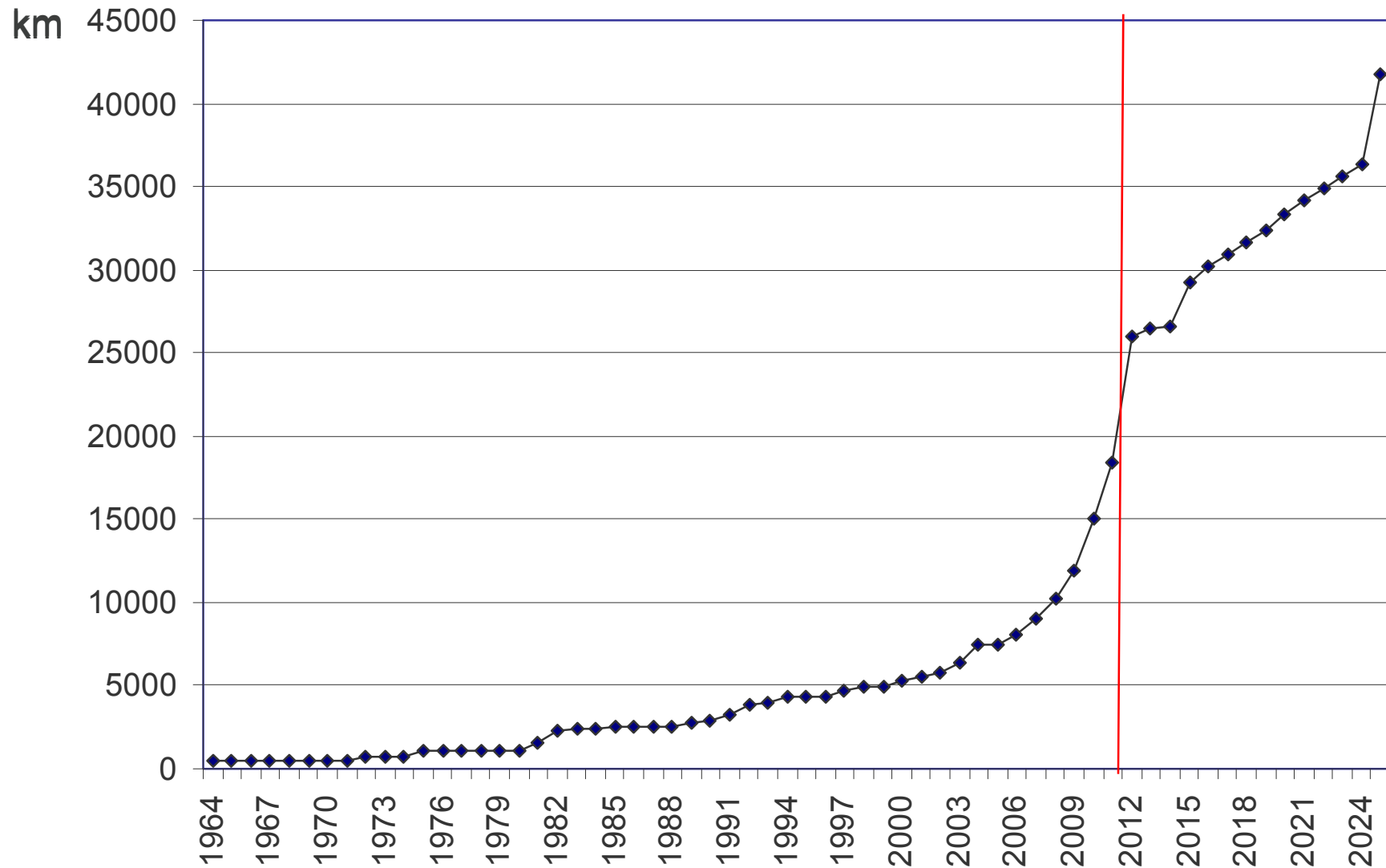
21 365 km of lines in operation

13 967 km of lines under construction

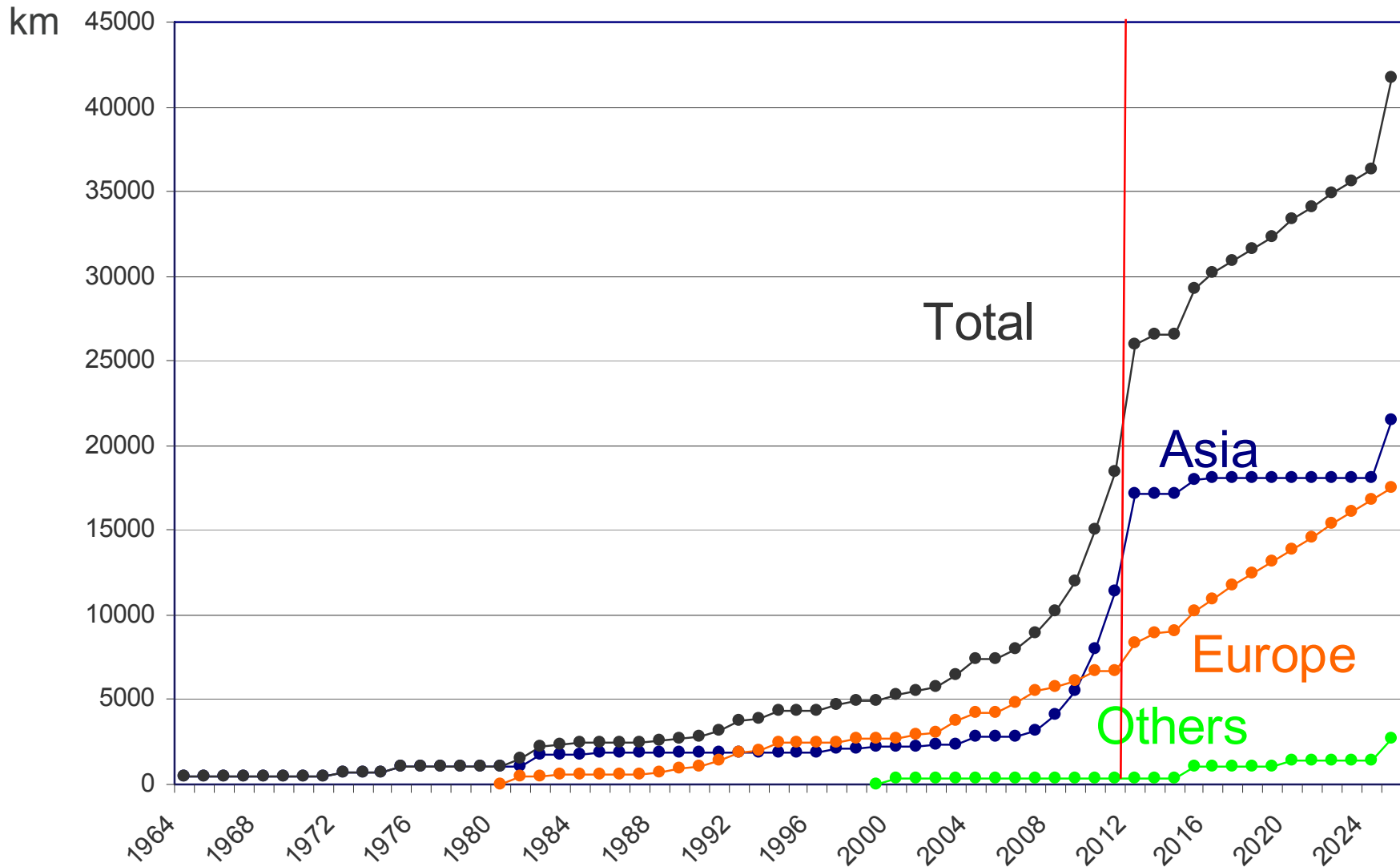
16 348 km of lines planned

June 2013

# Evolution of the world HS network



# Evolution of the world HS network



# World rolling stock high speed fleet

High speed train sets\* in operation in the world:

Maximum speed 200 km/h or more: 2 897

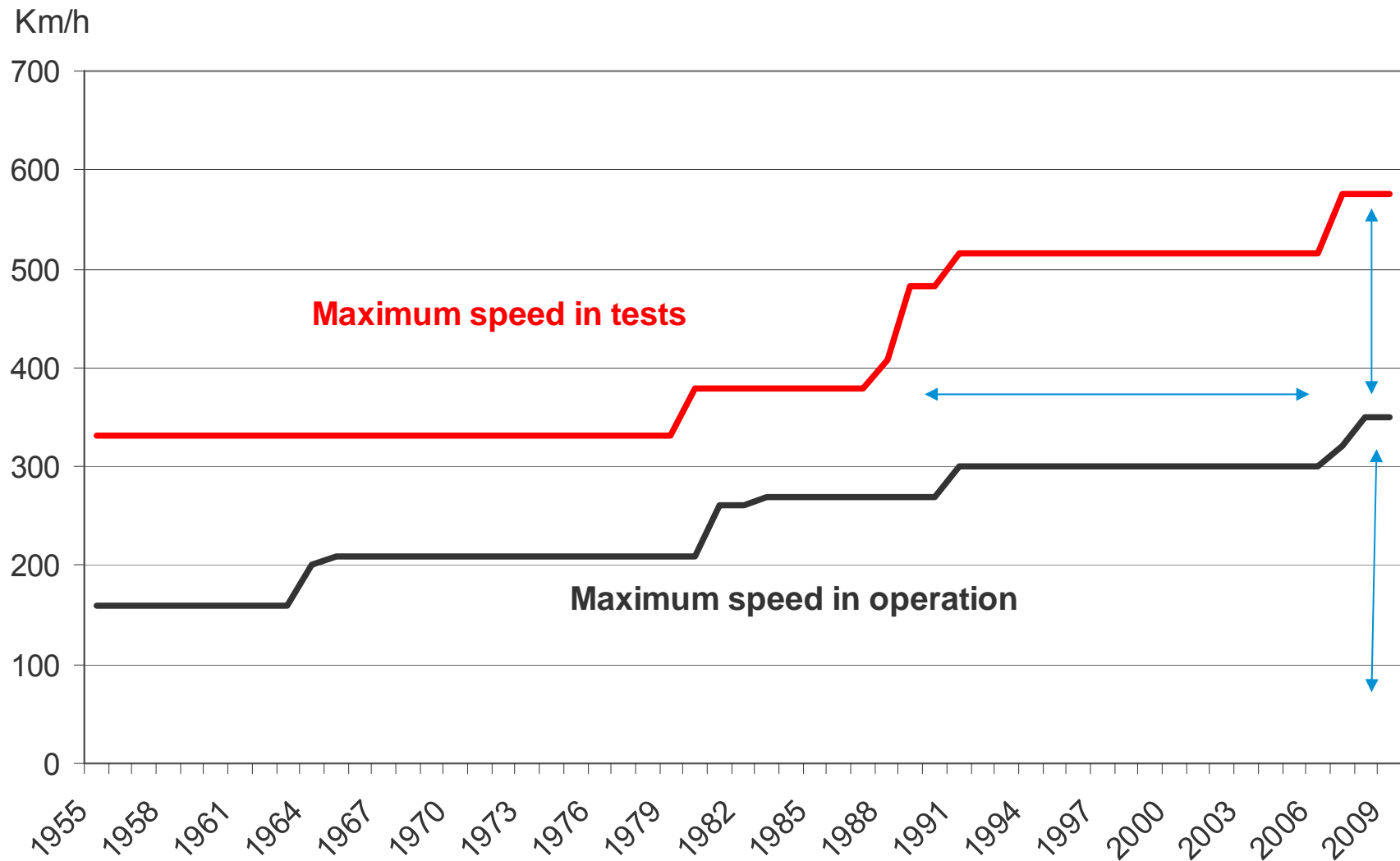
Maximum speed 250 km/h or more : 2 088

High speed train sets manufacturing: 945

\* and trains operating on dedicated high speed lines

December 2012

# Evolution of maximum speed on rails



# World speed record: 574,6 km/h – France, April 2007



# High Speed traffic volume

- 1.15 Billion passengers per year in HS trains
  - 485 Million in China
  - 300 Million in Japan
  - 125 Million in France
  - 240 Million in the rest of the world
  
- 15 Billion passengers have already travelled in HS trains

Twice the population of the Earth



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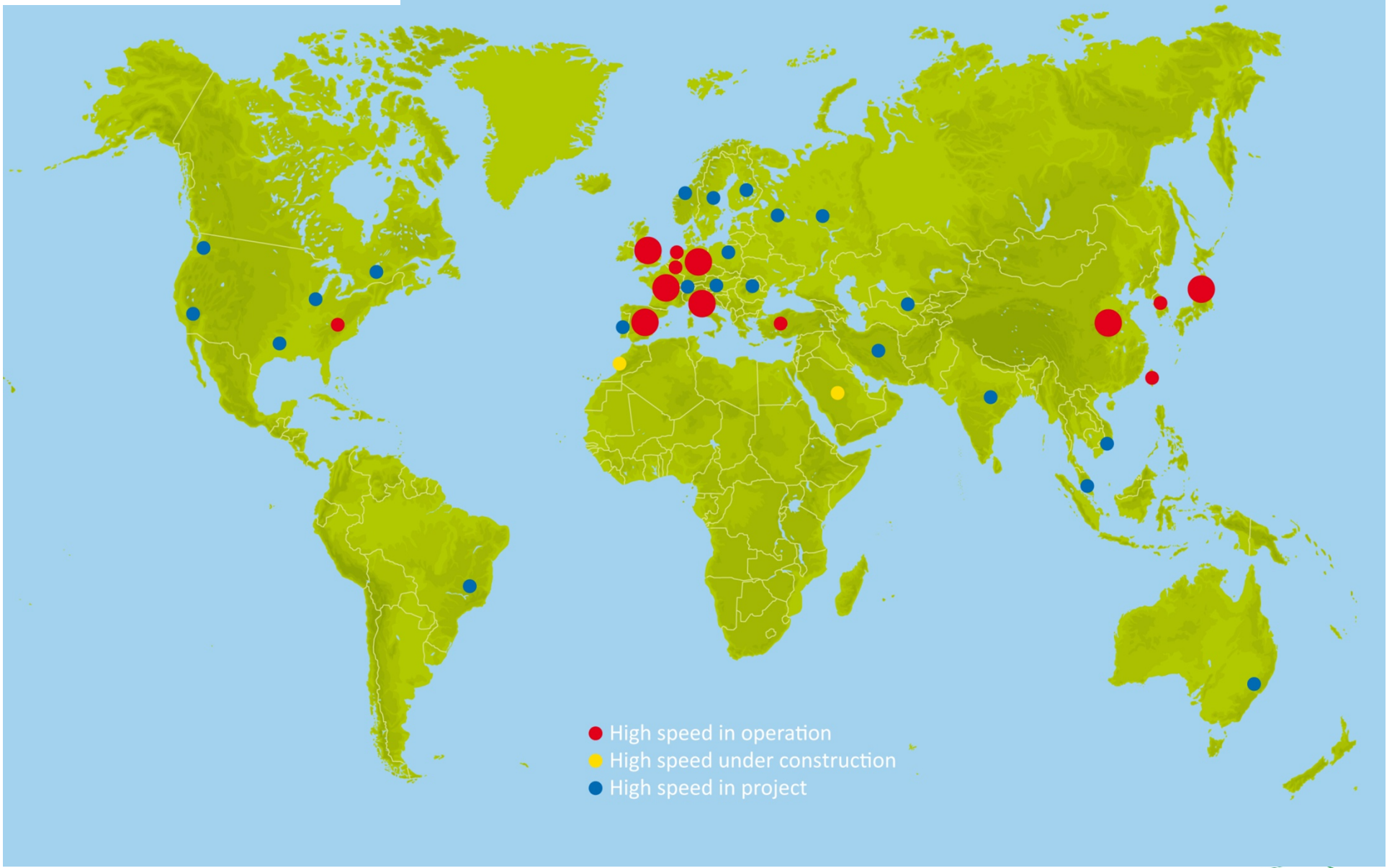
In operation: Belgium  
France  
Germany  
Italy  
Spain  
The Netherlands  
United Kingdom

Japan  
Korea  
China  
THSRC  
Turkey

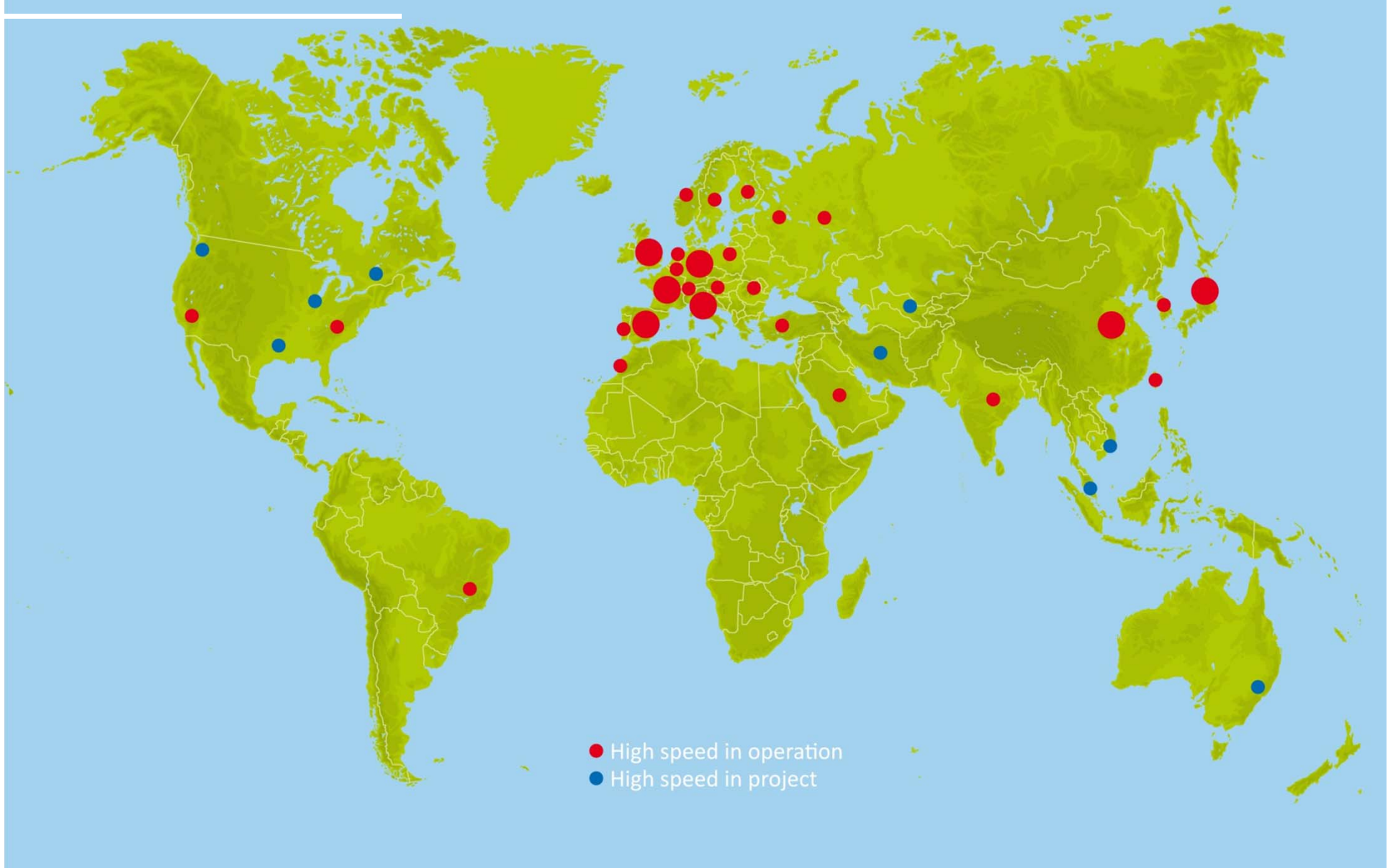
USA

Planned: Poland  
Portugal  
Russia  
Morocco  
India  
Iran  
Saudi Arabia  
Argentina  
Brazil  
Indonesia  
Canada  
Mexico  
...

2013



2025



# European Region



Updated February 2013



# France: at the heart of an European Network



# Germany: a particular concept on HS network



# Spain: Expanding a multi technology system



# Italy: Competition now





# Italy: Competition now



# The Netherlands: Lights and shadows



# Main challenge in Europe: Interoperability



# Main challenge in Europe: Interoperability



# Main challenge in Europe: Interoperability



# Japan



Updated February 2013

# Celebrating the 50<sup>th</sup> Anniversary



# Most recent technologies Shinkansen (South)





# Most recent technologies Shinkansen (North)



# China and Eastern Asia



Updated February 2013

# China: from 0 to 10 000 km of HRS in just 4 years



# THSRC: The only example of BOT in HSR



# South Korea: Technological evolution



# South Korea: Technological evolution



# Turkey: HSR contributes to develop and integrate



# United States





# USA: several possible models for HSR



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# Liberalisation in Europe

## New operators



NTV new Italian private operator

Will start operations with 25 new generation AGV trains

SNCF purchased 20 % of the capital

# Globalisation



# The future of high speed rail

- High speed technology is fully competitive today but new developments are necessary if we want keep this competitiveness for the next 20-30 year
- Developments in new technologies immediately follow the implementation of the first high speed system in any country

# Requirements by Regions

Region	Europe	Asia	USA
<b>Common requirements</b>	<ul style="list-style-type: none"> <li>• Reliability</li> <li>• Flexibility</li> </ul>	<ul style="list-style-type: none"> <li>• Life cycle cost</li> <li>• Performance</li> </ul>	
<b>Individual requirements</b>	<ul style="list-style-type: none"> <li>• Interoperability</li> <li>• Standardisation (reduction of the variety of trains / /components)</li> </ul>	<ul style="list-style-type: none"> <li>• Localisation</li> <li>• Transfer of technology</li> <li>• Consulting</li> </ul>	<ul style="list-style-type: none"> <li>• Creative financing</li> <li>• FRA compliance</li> <li>• "Buy America" (local content)</li> </ul>

# In the coming years, high speed will advance on

- Higher commercial speeds
  - maximum speeds in the range of 320 - 350 km/h
  - more availability time for the infrastructure
- New conception of the infrastructure elements:
  - ballasted or unballasted track, new fastenings systems
  - new materials (i.e. catenary wires)
- Standardisation and modularity of rolling stock
- New braking systems
- More respect to the environment (noise, energy efficiency)
- Improvements on safety, security and comfort
  - crossing winds, earthquake's detection, etc.
- New technologies (telecommunications, WiFi, etc.)

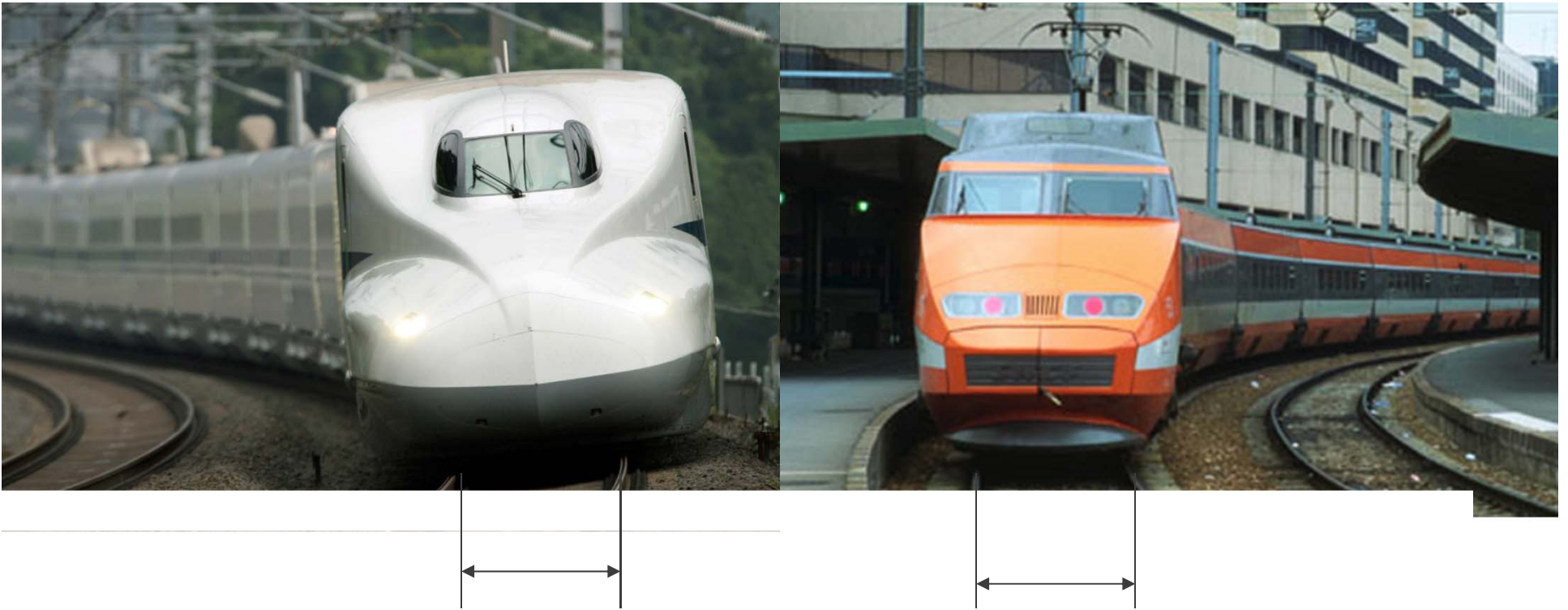
# In the coming years, HS rail operators will ask for

## **Business**

- More capacity (double deck &/or 2 + 3 instead of 2 + 2)
- More availability and maintainability of trains (RAMS)
- More reduced costs of (purchase and) maintenance (LCC)
- More reduced fees for infrastructure use
- More energy efficiency and less energy consumption
- Optimisation of the operation costs (i.e. when low occupancy)
- Globalisation
- ...

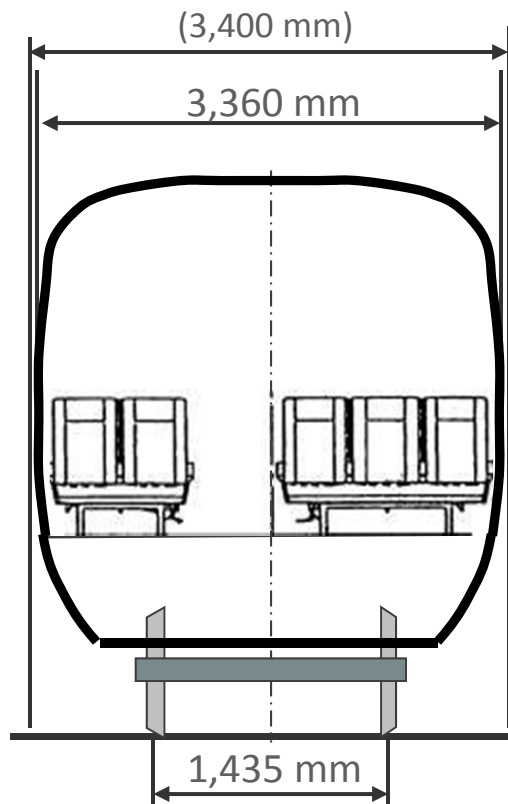


# Capacity

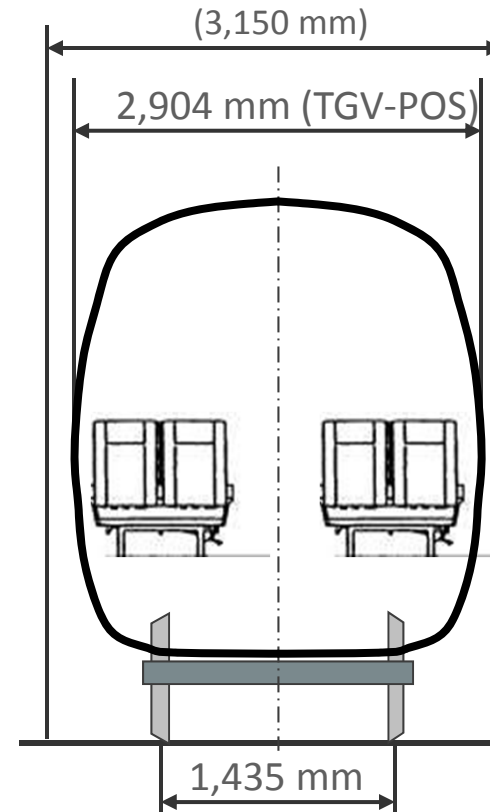


# Capacity

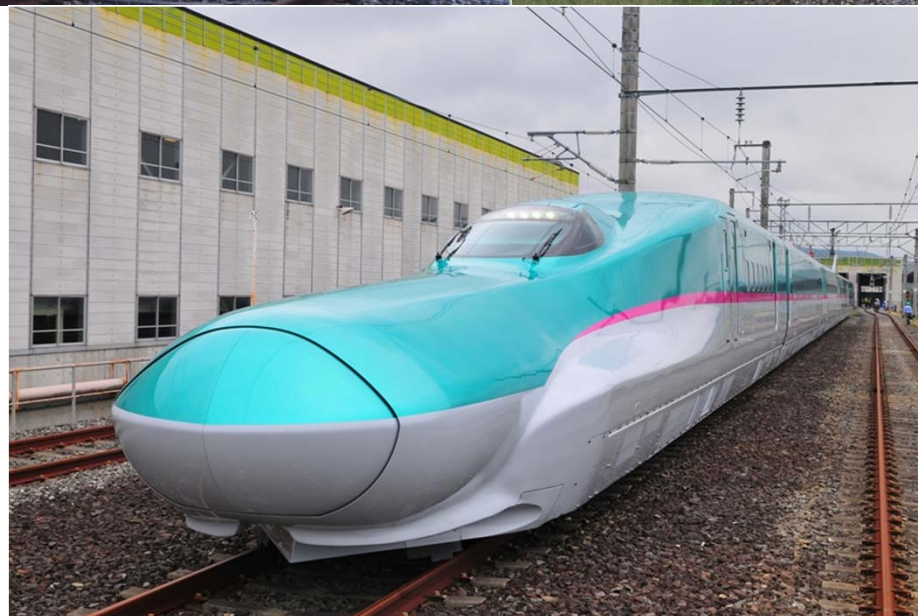
## Shinkansen loading gauge



## European loading gauge



# New prototypes becoming series trains



# New prototypes to compete



# New prototypes developed by the industry



# New prototypes developed by the industry



# New prototypes developed by the industry



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# Conclusions - Lessons learned

- Network: from a new HS line to a Continental HS network
- Operating on “classic”, “upgraded” and HS networks
- Capacity concept
- Stations: strategy. Situation, number, intermodality, accessibility, functionality
- Integral protection: safety, security, civil protection
- Environment and sustainability. Carbon balance
- Interoperability
- Skills & knowledge: how to follow
- **THE AIM IS THE SERVICE.** The line is the consequence

# Conclusion

- High speed is **expanding dramatically** around the world
- A **highly beneficial transport system for society**
- High speed **always needs public help**
- High speed is a **complex system**
- High speed conception is **not unique** and it must be adapted to each case
- High speed (railways) must continue to make **innovations**, in order to continue serving Society

# Complement more than compete



■ ■ ■ Thank you very much for your kind attention

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