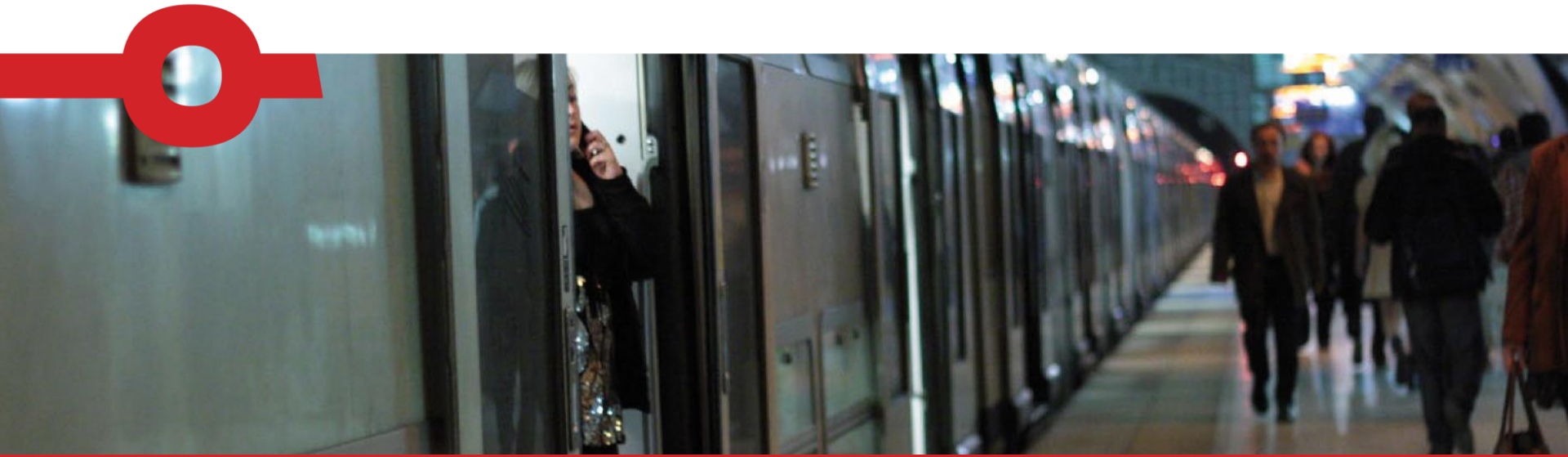


London Sept 11, 2014

How our experience could serve your ambitions Lessons learnt...



SYSTRA

1.



hs2 Challenges

SYSTRA

HS2 project sets ambitious targets

- V360
- 70 M.ton/year in terms of traffic (7 times Paris-Strasbourg LGV Eastern European line)
- Traffic intensity (18 trains /hour max)
- resilience to meteorological effects....

which challenges most of the current high speed lines or projects so far



2.



Lessons learnt from the French Experience

Technical basis for setting specifications for hs2

SYSTRA

1- The speed record at 574 km/h and further tests at 360 km/h

A high margin between operation at 360 km/h and wheel–rail system limits

Lessons from the record (on ballasted track)

- High margin between running safety parameters and safety limits at 574 km/h
- The specification of the track quality had to be tightened in order to keep above 400 km/h track quality under control
- Rayleigh wave phenomena not observed

Further tests at 360km/h on LGV East-European in operation confirmed technical feasibility of TGV-2N operation on ballasted track

- Excellent comfort conditions even for standing passengers
- Reference for track and rolling stock solicitation at 360 km/h
- Noise still a sensitive issue

2- Considerations on track form

- Extrapolation of ballasted track maintenance needs from SNCF operational maintenance data to hs2 conditions to provide elements to hs2 to make /your choice
- Involvement in EU R&D: SYSTRA leader of the innovative slab track development subproject in Capacity4rail , and further involvement in SHIFT2Rail
- Internal SYSTRA innovation project: 30% saving in civil works
- Designing innovative noise barriers, integrating noise protection into the track itself

3- Benefits of full implementation of ERTMS, data and voice

.....Towards a digital railway ?

- Experience of developing dual ERTMS / TVM signalling system for SEA (Tours Bordeaux)
- SYSTRA leader of traffic management/ control command spec in EU proposal precursor to SHIFT2rail
- Developing advanced solutions for ticketing, and passenger information for metros with intense traffic

4- Credibility in tunnel engineering

- SYSTRA historically involved in Channel tunnel, now in Crossrail project
- Advanced numerical technologies (BIM) help system design
- Involvement in the preliminary studies for the base Lyon-Turin project,
- Experience from SNCF from the Marseilles Tunnel

Network system issues: connections between hs2 to provide through services to classic routes connecting

- Connecting to existing network is DNA of TGV system
- TGV fleet designed and managed in view of connecting further to existing routes

5- Overall LCC analysis

- R&D projects on subsystems (slab track in Ccapacity4rail- innovative bridge designs internal to SYSTRA) now driven by cost cutting objectives
- High speed system R&D ongoing programme at SYSTRA based on objective of up to 30-50% cost reduction for future designs
- Specific methodology developed by SYSTRA in a dedicated environment “La Fabrique” for collaborative workshops to develop innovative solutions
- PPP experience (SEA construction) of tight cost control during line construction

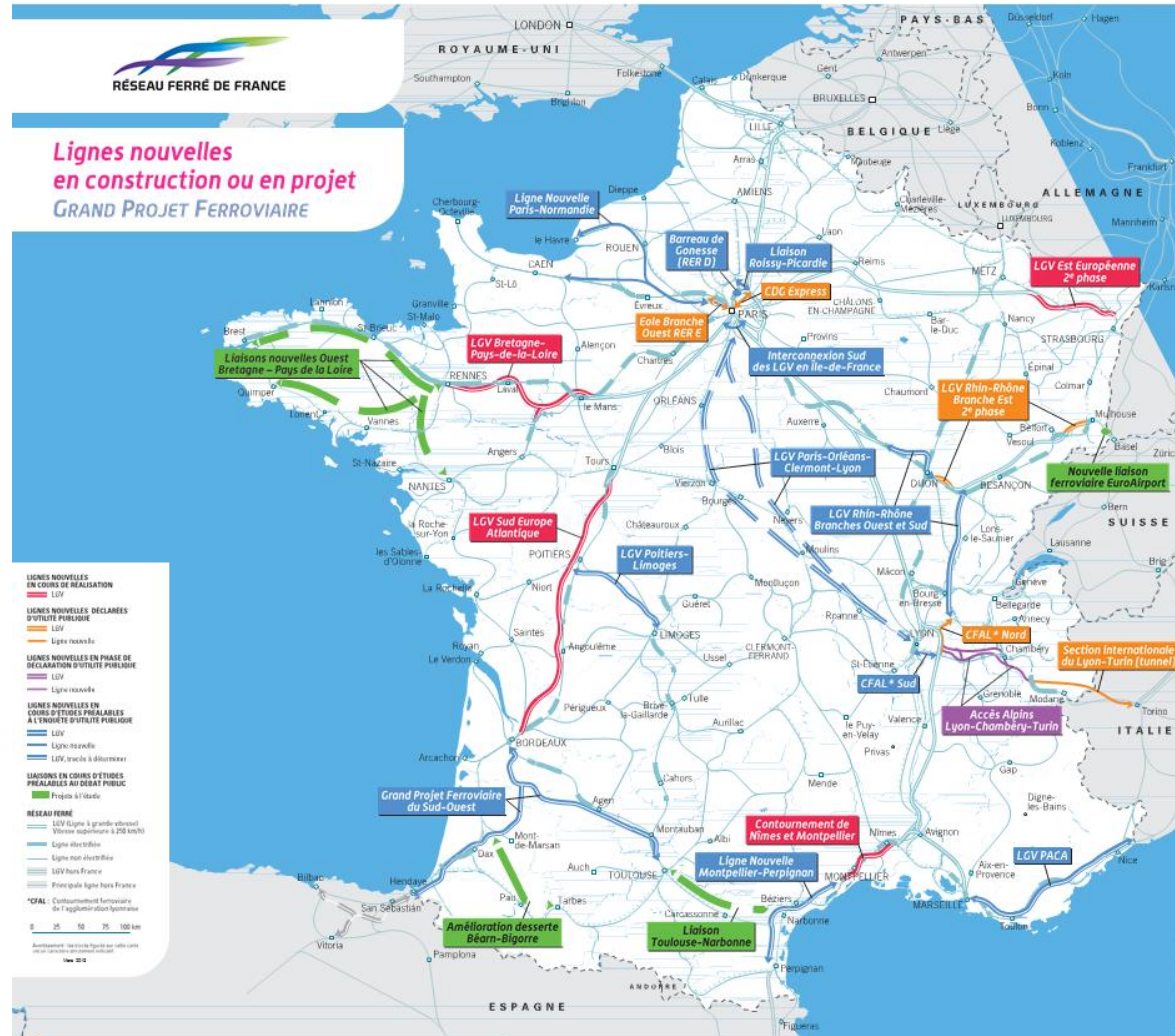
3.



How our experience helps meeting your challenges?
Involvement in major high speed construction projects ongoing in
France

SYSTRA

SYSTRA involved in major high speed construction projects ongoing in France a total of 2,000km





One of SYSTRA shareholders is one of the world's leading companies for passenger and freight transport



- SNCF transports more than a billion travellers per year.
- SNCF pioneered high speed rail and operates the iconic TGV.

Technical description



- Design speed 350 km/h
- Operating speed 320 km/h with ERTMS signaling
- Electrification 2 x 25 kV
- Signaling: TVM 300
- 10 junctions to the national railway system (NO new station)
- 25 interactions areas with the highway network (overpass or twinning A10 et A85)
- 400 engineering structures including 19 viaducts and 7 cut and cover tunnels



- 13, 000 catenary pillars
- 1,200km of track and ballast
- 50 million cubic tons of excavated material
- 7, 000 people working at peak times

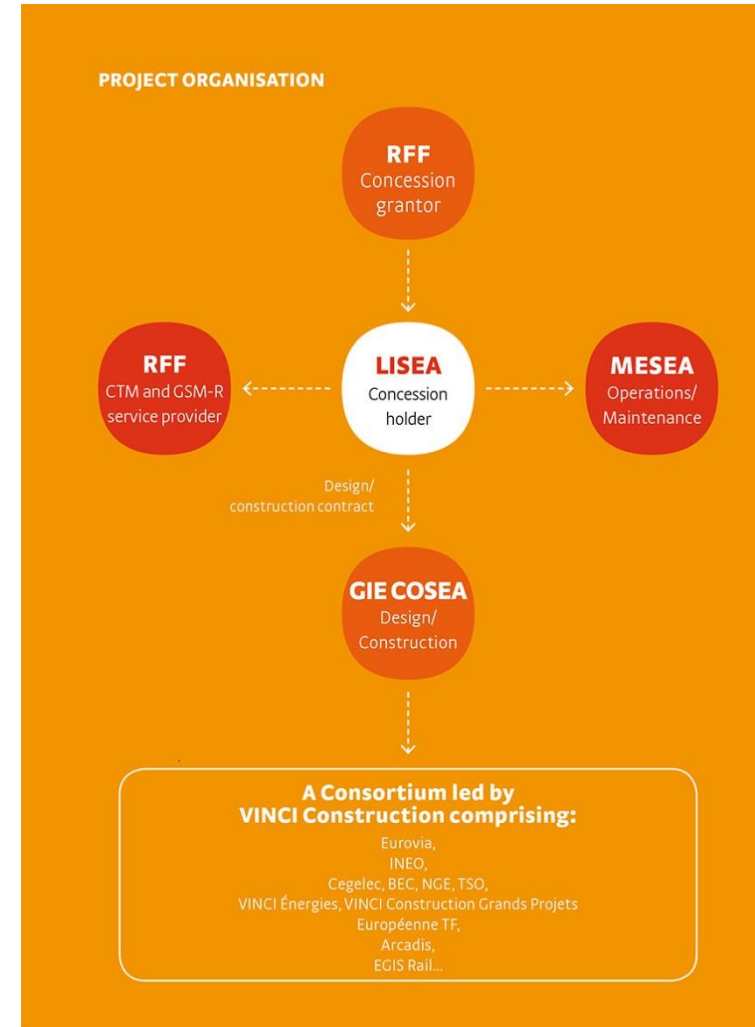
The SEA (Tours Bordeaux) project: a bundle of innovations

- ◉ Delivering on schedule in an innovative organisational framework
- ◉ Systematic use of modular construction
- ◉ Innovation in track works , signalling and line side equipment
- ◉ Exceptional civil works management



Experience of a PPP financing model : an asset for your project

- SYSTRA as a shareholder alongside VINCI over a 50-year period
- Experience of working with 20 robust partners assuming their share of risk in the project



Conclusions

- **hs2 is unique in the sense that it challenges most of the current high speed projects in the world**
- **French experience may bring**
 - Technical feedback from operation and tests,
 - Most recent experience of line design and construction
 - Innovation

That we think would help make hs2 a successful project in an innovative and realistic context!



THANK YOU



CONFIDENCE MOVES THE WORLD