SHIFT²RAIL
IP1 “New Generation Rail Vehicles”

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High level objectives

Railway System level objectives at S2R

- System capacity increase
- System reliability increase
- Railway travel cost reduction

What can be done in the rolling stock towards these objectives?:

- Increase the physical capacity of vehicles and provide with functionality to increase transport capacity of railway lines.
- Reduce the travel disruptions for passengers by increasing operational reliability and availability of vehicles, either through the use of fundamentally more reliable components or system/subsystem architectures
- Reduce the life cycle cost of the vehicle (reduction of maintenance, energy consumption …) and of other subsystems interfacing with the vehicle (reduction of track damage …)
- Increase the energy efficiency of the vehicle and reduce vehicle mass

Specific objectives derived from these are developed at sub-system level in each TD

IP1 Challenge

Develop Innovative/breakthrough technologies that allow the design of trains that are lighter, more energy efficient with a lower impact on the track, thereby **reducing the life cycle cost** not only at the RS level, but for the integrated railway system.

At the same time, technologies that increase the **operational reliability of trains**, causing less travel disruptions, ensuring that passengers get to destination on time and delivering a better service are targeted.

Technologies developed within SHIFT2RAIL will increase attractiveness of **Railway Transport**

- **NEW CONCEPTS TO BE DEVELOPED UP TO TECHNOLOGY DEMONSTRATOR LEVEL**

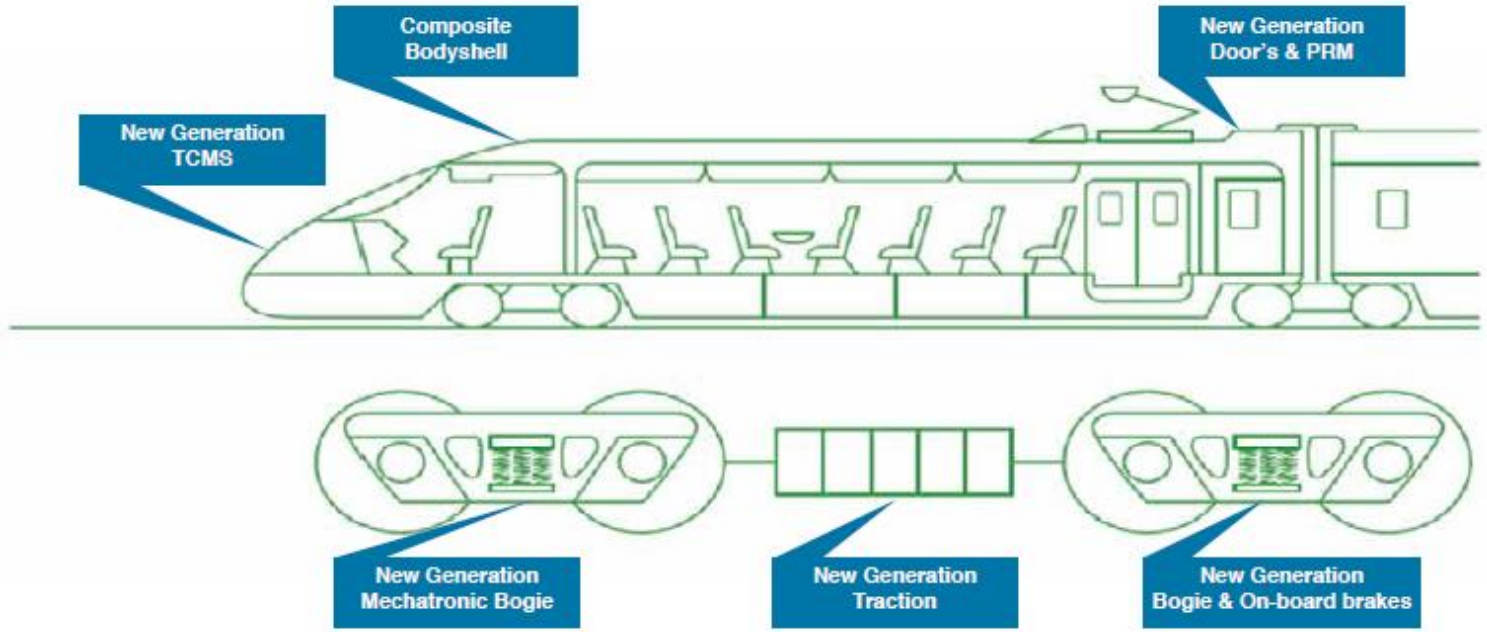
How do we define specific technical objectives?

1. By **identifying gaps and technological opportunities** that are applicable to rolling stock subsystems:
   - New communications technologies
   - Power electronics
   - Materials
   - ….

2. By making sure they are **needed and make sense when integrated** into the whole railway system
   - Contribute to meet the customer needs
   - Consider integration in vehicle and with other components of system
   - Evaluate expected impact at system level
   - ….

Areas of interest: Technology Demonstrators

- **Subsystem-based technology development** work (innovative technologies specific to sub-system)



- Integration to provide true railway **system level benefit assessment** (Transversal groups, system level assessment & KPIs)

- Focus on final **On-track Demonstration**

FOCUS ON TD1: New Traction Systems

- **Main objective:**

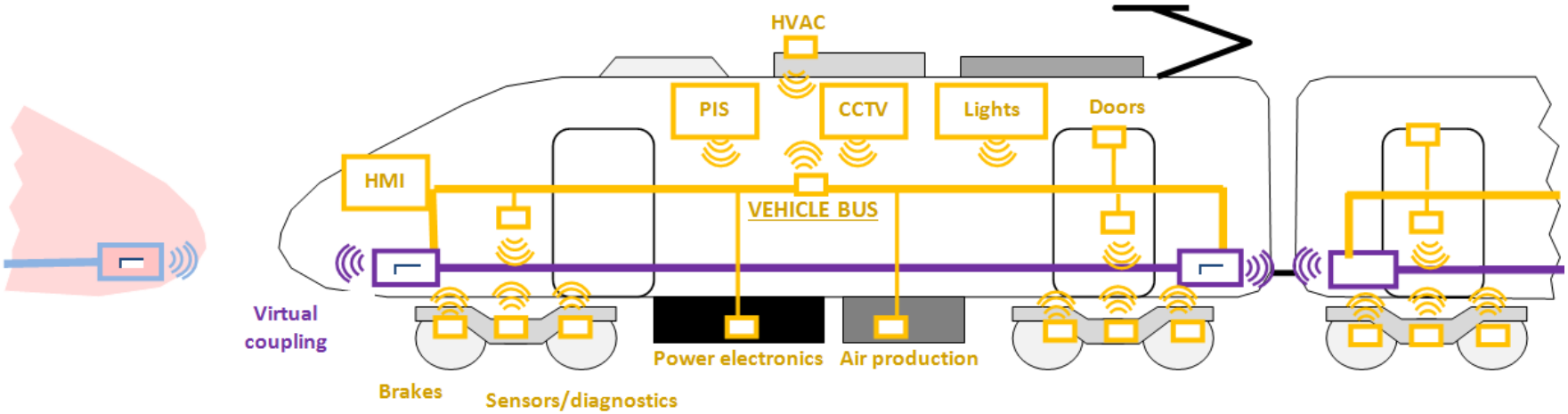
  Develop more efficient and lighter traction drives using the new generation of electronic material.

  Advanced design for reliability increase and noise reduction.

- **Main output(s):**

  A step change in energy efficiency, reliability and life-cycle costs with new power electronics able to control/command motors at a much higher frequency than to-day.

FOCUS ON TD2: Wireless/drive-by-data TCMS



- **Main objective:**

  Reduce/eliminate cabling (currently > 1km cable/ 1 m train!),

  Fail-safe digital TCMS, advanced processing architectures

- **Main output(s):**

  Major reduction in complexity ⇒ vehicle reliability and LCC ⇑

  Flexible coupling ⇒ increase in line capacity

FOCUS ON TD3: Light Carbodyshell

- **Main objective:**

  Incorporating composite materials into either a hybrid or full composite structures, considering not only performance but also manufacturing, repairability, maintenance, …

- **Main output(s):**

  Lighter car bodyshell structures while maintaining cost, safety, repairability, etc... Performance

  Energy consumption reduction

FOCUS ON TD4: Light track-friendly bogies

- **Main objective:**

  Take advantage of a number of innovative technologies (mechatronics, new materials, sensoring …) to produce whole new running gear solutions

- **Main output(s):**

  Lighter, track-friendly more silent and comfortable new concepts of running gear

  Energy and maintenance costs reduced

FOCUS ON TD5: Brakes

- **Main objective:**

  Develop new advanced technologies at different levels (Control, braking mechanism, performance) bringing application specific brake system solutions, which maintain safety and which meet future demands for functionality, performance, economy and ecology

- **Main output(s):**

  New brake solutions, reducing significantly system complexity, weight brake noise and Life Cycle Costs which meet safety requirements.

FOCUS ON TD6: New Generation Doors and PRM Solutions

- **Main objective:**

  Develop new generation access entrance system:

  - improving comfort (acoustic and thermal performances), reliability, safety and energy consumption
  - fulfilling PRMs specific needs in terms of mobility and fluidity
  - bringing synergies between railway sub-systems

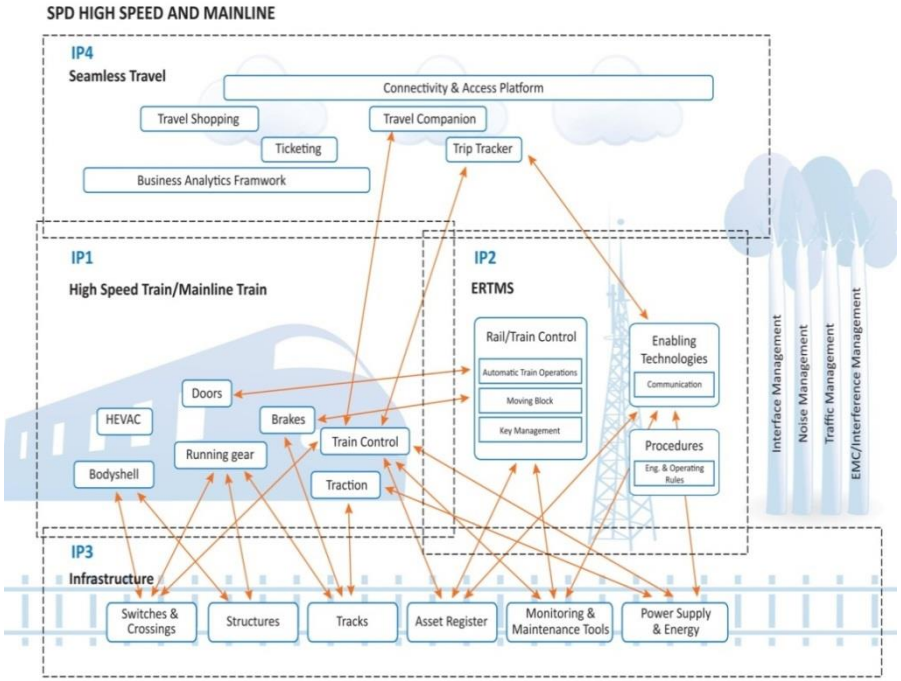
- **Main output(s):**

  Major breakthroughs for the passengers (attractiveness), the operator and car builder (better performances), but also to support network capacity increase (lighter solution).

Summary

Shift2Rail IP1 will focus on:

- Make optimal use of vehicle space
- Increase availability of vehicles
- Increase in-service reliability
- Reduce vehicle maintenance cost
- Be more Track friendliness
- Increase Energy Efficiency
- Offer ddditional services/performance



A system level approach to ensure transfer of benefits to the whole railway system

At the end of S2R, lighter, smaller, quieter more reliable and energy efficient solutions for urban environments will be available. These benefits will be validated by on-track demonstration!