RATP Group, CEA and IVECO BUS hold first ever demonstration in Europe of a fully autonomous garage

On 30 March 2018, RATP Group, the CEA and Iveco Bus presented a demonstration of a fully autonomous bus depot in the level 3 basement of the Lagny bus centre in the 20th *arrondissement* in Paris. The experiment is part of the European Bus System of the Future 2 (EBSF 2) program launched in 2015 and co-financed by the European Union.

Demonstrating a fully autonomous bus depot under real life conditions

The demonstration was held at the RATP Lagny bus depot. The demonstration is the culmination of a technological research project conducted by RATP Group, CEA List and Iveco Bus. Two situations were studied in the research project:

1. When the driver arrives at the depot, the bus powers up in autonomous mode, exits its parking space in the level 3 basement and approaches the depot exit. The driver begins his or her shift when leaving the depot.

2. At the end of the shift the driver leaves the bus at the depot entrance. With autonomous mode activated, the vehicle parks itself in the spot assigned by the automatic fleet management system after moving to the underground parking spaces.

There are several points of interest in the demonstration for RATP Group which could be developed, such as:

- Optimising available space in bus depots located in dense urban areas thanks to tighter vehicle parking made possible by automated systems
- Assisting bus drivers' tasks by means of advanced driving assistance systems and ultimately changing some of their assignment, for example, actions to take buses in and out the garage.

RATP Group teamed up with two partners, IVECO BUS and CEA List, to develop the automation system for depot operations and conduct the demonstration:

- **IVECO BUS** modified one of its electric hybrid Urbanway vehicles operated by RATP with approval from Ile-de-France Mobilités to be driven electrically and steered autonomously.

- **CEA List** also deployed its expertise in artificial intelligence and robotics. The bus is equipped with sensors and an autonomous navigation controller, which makes it capable to locating and steering itself without human intervention while detecting any obstacles.
- Teams at **RATP Group** steered the overall project, integrated various sub-systems and developed the interface between the bus and the current fleet management systems to tell the bus about available spaces in the depot. RATP Group also oversaw demonstration safety.

A driver is always on board the bus during tests conducted for the research project to ensure that the experiment works smoothly and supervise the system. However, the driver never intervenes in the vehicle's autonomous operation.

The Lagny bus depot in the 20th *arrondissement* in Paris is RATP Group's technological flagship and will be home to electric buses starting in 2019. The centre was inaugurated in 2016 after a modernisation and extension program to exemplify the bold RATP policy to modernise its industrial infrastructure and enhance the value of its real estate assets. RATP combines urban development with city centre industry by building a dense, multi-purpose, sustainable and smart city.

RATP Group at the heart of innovation in new forms of mobility

Autonomous vehicles are one of the priority fields of innovation for RATP Group, which aims to become a major partner for smart, sustainable towns and cities.
In addition to the demonstration of autonomous garaging, RATP Group is currently conducting experiments on driverless shuttles in Bois de Vincennes (Paris 12th *arrondissement*) and at the CEA Paris-Saclay facility.

IVECO BUS en route to autonomous driving

With this European premiere in terms of autonomous bus, IVECO BUS clearly positions itself as a manufacturer at thé forefront of innovation and contributes to demonstrate the technological excellence of the French industry dedicated to sustainable mobility. It should be noted that its parent group, CNH Industrial, is deeply involved in several autonomous driving projects in multiple fields of activity such as driverless farm tractors and the European Truck Platooning Challenge…

CEA: digital technologies for driverless vehicles

The digital technologies developed by CEA List help increase the degree of vehicle autonomy, particularly in the fields of sensors, artificial intelligence and secure systems. For example, digital technologies enable the vehicle to perceive its environment and operate under maximum security conditions by integrating and interpreting information.

A European project for the bus of the future

The "Bus System of the Future" projects (EBSF and EBSF_2) aim to develop a new generation of urban bus systems. The aim is to develop and deploy innovative vehicle technologies and infrastructures integrating the best operating practice and which have been tested in operations scenarios in several bus networks in Europe.

Work conducted by project partners in the last three years – trials have concerned over 150 vehicles – lays the foundations for using new technologies to ensure greater efficiency by bus networks.

"As a coordinator of the EBSF 2 project, *Union internationale des transports publics* (UITP) would like to congratulate teams in RATP Group, IVECO bus and CEA for their contribution to this unique research program in Europe."

The EBSF 2 project received funding from the EU Horizon 2020 program in research and innovation.

About RATP Group

With 16 million passengers transported daily globally, RATP Group is the fifth largest urban transport operator in the world. RATP Group operates in fourteen countries across four continents (France, United Kingdom, Italy, Switzerland, Algeria, Morocco, South Africa, Saudi Arabia, USA, India, China, South Korea, the Philippines and Qatar). The group operates metro networks (including automatic metro systems), tramway, bus and regional express rail lines.

About CEA

CEA is a public research organisation operating in four fields: defence and security, carbon-free energies (nuclear and renewable sources), technological research for industry and basic research. Thanks to its recognised expertise, CEA contributes to implementing cooperation projects with multiple academic and industrial partners. With its 16,000 scientists and staff, CEA is a major player in European research and boasts a growing international presence. List, a CEA Tech institute and technological research hub, focuses research on smart digital systems. Its R&D programs are vectors of major social and economic stakes and focus on advanced manufacturing, cyber-physical systems, data intelligence and technologies for the digital patient. In developing cutting-edge technologies, List contributes to the industrial competitiveness of its partners through innovation and technological transfers. www-list.cea.fr | @CEA_List | LinkedIn | YouTube.

About IVECO BUS

IVECO BUS is a brand of CNH Industrial N.V., a world leader in capital goods listed on the New York Stock Exchange and the Milan borsa. A major player in public transport and one of the leader manufacturers in Europe, IVECO BUS designs, manufactures and markets a wide range of vehicles that specifically meet the needs of private transport companies and public transport authorities: school buses, inter-city systems, line and tourism solutions (Crossway and Magelys), standard and articulated buses and their BHLS (bus with a high level of service) versions. It also boasts a clear leading position in clean technologies: NGV and Hybrid (Urbanway and Crealis) and minibuses catering to all personal transport requirements (Daily) and chassis intended for body specialist markets.

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