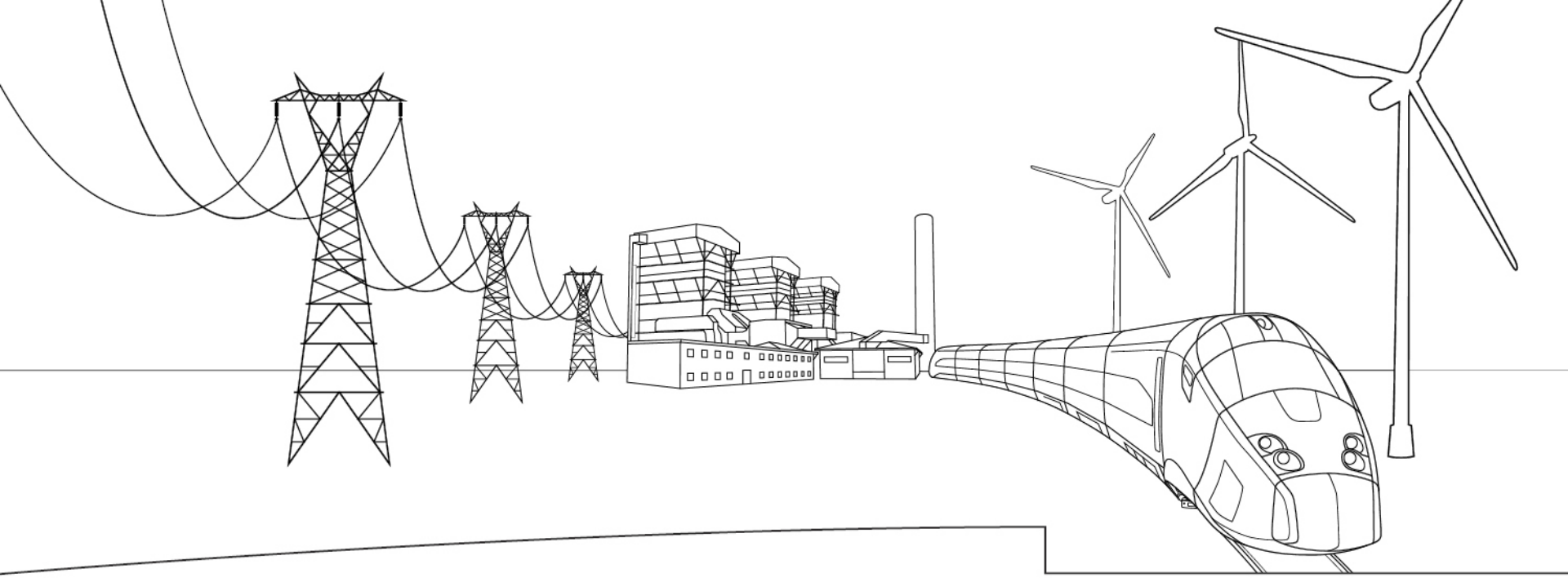

High Speed Rail for Czech Republic

Jaime Borrell

Prague

15/05/2014

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Shaping the future

Agenda

- **Czech Republic at the core of High Speed Rail in Central Europe**
- A new line of economic development at the heart of Europe
- How to adapt HSR to the country's needs

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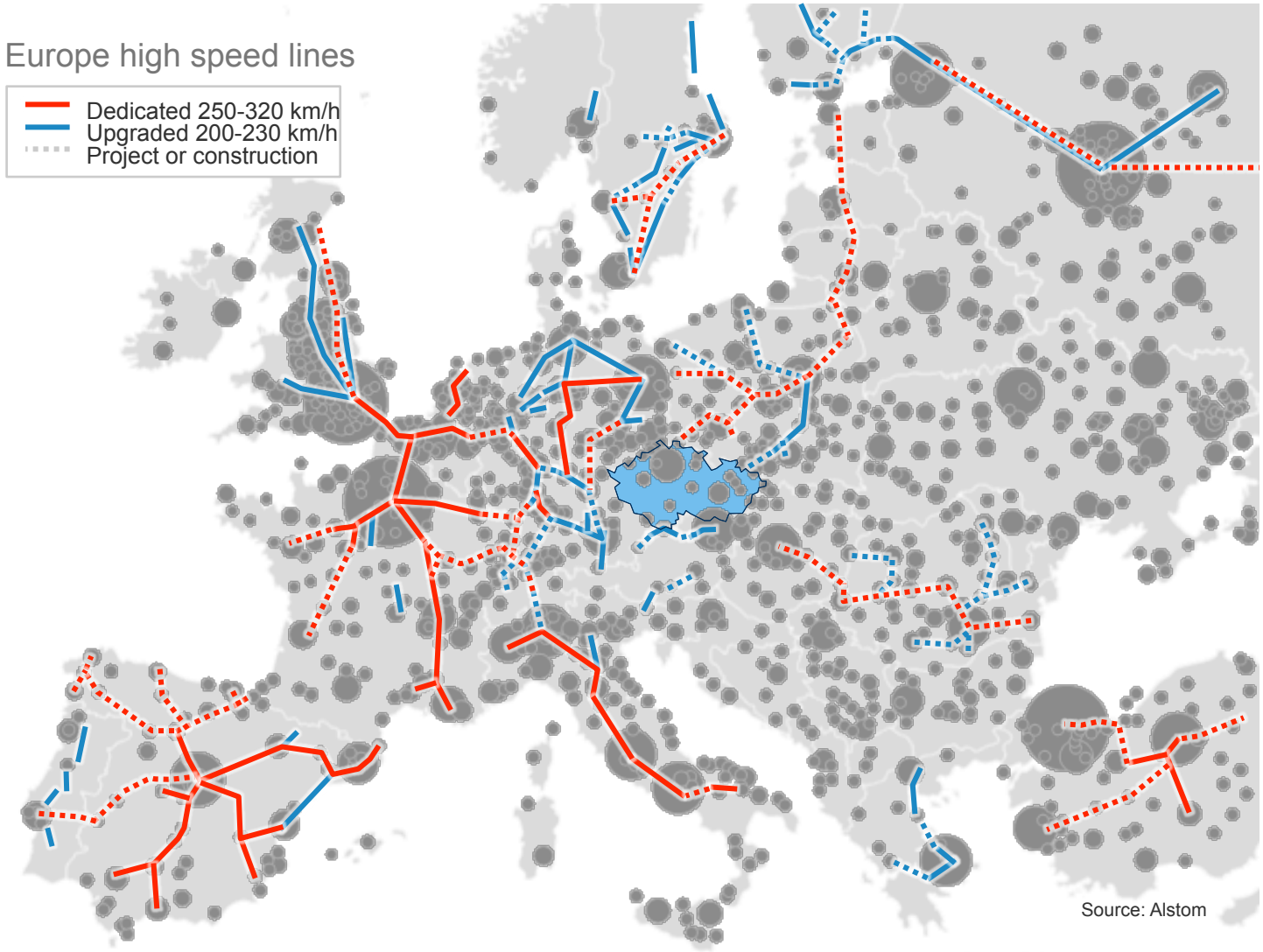
Czech Republic, future core of European HSR network

(High Speed Rail)



Strategic position

- Relevant European cities at **HSR distance** from Prague, Brno and Ostrava.
- HSR **preliminary studies ongoing** in Poland, Baltic countries, Hungary, Romania…
- **International HSR corridors** developing in Europe.

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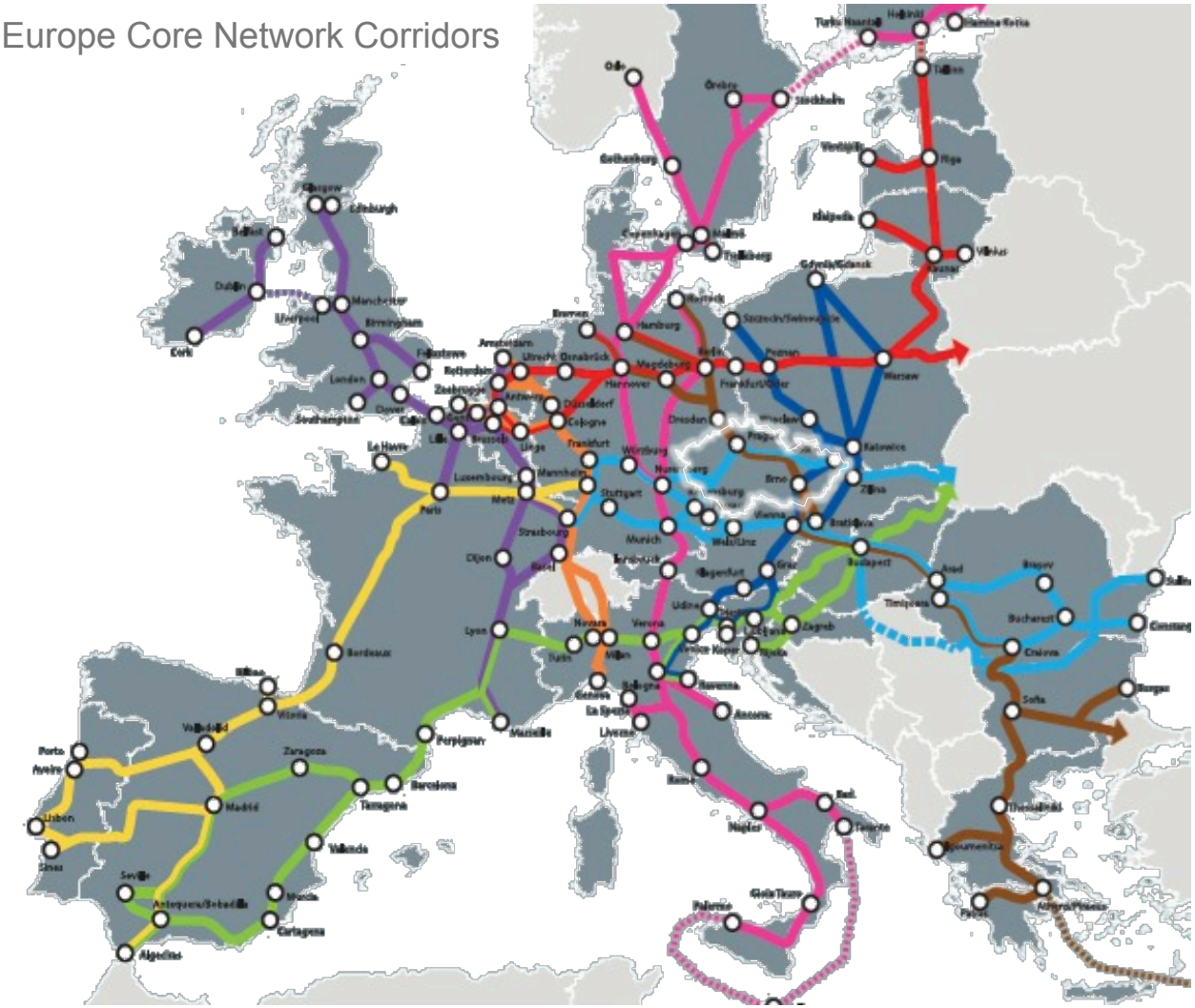
European Union is investing in railway

Europe Core Network Corridors



Cohesion Funds

€352bn
to invest
from **2014 to 2020**
on the core transport corridors
and the environment.
Up to 85% grant
through Public Service
Contracts or Regional Aid.

Connecting Europe Facility

€26bn
Transport Investment Facility
mostly for rail
through competitive calls.
(Including €11,3bn
of Cohesion Funds).

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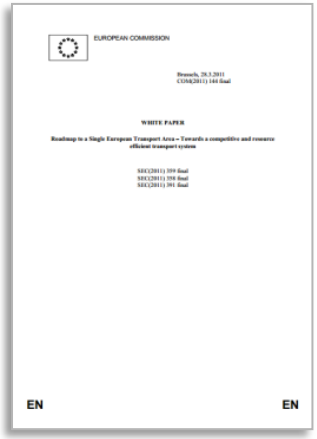
Europe places high speed rail at the core of its mobility

HSR is essential in the **multi-modal** transport network


EUROPEAN COMMISSION

WHITE PAPER

EN EN

3 out of 10 goals of European Commission's Transport White paper concern HSR

- By 2050, complete a European **high speed rail network**.
- **Triple the length** of the existing high speed rail network by 2030 and maintain a **dense railway network** in all Member States.
- By 2050, connect all core network airports to the rail network, **preferably high speed**.

SHIFT²RAIL European Research and Innovation Program

- Increase the **competitiveness** of EU rail industry to help retain world leadership
- Increase the **attractiveness** of rail transport
- Support the completion of the **Single European Railway Area**.

920 M€ for 2014-2020 from the EU and from the Industry (≈50%)

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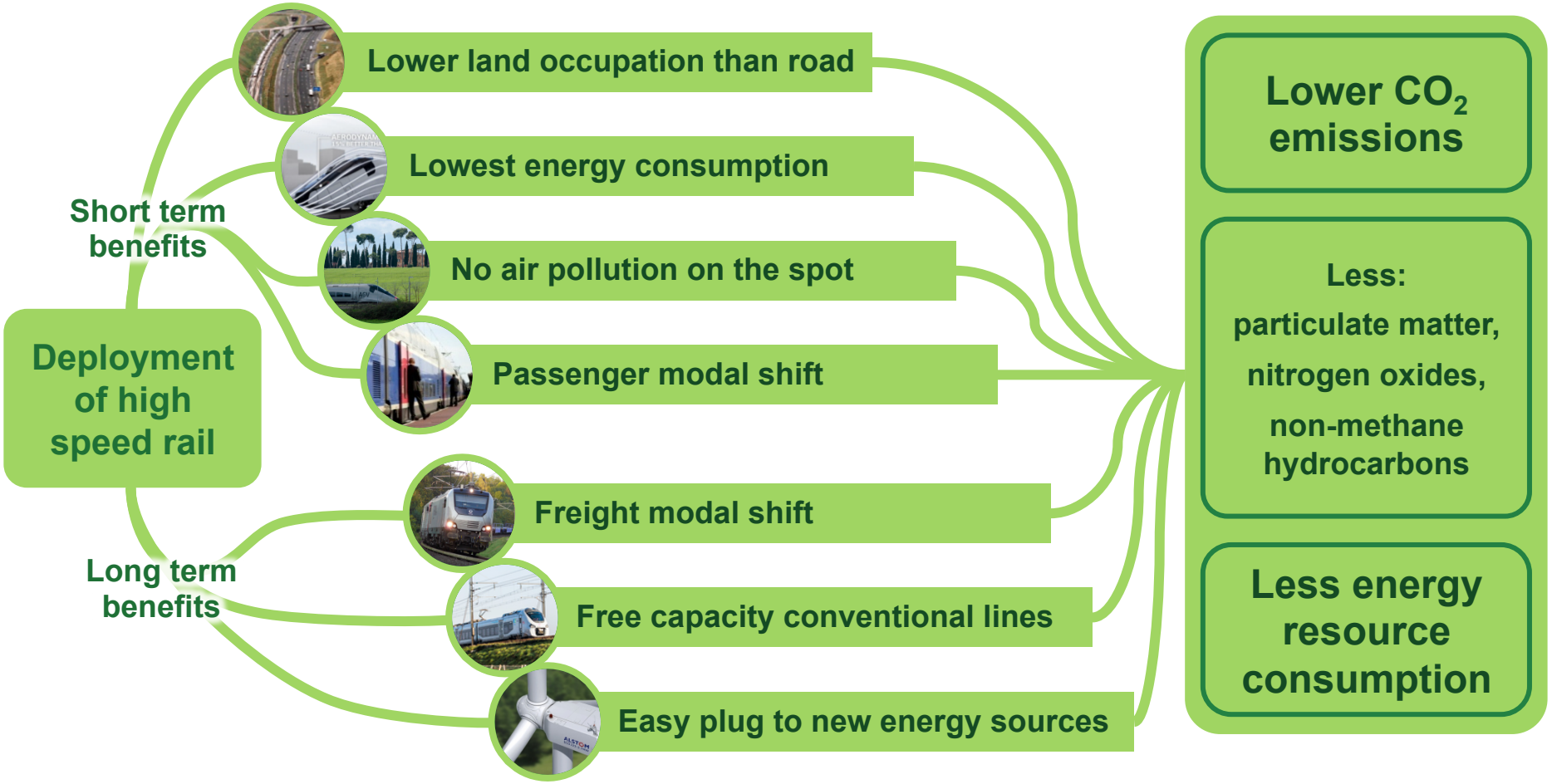
HSR is growing as the transport of the future

The most **sustainable** way to connect capitals and countries



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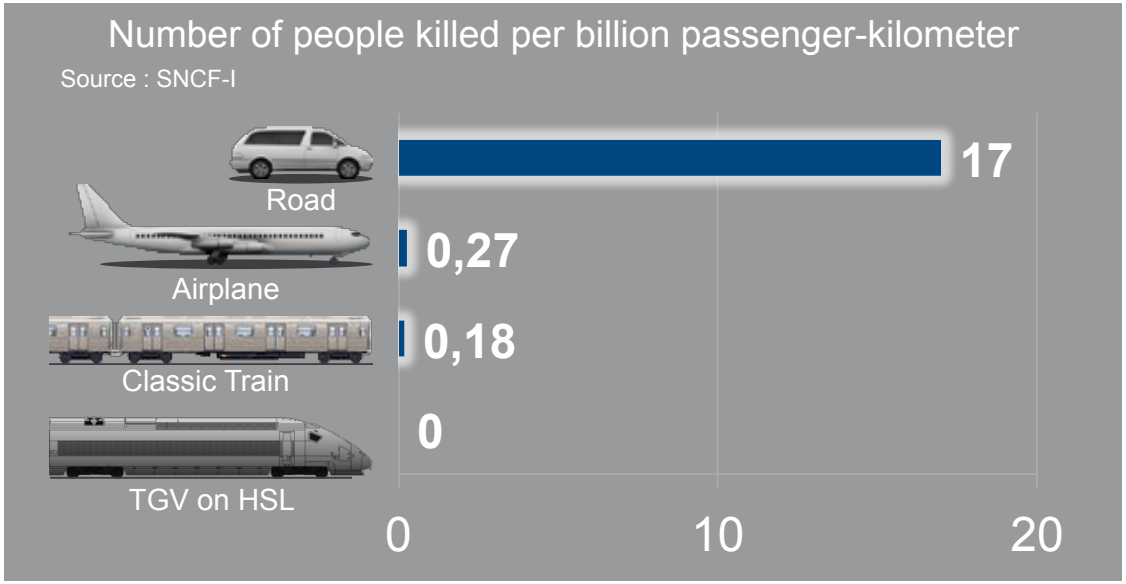
HSR is growing as the transport of the future

High speed rail offers the highest level of **safety**



Alstom's proven safety and wide experience

0 fatal accidents of Alstom very high speed trains on high speed lines

32 years of commercial service running **4.4 billions of km** with VHS trains

722 very high speed trains sold

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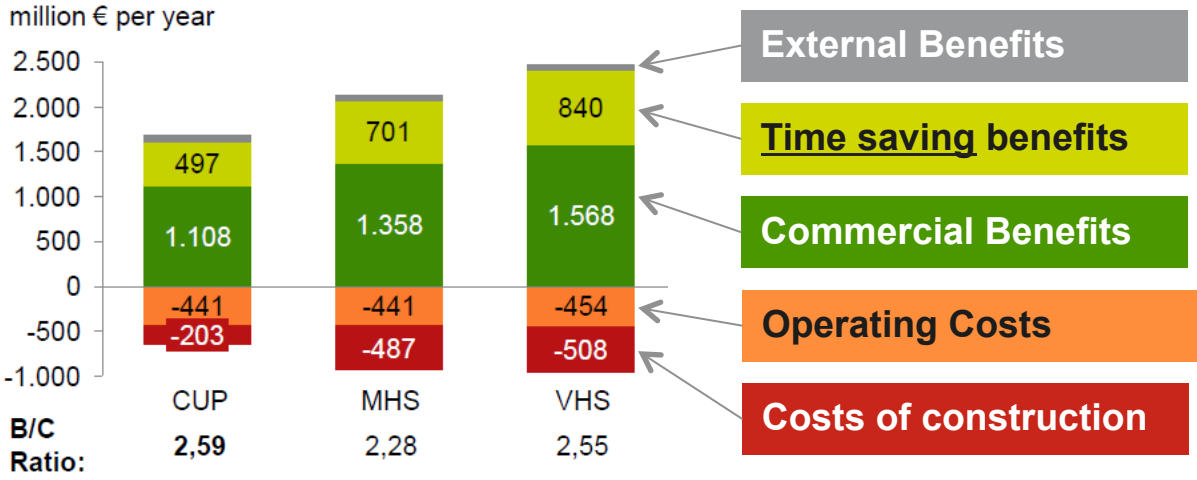
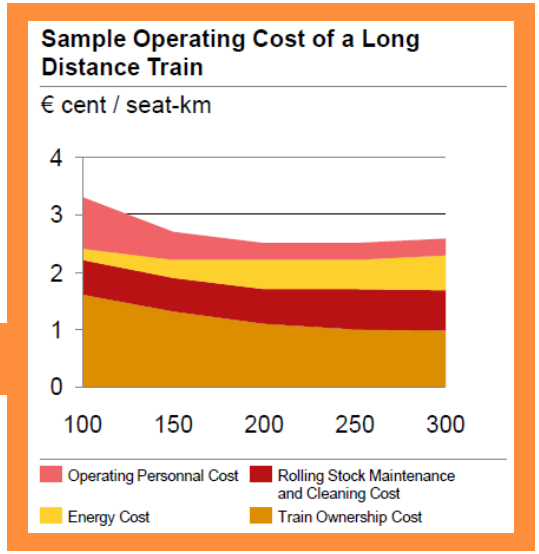
A new line of economic development

High speed can achieve **positive return on investment**

Annualized Costs and Benefits



Example from Civity study "The Benefits of Very High Speed Rail"
Link to the study on www.civity.de



Source: UIC Cost-Speed Report
Link to the report on www.uic.org

Commercial benefits can be sufficient to justify HSR

High speed **operating costs are optimized** due to intense use of trains

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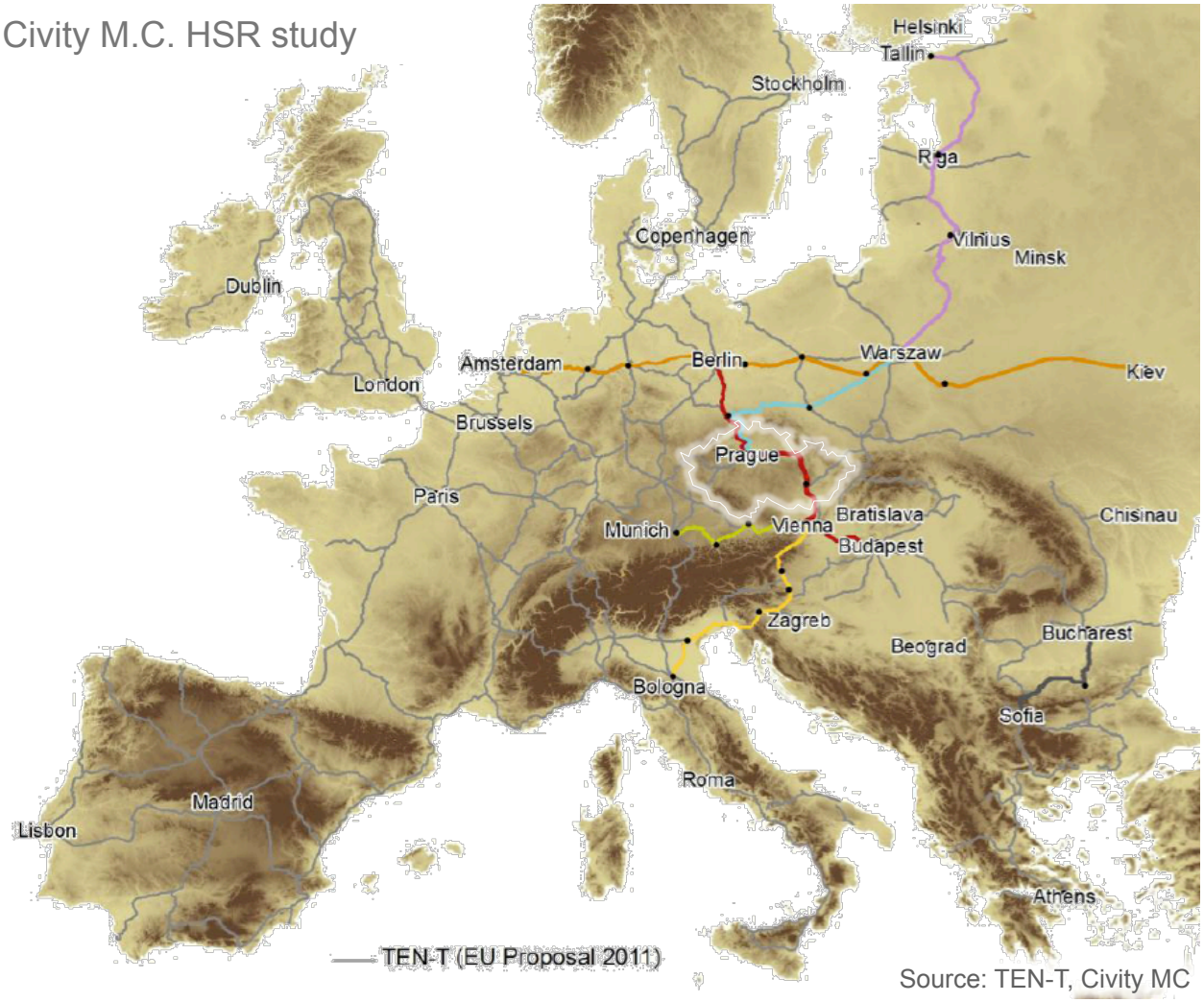
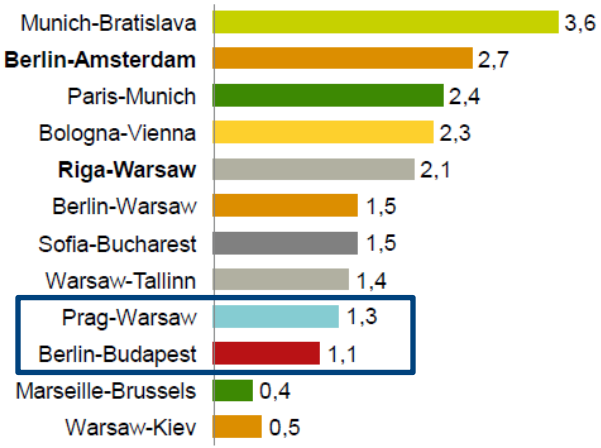
Preliminary Business Case of Czech HSR is positive

Civity M.C. HSR study



Source: TEN-T, Civity MC

Need detailed analysis



Link to the study on www.civity.de

- Preliminary assessment **positive**, but approximate hypothesis used (e.g. average European construction costs).
- A first level analysis is possible with limited cost.

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HSR will generate industrial and regional development

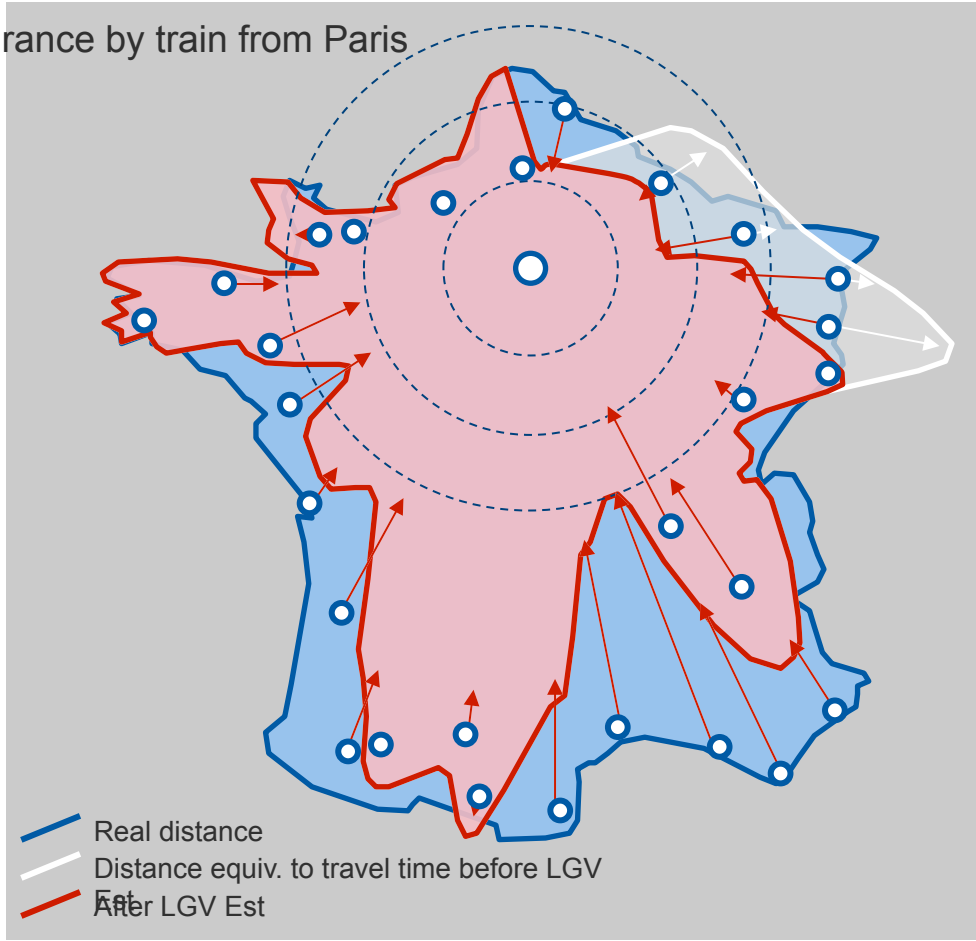
Change the Country and improve people's life

Socio-economic changes

- Impact on **health**
- **Reduce mortality** in transport
- Improve people **mobility** and **comfort**
- Save **travel time**: change country map
- **Reduce traffic** congestion
- **Free capacity** on other transports

Numerous examples of region developments after HSR

- **Boost international projection**
  Symbol of Innovation
- **Long term Country development**
  Mobility increased
  Induced demand and tourism
- **Industry development in the area**
  High technical jobs



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- Czech Republic at the core of High Speed Rail in Central Europe
- A new line of economic development at the heart of Europe
- **How to adapt HSR to the country's needs**
  - **National or international network?**
  - Upgraded or dedicated lines?
  - At which speed?

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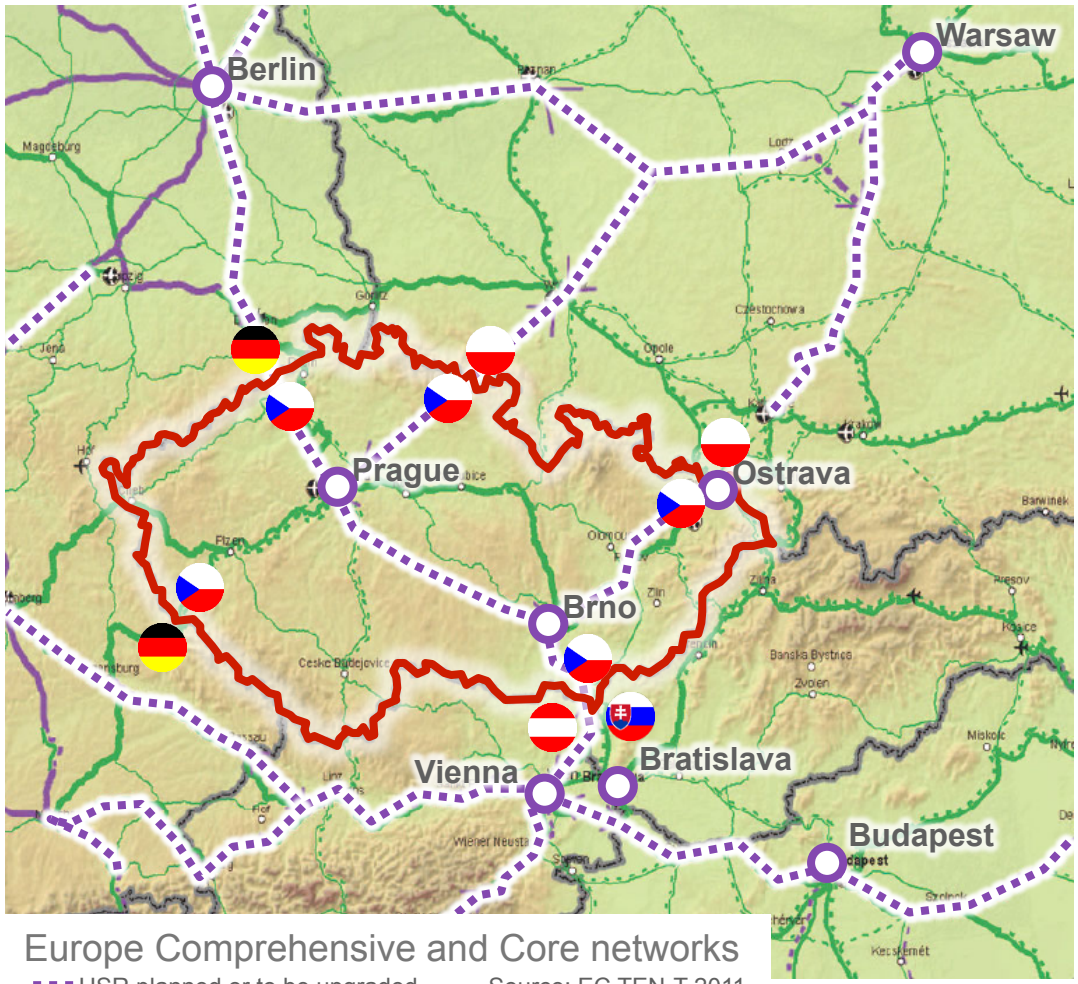
International services at Europe's heart

Border-crossing will be key for Czech Republic's HSR



Europe Comprehensive and Core networks

HSR planned or to be upgraded Source: EC TEN-T 2011

Ideal distances are international

HSR best distances 200 to 800 km.
National network may be enough, but **very attractive international lines**:

- Prague-Brno-Vienna-Budapest
- Brno-Ostrava-Warsaw
- Brno-Bratislava-Budapest
- Prague-Berlin
- Prague-Warsaw
- etc.

Political challenges

Sometimes the toughest obstacles are mental: cultural, operational, social, international relations…
Key success factors:

- **Bilateral/multilateral agreements**
- **EU alignment and support**

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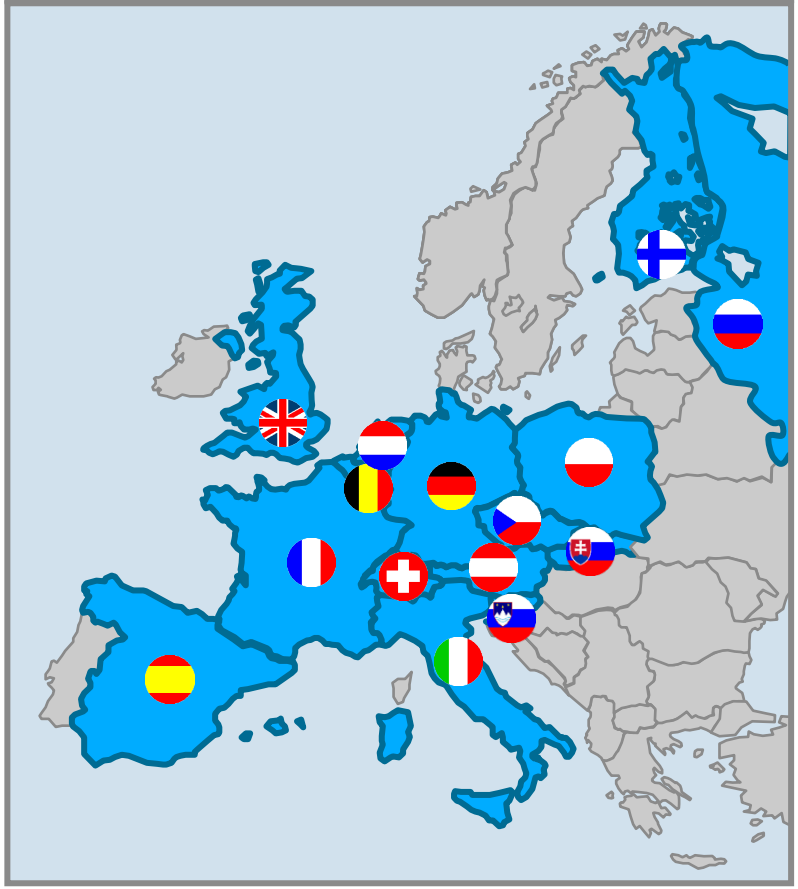
Cross-border and high speed

A technical **challenge mastered** by **Alstom**

Alstom high speed trains are crossing **16 borders** and **2 more** to come



Success on border crossing relies on **expertise**:

- Signaling: reliable ERTMS, multi-sig integration
- Certification: cross-acceptance, national rules
- Technical: Multi-voltage, EMC management…
- Operational: transitions, pantograph, language…

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Upgrading conventional lines (“CUP”)

A choice when **demand is limited**

When to upgrade conventional lines

- **Limited demand**, low population
- Moderate distance, 200 km/h is enough
- Additional capacity not needed in the future
- Difficulties to implement HSR, such as particularly high infrastructure costs

Advantages of upgrading lines

- In general it requires **lower investment**

Inconvenient of upgrading lines

- Different trains and speeds limit the capacity
- Transition works disturb the normal traffic
- Sometimes very long time to deploy due to compatibility with ongoing services
- Investment done is sometimes criticized if later HSR dedicated lines are launched

WCML in UK
170 to 220 km/h max speed
Now HSR project on-going (HS2)

Levante corridor in Spain
187 km/h average max speed
Now HSR deployed (Madrid-Valencia 300 km/h)

Tilting trains can **reduce travel time** with **better comfort** and **low energy consumption**

Alstom Pendolino
454 in service
300 with tilting
25 years
14 countries

Commercial speed **250 km/h**
Tiltronix: new generation of anticipative tilting
8º tilt achieving **30-35%** speed gain in curve
Better comfort and less sickness than non-tilting trains

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Building dedicated lines (“MHS” and “VHS”)

A new way to travel in **shorter time** and with more **capacity**

When to build dedicated lines

- **Significant demand**, growing population
- Intermediate distance, from 200 to 800 km
- Future capacity needed for the whole transport system, including conventional rail and freight

Advantages of dedicated lines

- Very **short travel time**
- **High capacity**, on HSR and conventional lines
- Higher ridership, higher income
- More modal shift, more sustainable

Inconvenient of dedicated lines

- It requires **significant investment**
- It needs new land acquisition, landscape impact, opposition of neighbor residents
- Takes time to deploy, needs strategic vision

Alstom’s wide Infrastructure offer

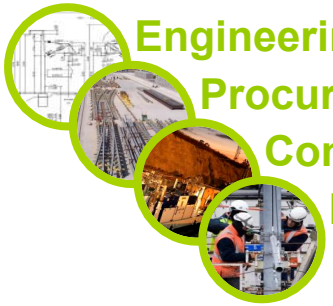
Track works

Electrification

Infrastructure equipment

Maintenance

Alstom EPCM **contractor** skills at **all steps**



Engineering

Procurement

Construction

Maintenance

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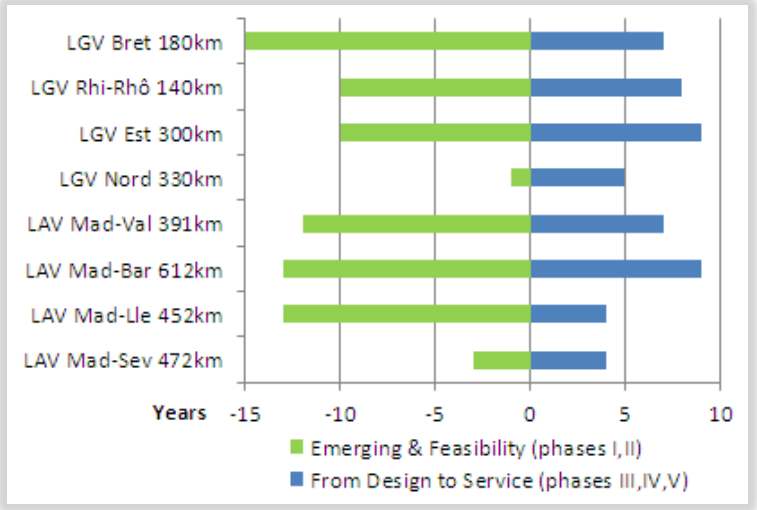
Delivering dedicated lines on-time

How to **reduce deployment time** of High Speed Rail

System approach

System integration can also be outsourced, benefiting from suppliers' experience.
Time can be shortened, avoiding multiple tender phases, and counting on a world-wide expert.



Source: UIC. Link to the study on www.uic.org

Alstom has **extensive experience** in delivering **turnkey** infrastructure systems, notably in **VHS lines**

Albacete – Alicante HSR Line
2011-2014 **PPP project**
26-km line, **300 km/h**
Catenary, Substations, Telecoms, Signaling - Full **Level 2 ERTMS**

UK Channel Tunnel Rail Link – Section 2
2002-2007 **Delivery ahead of schedule**
109-km line, **300 km/h**
Rolling stock, Catenary, Track Infrastructure **availability reaching 99.9%**

South Korea - KTX Seoul – Pusan HSR
1994-2010 **First HSR turnkey project**
477-km line, **300 km/h**
Rolling stock, Catenary, Signaling, huge civil interface, TGV **technology transfer**

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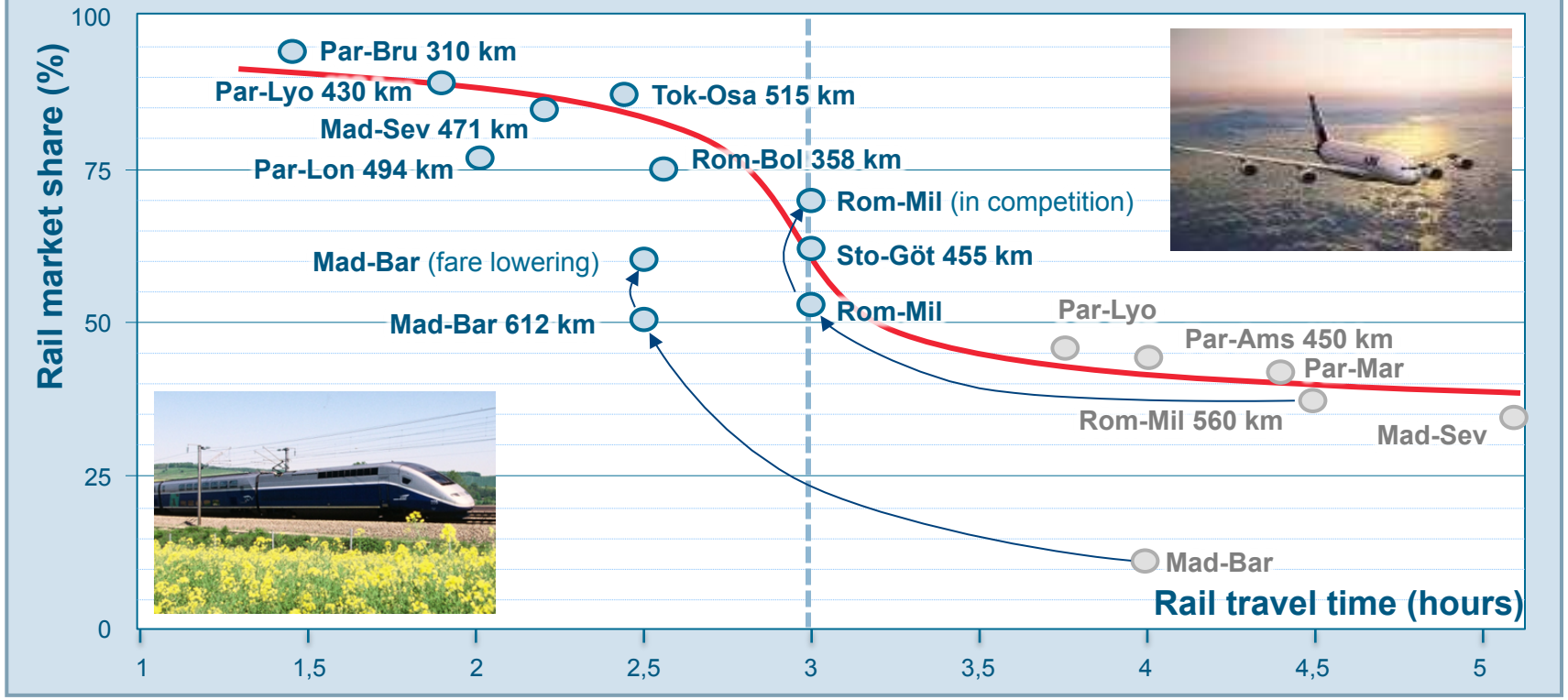
Speed is a consequence of other parameters

Demand, **distance** and the wanted **travel time**

Source: Alstom elaboration
data from UIC, SNCF, NTV and others

Curve of the Rail/Air modal split
(Distances between 300 and 600 km – 180 to 320 km/h)

Conventional rail
HSR or CUP



Between 2 and 3½ hours, every minute gained can increase the ridership

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Two main groups are found around the world

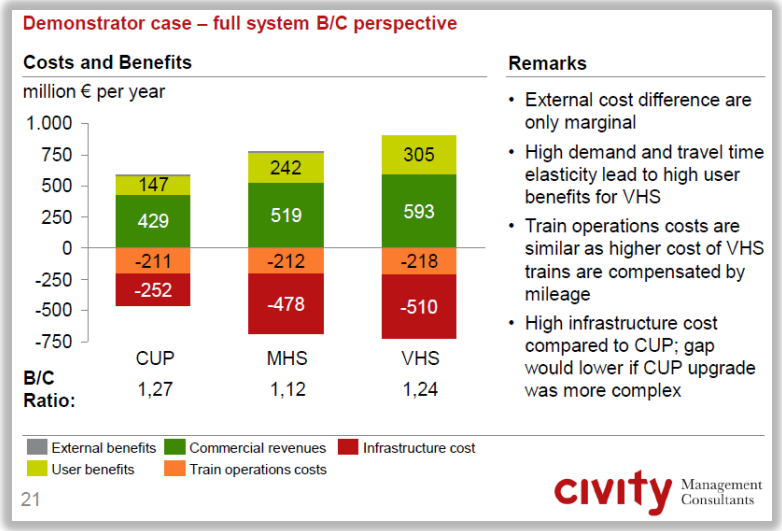
Very high speed recommended for **international** corridors

Medium High Speed lines, around 250 km/h

- Low speed yield (high number of stops)
- Medium-short distances
- Historical constraints (track, tunnels…)

Very High Speed lines, 300 km/h or more

- Most of cases
- Medium-long distances
- Aggregation of corridors, international links
- Compatible with both VHS and MHS trains



Conclusions of comparison MHS and VHS systems are extracted and deduced from Civity's report "Further Development of the European High Speed Rail Network"

VHS is often better than MHS:

- **Similar costs** (infrastructure investment and operating costs)
- Shorter travel time induces more demand and allows more trips per year → **more incomes**
- Main exception is low speed yield, dense concentration of big cities

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Speed and model will depend on long term strategy

Czech Republic can define its **specific model**

Each country chooses its model

Recent projects are **mainly VHS lines**, there are a **few cases of MHS lines**, such as some in China or Turkey.
The rest of MHS cases are 250 km/h trains on VHS lines, by operators with mixed fleet.

Cases	CUP *200 kph*	MHS *250 kph*	VHS *300 kph*
Benelux			■
France	⇩		■
Italy	⇔		■
China			■
Spain	⇩		■
UK	⇧		■
US	⇩		▭
Germany	⇔		■

⇧ Intense use ⇔ Medium use ⇩ Low use

Alstom wide **experience** and **portfolio masters all systems and speeds**

Pendolino

250 km/h
Conventional and **high speed lines**
502 sold, operate in **14** countries
Tilting system in option

Duplex

320 km/h
Conventional and high speed lines
247 sold, operation in **6** countries
Highest capacity in European VHS

AGV/TGV single deck

360 km/h
Conventional and high speed lines
475 sold, operation in **10** countries
Low energy consumption

* TGV is a trademark of SNCF

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Very high speeds need proven technology

Alstom is constantly **researching and improving** its technology

Alstom's return of experience

- **In service** for more than **30 years**. More than 1000 high speed trains: the **largest fleet**,.
- **Maintaining** since more than **20 years**, even rolling stock from other manufacturers

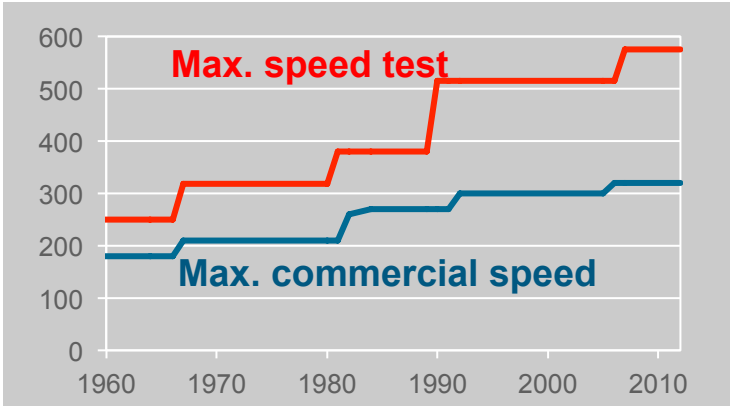
Test standard components:
2 x TGV POS power-cars
3 x **Duplex** coaches
2 x **AGV** bogies + traction

Alstom's research, tests and records

Constant development, use of **world record** campaigns to test and research:

- June 2001: **1067 km in average 306 kph**
- Over 700 km of test runs **above 500 km/h** and 2000 km of test **above 400 km/h**
- April 2007: **574,8 km/h** (357,16mph)

Safe margin tests/commercial speed:



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- **Conclusions**

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Take away…

- HSR system is to become THE new, **safe, fast and sustainable** way to **connect capitals and countries**
- European Union is **supporting and funding** HSR, and **2014 is an important year** in its calendar
- Czech Republic has a **strategic position** at the core of the HSR in Europe, and will create **its own model**
- Alstom can draw from a **worldwide experience** of supplying **all parts** of HSR and even **complete systems**
- The deployment can be done in a **reasonable time** and the system can be **economically viable**

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Thank you for your attention!

www.alstom.com

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Shaping the future