International Railway Safety Council

NExTEO project

by Dominique DEAU

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SNCF RÉSEAU

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Issues

1. **NExTEO : ambition and functionalities**
2. **EOLE line extension**
3. **Safety specific issues**
4. **Conclusion**

1. NExTEO : ambition and functionalities

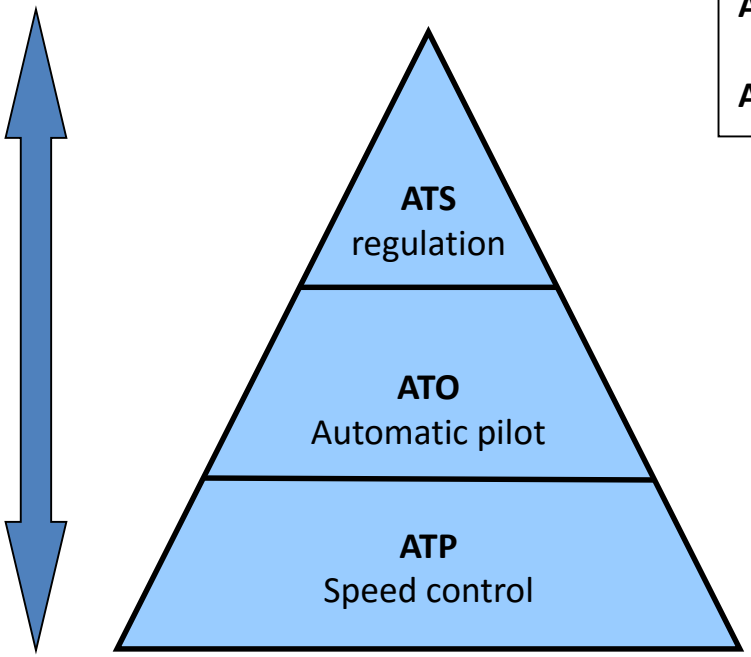
- Nexteo

ATS : Automatic Train Supervision

ATO : Automatic Train Operation

ATP : Automatic Train Protection

NExTEO



Today signalling system (KVB, KVB-P, ETCS)

1. NExTEO : ambition and functionalities

- **Improvement of line capacity in order to meet the demand :**
  - by reducing the headway between trains (mobile block) ;
  - by avoiding dispersion of driving (automatic acceleration / braking).
- **Reduction of the journey time :**
  - by closely respecting the speed profiles ;
  - by giving up the constraints of the KVB and the related procedures (approach of a closed signal...) ;
  - while guaranteeing safety (speed control).
- **Quality improvement :**
  - by delivering reliable information to the travellers (platform...) ;
  - by adapting dwell time and time between stations ;
  - by managing junctions (algorithm...).

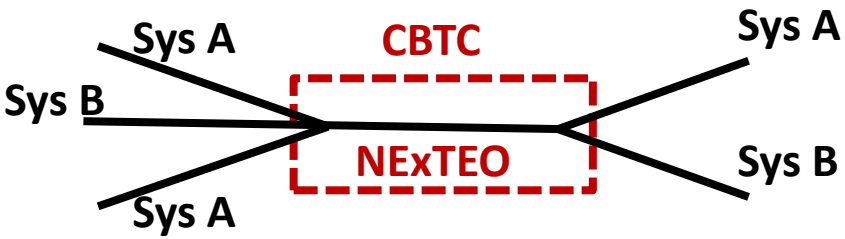
1. NExTEO : ambition and functionalities

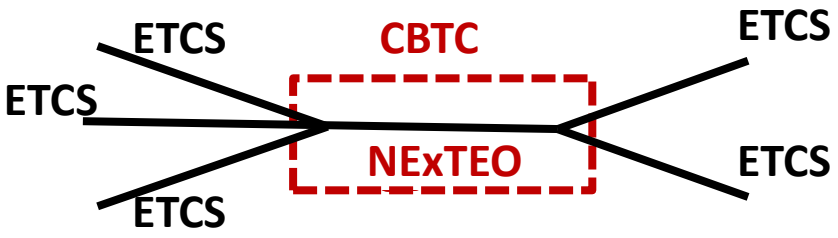
- **NExTEO structuring choices**
  - interlocking kept in the signal boxes of the RFN network ;
  - mix of traffic between NExTEO trains and non-NExTEO trains ;
  - lineside signals (migration) extinguished and cancelled for NExTEO trains ;
  - choice of an on-board architecture with an EVC ;
  - dynamic transitions (both for ATP and driving mode).

- **Result of the tendering process : NExTEO is a CBTC system.**

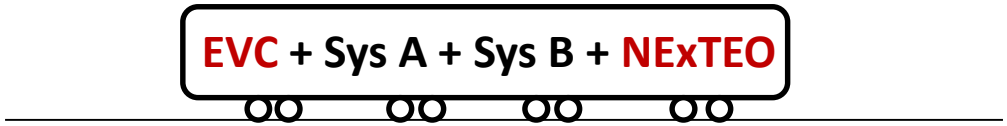
2 EOLE line extension

- **A CBTC system is more efficient and has highest performance than other systems but it is more expensive.**
- **Consequently :**
  - track implementation : CBTC (NExTEO) is limited to the central section (balance between cost and need),



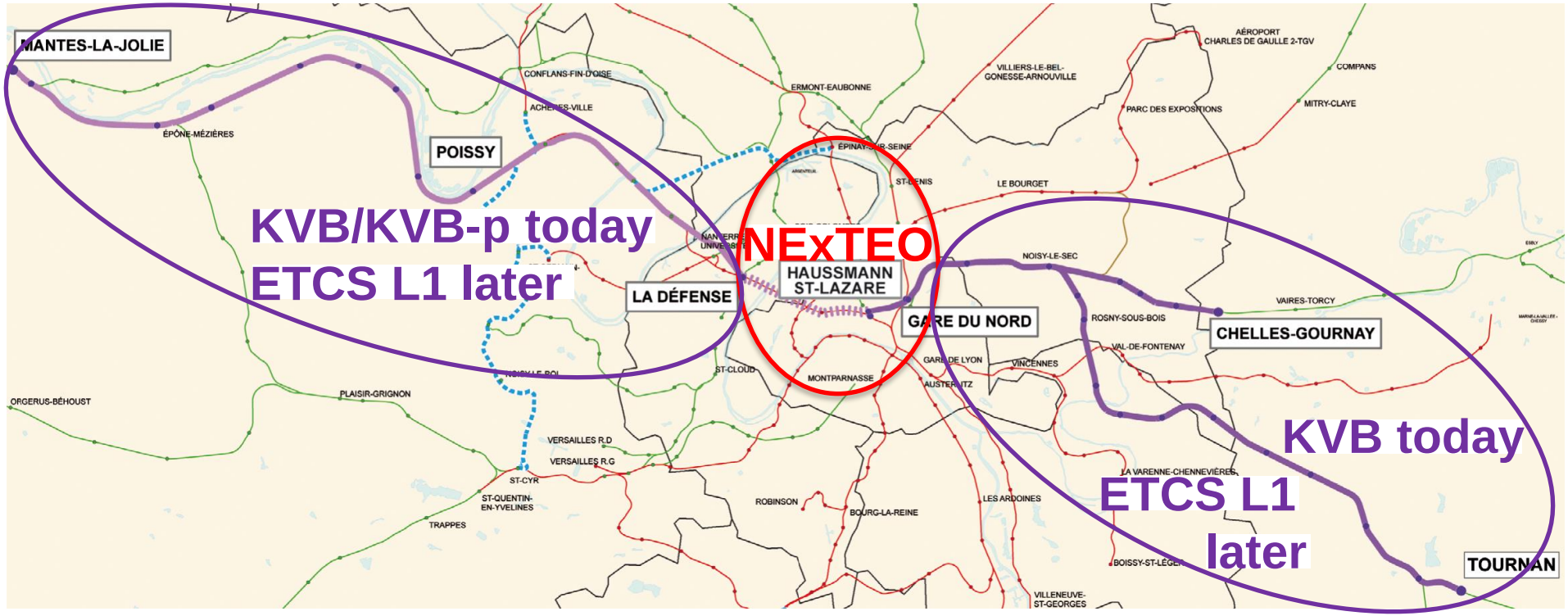


  - train implementation : the rolling stock is equipped with an EVC and all the systems used on the route ; therefore it can run everywhere on the network.



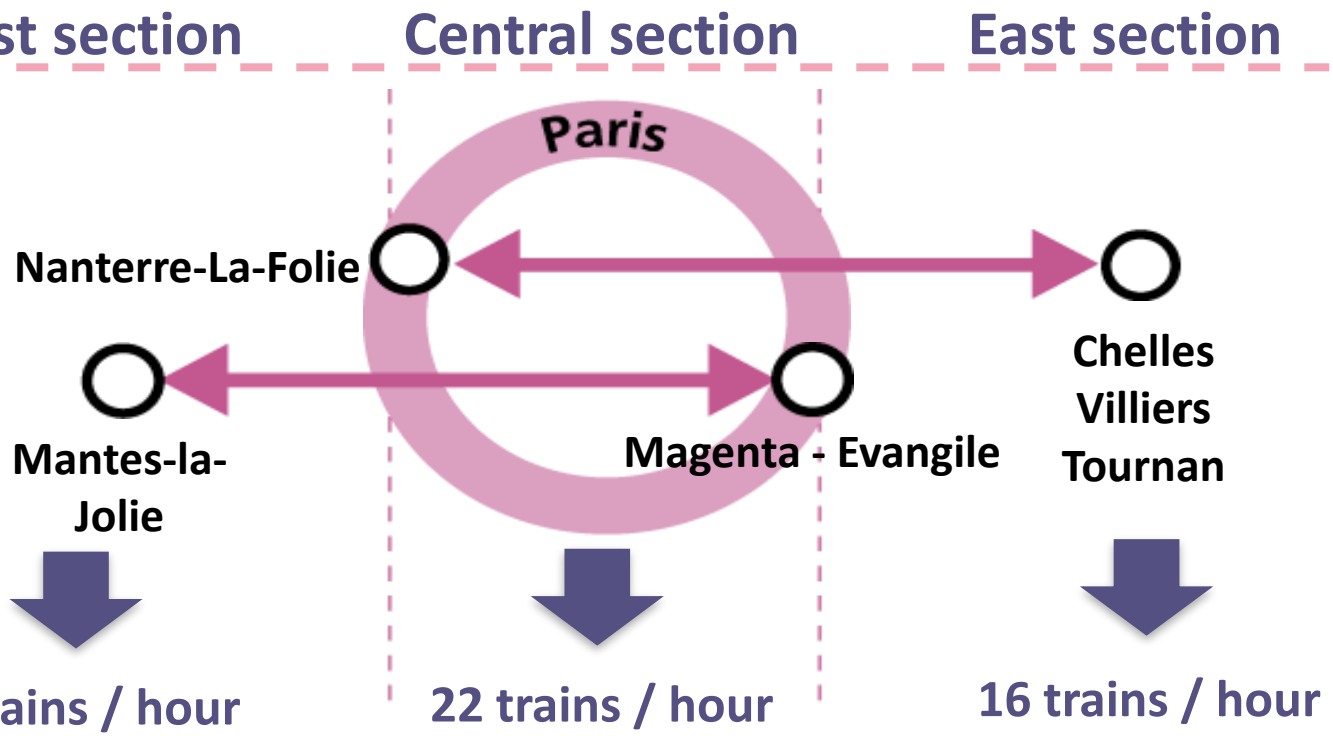
2 EOLE line extension

- **EOLE: route overview**

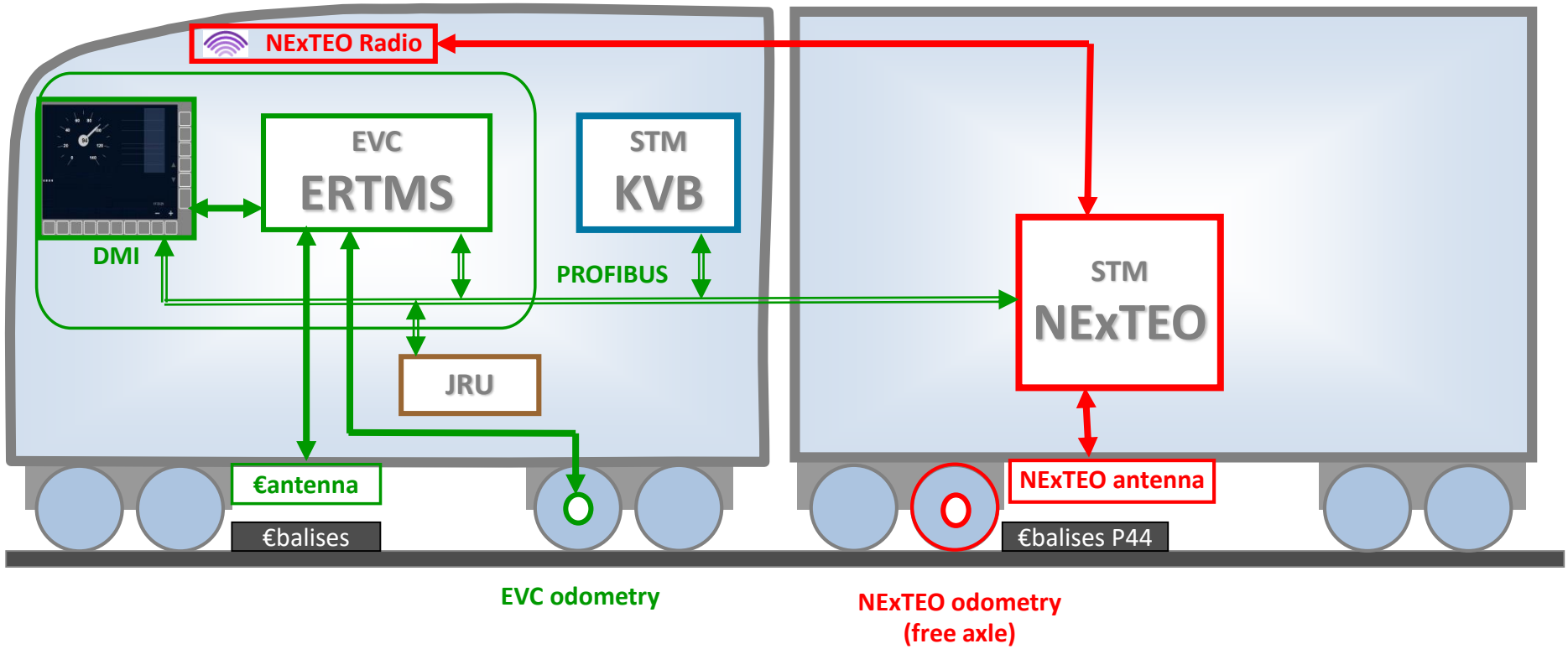


2 EOLE line extension

- **EOLE: service pattern**



- **Train implementation**



3 Safety specific issues: ① on move transitions

- **Necessity to fulfil requirements in terms of line capacity and journey time.**
  - a) On move ATP transition. SNCF realises ATP transitions:
    - between national ATP since 1981 ;
    - National ATP ⇔ ETCS level 1 or 2 since 2009 (THALYS).

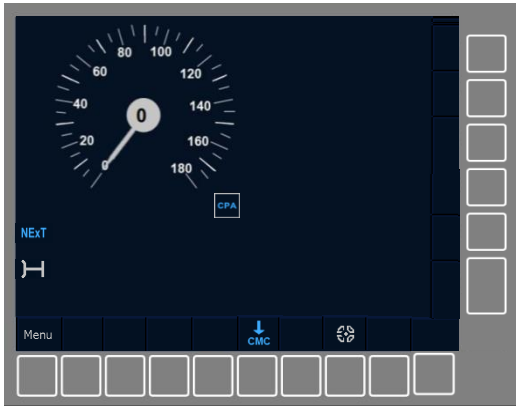
ERTMS manages a sequential transition between national ATP : asleep of the left ATP and awake of the taking over ATP. Need to add a supplementary temporary supervision on high density lines to avoid running without ATP during “n” seconds (n ≤ 15s).

  - b) On move ATO transition at the time of on move ATP transition : ergonomic study with the drivers

3 Safety specific issues: ② driving ergonomics

- **Compliance with European specifications : ETCS DRIVER MACHINE INTERFACE (ERA_ERTMS_015560)**

- **Reduce display :**
  - Only train speed
  - No pre-indication nor indication



- **Ergonomic study**
  - Static
  - Dynamic on a driving simulator (SIMUFER)

3 Safety specific issues: ③ doors

- **New specific risk to be managed : short stop and automatic repositioning (ATO) :**
  - a CBTC manages door issues (the rolling stock is passive) ;
  - on mainlines, the doors have to be managed by the rolling stock outside CBTC area in respect with the rules defined by the National Safety Authority (EPSF in France) ;

⇨ final analysis = a supplementary condition given by the CBTC

3 Safety specific issues: ④ continuous process with French NSA

- **To facilitate the acceptance of NExTEO preliminary safety case, a regular review meeting process is in place between SNCF and the French N.S.A. (EPSF) :**
  - 2014 : review of a document explaining “NExTEO principles”;
  - 2015 : special session on NExTEO degraded modes :
    - Loss of radio link (between track and train);
    - Failure in balise reading;
    - Doors (see above);
    - NExTEO-EVC interface;
    - NExTEO-signalling interface
  - End of 2015-2016 : guaranteed deceleration rate

4 Conclusion

- **Safe integration of a CBTC on a mainline railway requires specific attention on the following points :**
  - Non regression on existing systems;
  - Handling degraded modes;
  - Human factors.