

DEUTSCHLAND—SLOVENSKO—EESTI—SLOVENIJA—ELLÁS—PORTUGAL—ESPAÑA—POLSKA—FRANCE—ÖSTERREICH—IRELAND—NEDERLAND—ITALIA—M
RTENARIAT—ÉCO-RESPONSABILITÉ—RÉSEAU—AVENIR—MOBILITÉ—ACCÈS—EUROPE—TERRITOIRES—ÉVOLUTION—PERFORMANCE—DÉVELOPPEMENT DURABLE—ACCOMPAGNEMENT—ORGANISATION—SÉCURITÉ—AMÉNAGEMENT—OUVERTURE—INNOVATION—INTERCONNEXION—PARTENARIAT—ÉCO-RESPONSABILITÉ—RÉSEAU—AVENIR—MOBILITÉ—ACCÈS
NTA LUCIA—GARE DE LYON—MADRID ATOCHA—LISBOA SANTA APOLONIA—KIFJHOEK—WOIPPY BERLIN HAUPTBAHNHOF—LONDON SAINT PANCAS—DUBLIN HEUSTON STATION—PRAHA HLAV
—NARBONNE—MARSEILLE—VILNIUS—LYON—MILANO—BERN—STRASBOURG—NANCY—PARIS—KØBENHAVN—CALAIS—DOVER—LONDON—WARSAWA—WARSAWA
PPY—MASCHEN—VALENTON LISBOA—SALAMANCA—MADRID—BARCELONA—NARBONNE—MARSEILLE—VILNIUS—LYON—MILANO—BERN—STRASBOURG—NANCY—PARIS—KØBENHAVN—CALAIS—DOVER—LONDON—WARSAWA—BRISTOL—BRUXELLES—
BERLIN HAUPTBAHNHOF—LONDON SAINT PANCAS—DUBLIN HEUSTON STATION—PRAHA HLAVNI NADRAZY—ROMA TERMINI—VENEZIA SANTA LUCIA—GARE DE LYON—MADRID ATOCHA—LISBOA SANTA APOLONIA
KØBENHAVN—CALAIS—DOVER—LONDON—WARSAWA—BRISTOL—BRUXELLES—DEN HAAG—AMSTERDAM—DORTMUND—HANNOVER—BERLIN—PRAHA—FRANK



ERTMS Strategy - RFF

Helsinki, 2 Oct. 2012



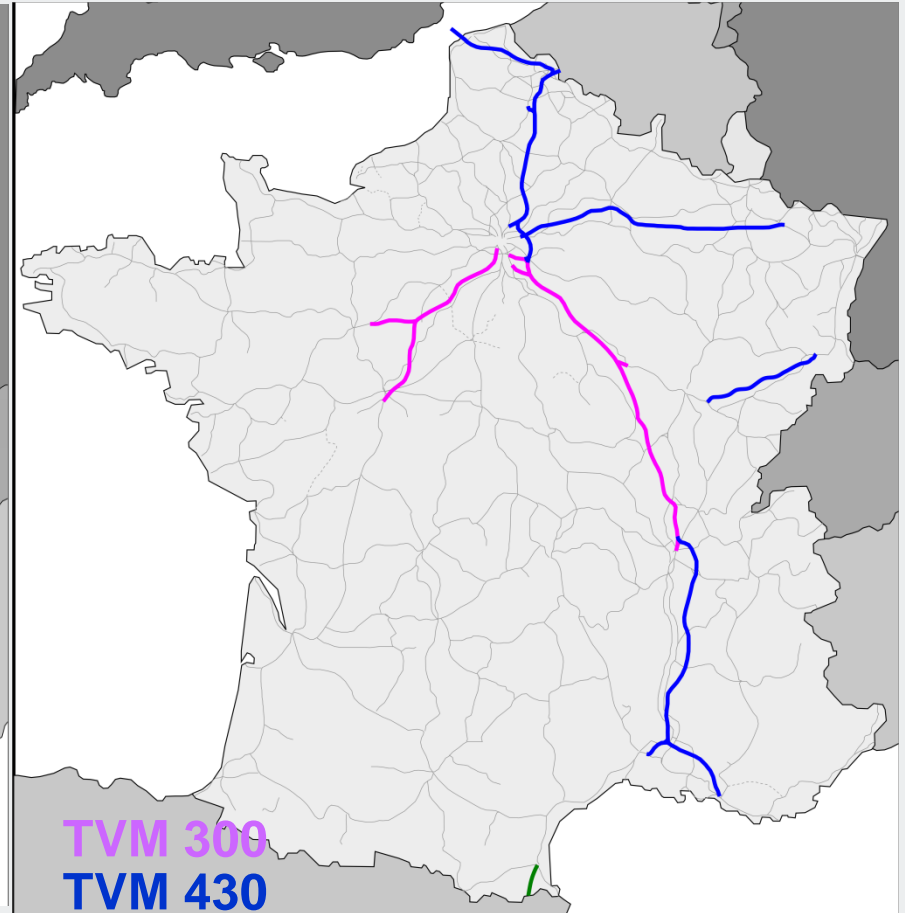
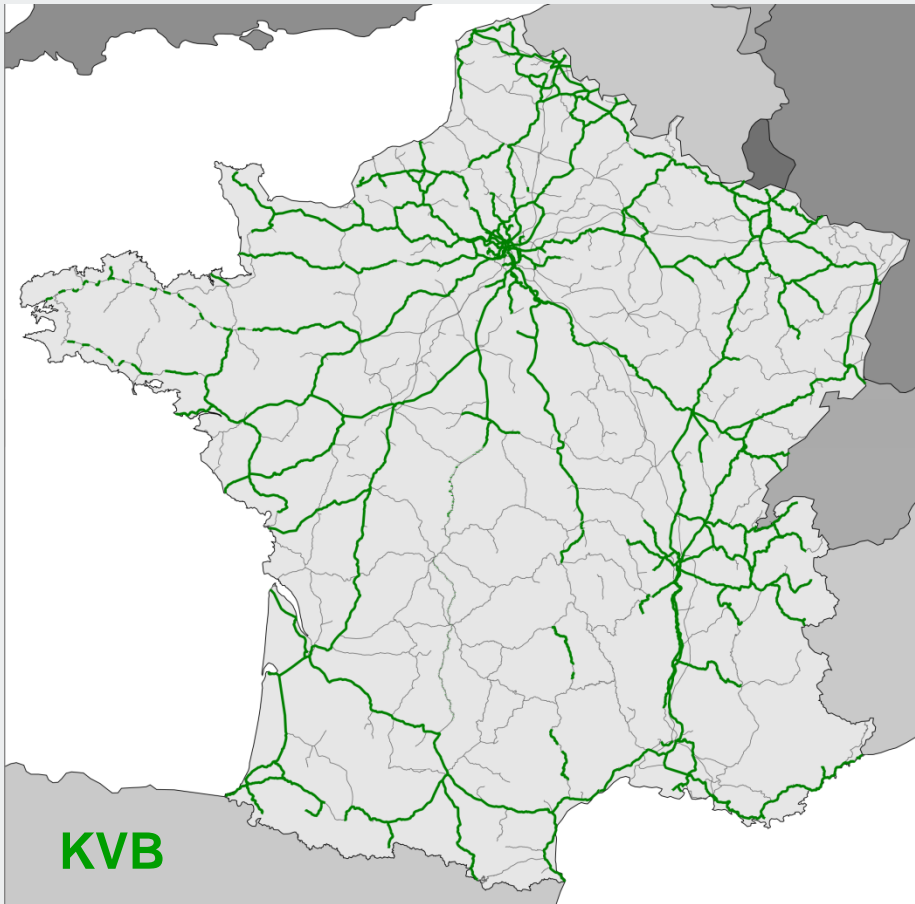
High speed lines (HSL)

- **TVM 300**
- **TVM 430**
 - TVM: Transmission Voie-Machine (1981)
 - Mature system, high level of reliability and availability
 - Obsolescence not before 2030

Conventional Network (CvN)

- **Crocodile**
- **DAAT**
- **KVB (+ crocodile)**
 - KVB: Contrôle de Vitesse par Balises (1990)
 - Mature system, high level of reliability and availability
 - Obsolescence not before 2020-2025
 - Installed on heavy traffic lines, on protection signals but not on block signals
 - Several technical generations, analogic then digital
 - Balises were sprinkled over the network, without line or area logic

Existing Class B systems



ERTMS: present deployment in France - HSL

- **East European HSL: Vaires (Paris) / Baudrecourt: *equipped, in operation end 2013***
 - 300 km HSL length, 320 km/h
 - ERTMS 2 v2.3.0d over TVM430
- **BPL : Le Mans / Rennes : *in operation in 2017***
 - 182 km HSL length, 320 km/h
 - ERTMS 2 + ETCS1 (25 km), v2.3.0d over TVM300
- **SEA: Tours / Bordeaux : *in operation in 2017***
 - 302 km HSL length, 320 km/h
 - ERTMS 2 v2.3.0d over TVM300
- **East European HSL Phase 2 : Baudrecourt / Vendenheim (Strasbourg) : *in operation in 2017***
 - 106 km HSL length, 320 km/h
 - ERTMS 2 v2.3.0d over TVM430

The 3 lines under construction will be equipped based on the already existing product developed for the East European HSL

ERTMS: present deployment in France - CvN

Freight Corridors C/2 and D/6

- 2 200 km lines (double, triple or quadruple), up to 220 km/h, + access signals to main lines
- ETCS1 v2.3.0d, over KVB
- Pilot sites in operation in 2015
- First section Belgian border – Swiss border in operation in 2018

7 border points:

- ➔ Mont St Martin (Infrabel+CFL)
- ➔ Zoufftgen (CFL)
- ➔ Stiring-Wendel (DB Netz)
- ➔ Bâle (SBB)
- ➔ Modane (RFI)
- ➔ Perpignan (TP Ferro)

RFF is member of the RFC2 and RFC6 EEIGs



High Speed Lines:

- **Level 2 in version 2.3.0d, redundancy of the GSM-R coverage**
- **Initial deployment on East European HSL, based on Ansaldo technology, overlaid with TVM430**
- **Beyond the lines being built, next HSL to be equipped with ERTMS only**

Conventional Network:

- **The heterogeneity of the interlocking systems lead to install level 1, in version 2.3.0d, taking the information “at the lamp” , as KVB does**
- **No change in iXL, based on existing lateral signalling system**

HSL East-European

■ Delay in operation where due to :

- 2004 : Contract signed based on SRS 2.2.2
- 2005 : Amendment due to STI modification (CR in subset 108)
- 2007 : Amendment due to STI modification (SRS 230 taken into account to define the 230 Corridor 2007 together with Belgium and the Netherlands)
- 2008 : Performances issues in the products provided by the supplier
- 2011 : New contract based on STI 2010/79 – SRS 230d
- In addition to that, issues due to
 - textual specifications not accurate enough and potentially misinterpreted by the supplier
 - product development methods to upgrade

ERTMS Corridors

- **The tendering process was longer than expected**
- **No exhaustive referential of all potential signalling cases found on the French network: misunderstanding between RFF and Alstom lead to significant delays**
- **STI modifications created some perturbations**
- **The declination of so-called “off-the-shelf” products almost lead to specific products, due to:**
 - An important technical thesaurus implying many specific rules and their respective requests
 - A large number of signalling technologies found on the network, to which the ERTMS products and philosophy must be adapted,
 - The combinatory number of signalling cases on the French network
- **Planning shifts induce difficulties to reserve human and technical (scarce) resources**
- **ERTMS knowledge still to be diffused among SNCF installers and maintainers**
- **Costs of tests on a circulated network**
- **Financing is not secured yet: no formal commitment from RFF prevents supplier and engineering teams to be staffed at the correct level**

What's next ?

Existing High Speed Lines currently without ERTMS

The High Speed Line Network is in front of 2 challenges :

- **To open the network** : this should come in priority from the North on the Northern HSL (Paris – Lille / Calais)
- **To increase the capacity** : this is due to the fact that old TVM generation is limited in terms of capacity to 12/13 trains per hour. The main impacts are on :
 - South East HSL (Paris-Lyon)
 - South West HSL (Paris – Tours- Le Mans)

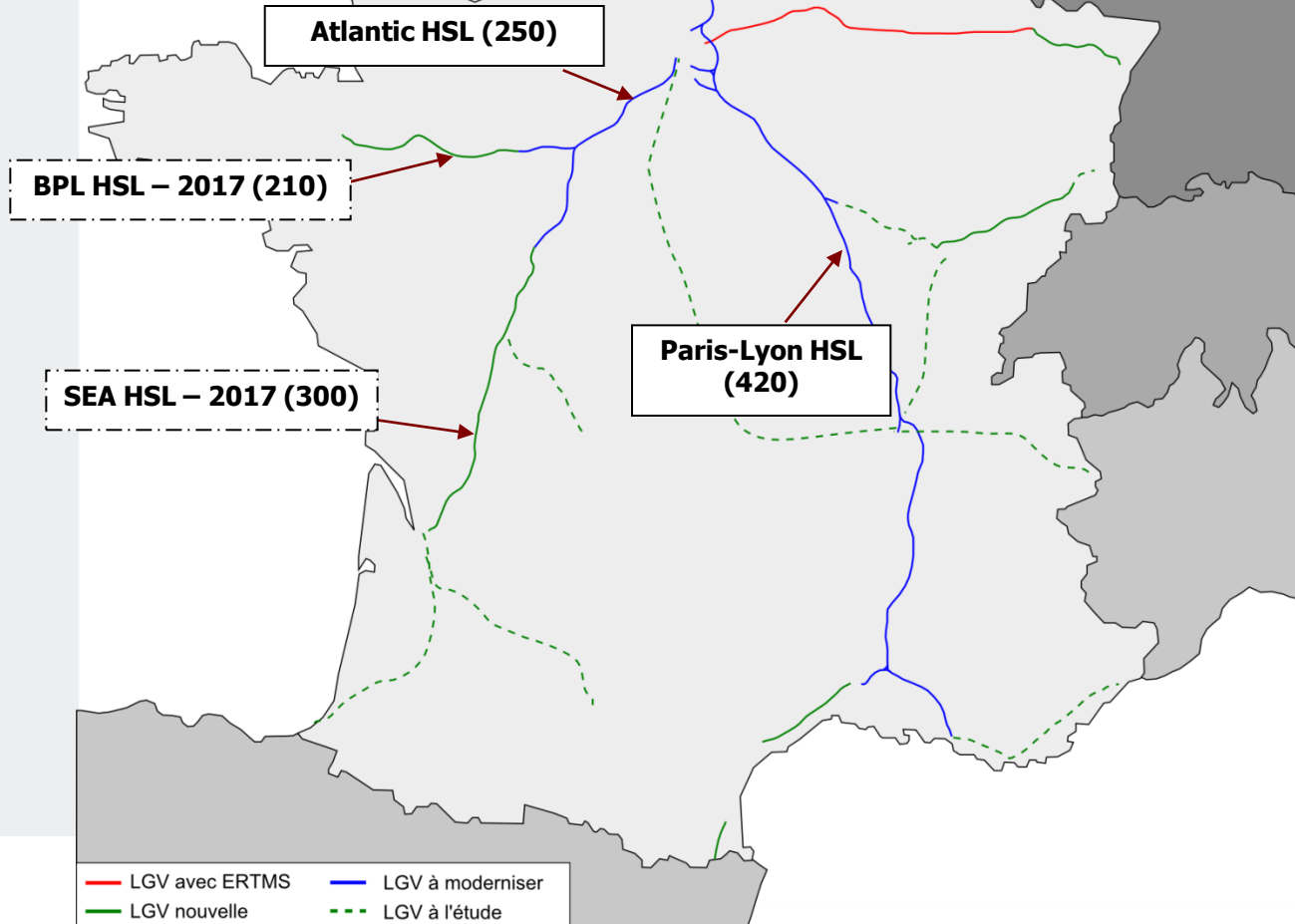
⇒ **Rolling out ERTMS on HSL is therefore necessary within a defined timeframe – target date is planned for 2020-2025**

This time plan is dependant on :

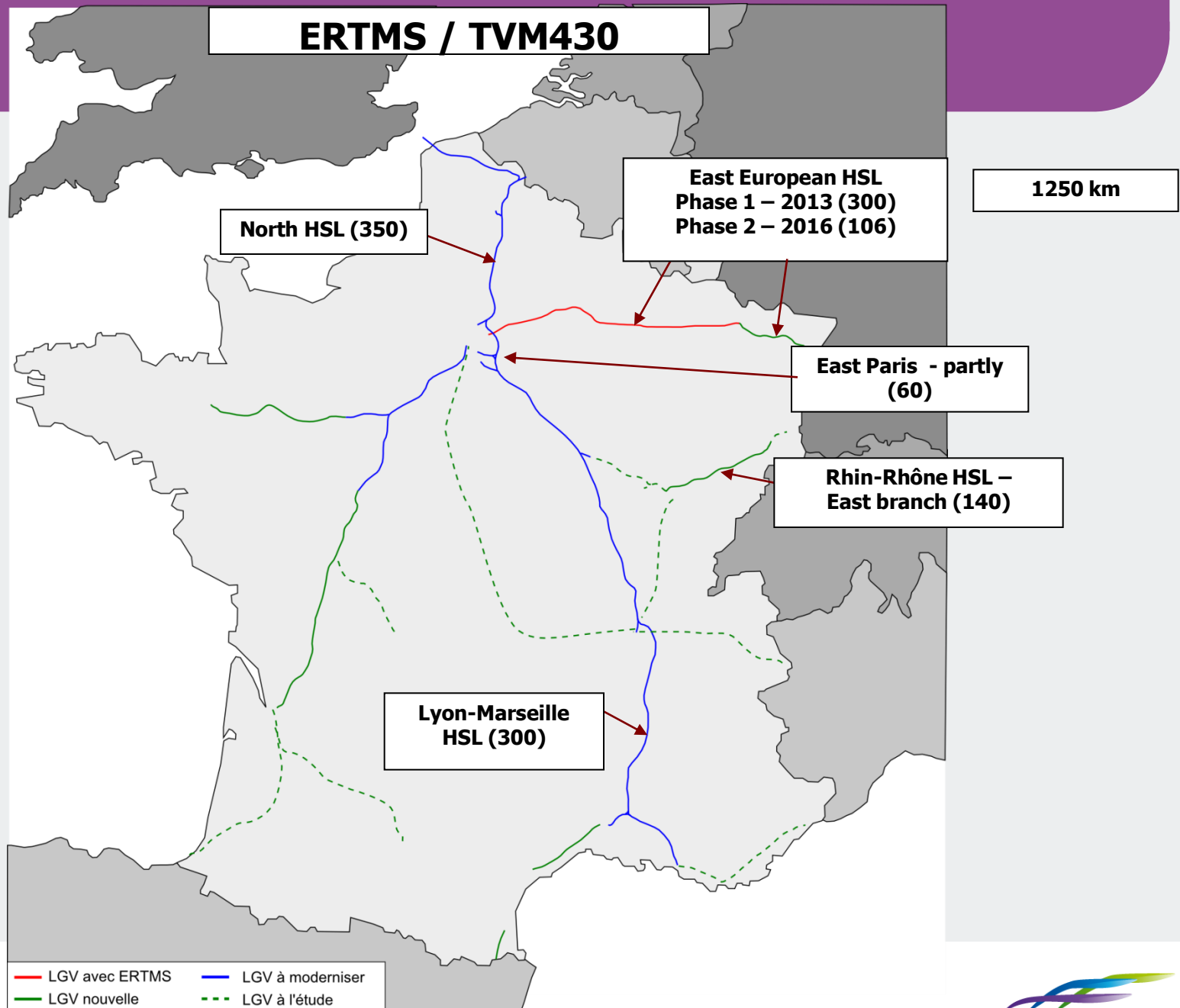
- **Delay to develop a ERTMS subsystem able to reach the required level of performances**
- **The possibility offered by the existing traffic to have sufficient time windows to perform the installation work**
- **The equipment of the trains**

ERTMS / TVM300

1180 km



ERTMS / TVM430



Existing High Speed Lines currently without ERTMS

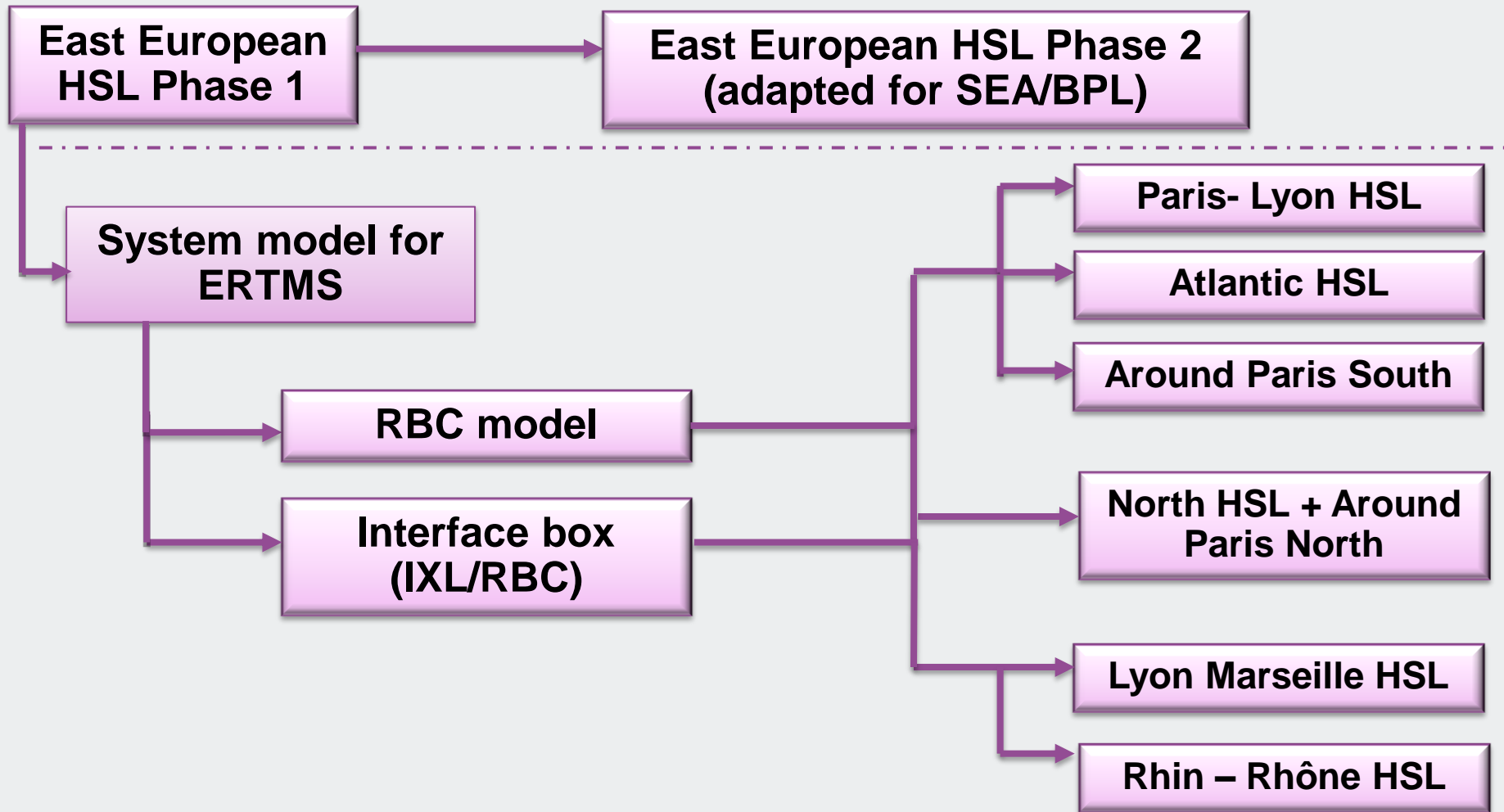
Based on the fact that :

- Our experience proved that the development part represents more than 75% of the total cost of an ERTMS project on HSL
- RFF cannot reuse the already developed sub-system on other lines due to
 - RFF public statutes
 - Performances needs (high density HSL – Paris Lyon – requires additional performances vs the current product)

Decision have been made to :

- Base product development on a more formal approach by
 - **Specifying a model at system level**
 - **Specifying a model for the RBC**
 - **The model will be dynamic**
 - **The properties to be respected by the model will be defined**
 - **The model will be proved vs these properties**
 - **The model will be provided to the industry and will be an entry point for the V cycle activities.**
 - **Specifying the interfaces with the existing IXL**
- in order to speed up the development and validation process**

Development plan for High Speed Lines



Further development on the Conventional Network

STI 2020

- Connection of several cities to the existing RFCs (roughly 3 000 km)

Alternative routes

- Needed for a seamless operation of ETCS trains

ERTMS Regional

- Derived from level 3 and tested in Sweden, a study showed that for some types of lines this solution could be technically and economically sound. RFF recently decided to go deeper in the analysis and to search for a pilot line – however this approach needs an involvement of Transport Authorities and RUs.

KVB Replacement

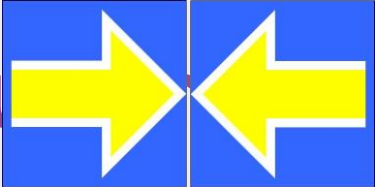
- On the long term, ETCS will replace KVB and crocodile. The present approach, yet informal, is to uninstall KVB and croco 10 years after the installation of ETCS on an axis.

Level 2 on the conventional network:

- RFF is presently looking under which conditions the Danish approach could be possible (level 2, getting rid of lateral signalling, implying a renewal of iXL)

Baseline 3:

- Early implementation packets will be installed on the CvN to allow seamless use of B3 on-board systems
- On the long term, L1LS is seen as a potential solution to equip areas where only some signals are equipped with KVB, to be able to uninstall KVB while respecting the “Globally At Least Equivalent” principle.

Thank you  for attention