



Joint News Release

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NTU and Volvo to jointly develop autonomous electric buses in Singapore

Nanyang Technological University, Singapore (NTU Singapore) and Volvo Buses announced today that they will begin testing autonomous electric passenger buses in Singapore in 2019.

For Volvo, this will be its first autonomous application in public transportation anywhere in the world and it has chosen NTU Singapore as its partner in this endeavour. Volvo has already demonstrated its autonomous technology in mining, quarry and refuse collection operations.

The 12-metre Volvo 7900 Electric bus is already in service around the world, providing a quiet and emission-free operation, and requiring 80 per cent less energy than an equivalent sized diesel bus.

The 40-seater buses to be deployed in Singapore will be equipped with autonomous driving technologies. These include GPS and LIDAR laser technology systems for charting, positioning and detecting obstacles around the vehicle, and an integrated navigation system that includes automated steering, gear changing, and speed throttling technologies.

The buses will be tested from early 2019 at the Centre of Excellence for Testing and Research of Autonomous vehicles at NTU (CETRAN). The autonomous vehicle test circuit, which is modelled after real road conditions in Singapore, provides a safe and controlled environment to test autonomous vehicles.

The NTU and Volvo partnership is also part of the collaboration between NTU and the Land Transport Authority (LTA) under the university's living lab platform announced in October 2016. The living lab platform assesses technology maturity and road-worthiness, including the certification of the technologies for deployment on public roads.

The NTU-Volvo programme will be supported by SMRT and ABB, which will be assessing the vehicles' roadworthiness and charging systems.

"We are seeing fast-growing interest in both autonomous and electric vehicles in cities all over the world. Together with NTU, one of the world's leading universities of technology, we now have the possibility of testing various solutions under realistic conditions in a major city

that has high ambitions for its public transport,” said **Håkan Agnevall, President Volvo Buses**.

He added: “We consider Singapore and NTU as excellent partners for Volvo, offering an enabling environment and complete ecosystem of research, development and implementation of new solutions. The technology developed in Singapore can contribute to future autonomous applications by Volvo Buses.”

NTU President Professor Subra Suresh, said, “We have a vision to transform NTU into a smart campus that embraces technology to improve everyday life, and ensures the sustainability of resources. This partnership with Volvo on electric autonomous buses is part of the roadmap of the Smart Campus initiative. We hope that the solutions created out of this programme will contribute significantly to Singapore’s ambition of adopting autonomous vehicle technologies and enhancing public transportation.”

LTA’s Chief Innovation and Technology Officer Mr Lam Wee Shann said, “The Land Transport Authority fully supports innovation and cutting edge technology that will ultimately benefit commuters. The agreement to develop and trial electric autonomous buses is a significant milestone in our journey to make this a reality in Singapore’s public bus network.”

Comprehensive research and rigorous testing

The autonomous electric buses will be tested on campus at CETRAN, which replicates different elements of Singapore’s roads, with common traffic schemes, road infrastructure, and traffic rules.

The circuit features a rain simulator and flood zone to test autonomous vehicles’ navigation abilities under tropical weather conditions. It also helps improve overall safety and efficiency by allowing researchers to assess the vehicles’ interaction with pedestrians.

Håkan Agnevall said, “Our electric buses already make it possible for cities to improve their air quality and reduce noise levels. With our system approach to electromobility we, in addition, open up new ways for urban planning. When developing autonomous solutions for public transport we can really leverage the Volvo Group expertise in this rapidly developing technology field.”

Professor Lam Khin Yong, NTU’s Vice President for Research, said, “NTU fosters a culture of research excellence centred around translational research, accelerating ideas nurtured at the lab into practical and industry-relevant innovations for society. Our partnership with Volvo, a world leader in public transportation which explored hybrid and electromobility solutions as early as 2010, will set a new milestone in this era of disruption, automation and artificial intelligence.”

Singapore’s public transport operator SMRT will also play a critical role in determining the roadworthiness of autonomous vehicles and assist in operational trials.

One of the buses will undergo tests at a local bus depot managed by SMRT. This would test the vehicle’s capabilities to autonomously navigate into vehicle washing bays and park safely at charging areas.

Mr Desmond Kuek, President and Group Chief Executive Officer, SMRT Corporation, said, “Our goal is to stay future-ready with the latest urban mobility solutions to provide safe, efficient and comfortable journeys in Singapore’s unique operational setting. This MOU paves the way for SMRT, working with our partners, to host operational trials for autonomous buses, and test out the command & control system required for operating such smart vehicles. Our engineers will be part of the joint effort to lead the proof of concept in Sweden, before moving the trials to Singapore. We will leverage on our extensive experience operating and maintaining buses to support the eventual deployment of autonomous vehicles safely on our roads in the future.”

For the development and deployment of fast-charging stations based on the *OppCharge* interface, Volvo and NTU will be partnering ABB, a global leader in charging solutions for electric vehicles.

The charging station is capable of providing 300kW of charging power in three to six minutes, during the layover times at the bus route’s end points.

Commenting on the initiative, **Tarak Mehta, President of ABB’s Electrification Products division** said: “ABB has long been at the forefront of developing greener solutions. With this project, we reaffirm our intent to develop the Electric Vehicle industry in the Asia Pacific region. Our high-quality electric charging systems, combined with our cloud-based connected platform ABB Ability™, are paving the way for vehicles to become cleaner, more efficient and cost effective than ever before.”

Volvo Buses is one of the world’s leading manufacturers of electrified buses and has sold more than 3,800 hybrid buses, electric hybrid buses and all-electric buses.

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About Volvo Buses

Volvo Buses is one of the world’s leading bus manufacturers, with a strong focus on vehicles and systems for long-term sustainable public transport. The product range includes complete transport solutions, city buses, intercity buses and tourist coaches, as well as services in

financing, vehicle servicing, vehicle diagnostics and traffic information. Volvo Buses is part of Volvo Group, one of the world's leading manufacturers of trucks, buses and construction machines as well as drive systems for marine and industrial applications. Volvo Group also provides complete financing solutions. For more information visit <http://www.volvobuses.com>

About Nanyang Technological University, Singapore

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,500 undergraduate and postgraduate students in the colleges of Engineering, Business, Science, Humanities, Arts, & Social Sciences, and its Interdisciplinary Graduate School. It also has a medical school, the Lee Kong Chian School of Medicine, set up jointly with Imperial College London.

NTU is also home to world-class autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Nanyang Environment & Water Research Institute (NEWRI), Energy Research Institute @ NTU (ERI@N) and the Institute on Asian Consumer Insight (ACI).

Ranked 11th in the world, NTU has also been ranked the world's top young university for the last four years running. The University's main campus has been named one of the Top 15 Most Beautiful in the World. NTU also has a campus in Novena, Singapore's medical district.

For more information, visit www.ntu.edu.sg