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Memorandum

To	Parliament of Australia - Committee Secretariat	Pages	6
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Subject	Inquiry into automated mass transit		
From	AECOM Transport Advisory		
File/Ref No.	181207-Inquiry-for-Automated-Transit-AECOM-submission-V.1.0	Date	07-Dec-2018

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Dear Sir/Madam,

The Minister for Cities, Urban Infrastructure and Population, the Honourable Alan Tudge MP, has asked the Committee to conduct an inquiry into automated mass transit.

AECOM's Transport Advisory Team in Sydney welcomes the opportunity to make a submission to the Committee and has mobilised a team of Public Transport experts to propose the following discussion points.

A. Key drivers from the Terms of Reference

"The inquiry will focus on road and rail mass transit systems, as well as point-to-point transport using automated vehicles to cover the 'last mile'. In addition, the inquiry will examine the role of new energy sources, such as hydrogen power, in land-based mass transit."

"The Committee to inquire into and report upon current and future developments in the use of automation and new energy sources in land-based mass transit, including:

- Rail mass transit
- Road mass transit
- Point-to-point transport using automated vehicles
- Commonwealth roles and responsibilities in the development of these technologies"

B. Proposed methodology of work

The terms of reference addresses cutting-edge topics in the field of passenger mobility (automation and transition to alternative energy sources for both road and rail transport) and the latest issues in the field of governance of transport and mobility (how can the Federal Government create a favourable context to enhance sustainable mobility). Each of these topics can be allocated into several complex technical and regulatory subjects that are heavily interrelated. For example, the latest trials for automated road shuttles deal with:

- Automated systems for road vehicles, originally developed for rail systems
- Power supply systems with no local emissions, generally using electric technology

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- Governance issues as trials engage state authorities (financing and supporting innovation, regulating rail and road ITS), local authorities (road safety, traffic management), industries (automated systems, vehicles) and public transport operators
- Regulatory issues regarding the evolution of driver's responsibilities and regulation of automated vehicles in general traffic.

Taking advantage of a range of international technical experts, AECOM recommends these questions be addressed from a holistic "transport planning" point of view. Rather than exhaustively exploring what complex technical subjects are, our approach is to define topics to be further studied, illustrated through simple direct questions and, where possible, by relevant examples from the latest international practice. The Committee can choose those subjects to be further studied.

Subjects should be addressed distinctively considering those related to the development of automated mobility on one side, and those related to the optimisation of energy consumption by mobility systems on the other side. Using our connections with Public Transport Operators, High-level technical expertise can be brought from a range of international experts and organisations, such as RATP (National Public Transport operator in Paris, France) through two relevant case studies:

- Automation for rail and road transit
- Energetic transition for a bus fleet in a major world capital

1. <u>The development of automated mobility for Rail Transit Systems:</u>

Automated systems for MRT lines are mature and are already operated on several networks around the world. For high-level stakeholders from the Federal Government, key drivers are understanding the current automation technologies, being able to choose the right level of automation to enhance an existing MRT line and have a full vision of previous and current experience in the implementation of fully automated MRT lines and networks in major world cities. Another crucial question to address is related to systems: how can ITS technologies be developed simultaneously for rail and road transit in the following years, without interfering one with another?

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Case study: Automated metro lines in Paris, France

French National Operator RATP has delivered on passenger train automation since 1952. The first automated metro with a human driver was released in 1968 on line 11 in Paris, based on specific dedicated railway signalisation systems. In 1998, the first high-capacity fully automated metro line "Météor" (without human driver) was inaugurated. In 2012 line 1, the most patronised line with 725,000 passengers per day, was converted into full automation while operating, another world first. And line 4, the second most patronised, will be converted in 2019. Based on RATP's experience and using contacts AECOM has with RATP in Paris, these case studies can be explored and relevant key drivers can be highlighted for the Australian Parliament Committee. Key questions to address are:

- *"What are the different levels of automation for MRT systems?"*
- *"How do major MRT network operators upgrade existing lines to semi-automatic or fully automatic lines?"*
- *"How do major cities implement new MRT networks and lines with high capacity automated lines in Paris, London, Hong Kong, Kuala Lumpur, New York and Singapore?"*
- *"Can ITS be simultaneously developed for both automated rail and road transport?"*

Automation for guided LRT systems in interaction with other vehicles and pedestrians is a new subject and Public Transport Operators are currently implementing trials with Public Authorities. The Inquiry can review the current and latest trials, understand their goals, describe their governance (institutional context, stakeholders, funding, roles and responsibilities) and define the lessons to be learnt for deployment in Australia. Key questions to address are:

- *"Are there tramway LRT networks operated with automated vehicles in 2018?"*
- *"How is automation used by public transport operators to increase efficiency and productivity for operation of LRT networks?"*

Figure 1: automated metro lines in Paris, France. Left: line 14, first high-capacity fully automated metro line released in the world. Right: on-going implementation of Platform Screen Doors on line 4, converted to automation without interrupting operation. Source: RATP

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2. The development of automated mobility on Road Transit Systems:

Automated vehicles and systems circulating on roads are new and are the subject of a range of global trials, both for private and collective vehicles. There are still major on-going governance and political issues to define what the mobility trends will be for the next 20 years: the percentage of automated cars, evolution of car ownership, ethical questions regarding choices to be made and responsibilities during accidents. Further studies in this area could investigate the strategic, ethical and industrial stakes for the development of automated vehicles and focus on some interesting scenarios or case studies held by public stakeholders in Australia and abroad (such as insurance companies and international organisations). A potential focus could be on the latest decisions to deploy automated vehicles in Australia and abroad. Key questions to address are:

- *"What are the possible scenarios for future urban mobility trends in major cities?"*
- *"What are the latest national initiatives to promote the use of Automated Vehicles in Australia?"*

As Public Transport Operators start to investigate automation for bus shuttles, trials are being implemented in various urban contexts. Based on international experience, a study could review the different trials and their governance (institutional context, stakeholders, funding, roles and responsibilities). Research could focus on how these global trials could be adapted to the specific Australian context and on the local opportunities to set up trials (such as political will and joint-ventures), and on new mobility governance issues for major Public Transport Operators: how do they aggregate new "last-mile services" in a perspective of increasing competition where access to mobility is made easier through the release of different data-based services (free floating cars and devices, Mobility As A Service)? Key questions to address in this respect are:

- *"How is automation used by Public Transport operators to increase efficiency and productivity for operation of bus networks?"*
- *"How do Public Transport operators and stakeholders assess automated public transport shuttle services and what are the key issues to address?"*
- *"What are the major initiatives from public and private sectors to enhance shared and on-demand mobility?"*

Automated mobility is also progressing for private cars and new individual mobility services. The study can investigate how major automobile producers tend to shift from industrial manufacturers to service providers using data and on their expected schedule to deliver different automated services to the market. Coinciding with the development of automation for public bus services, other initiatives involving the public and private sector are diluting the frontier between public and private automated transport: the study can investigate the development of services such as on-demand automated shuttle services, including local and international Joint-Ventures in Europe and the first commercial services with automated vehicles in the USA. Key questions to address are:

- *"What are the major initiatives from car manufacturers to deliver sustainable mobility services?"*
- *"What lessons can be learned from initial partnerships and operation of automated vehicles in the public transit sphere?"*

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3. The optimisation of energy consumption by Rail Transit Systems

Catenary-free power systems are to be considered as an opportunity for the development of rail systems as they eliminate local pollutant emissions from diesel propulsion, mitigate risks for power supply availability and decrease maintenance costs. Further research on the latest evolutions for passenger train power systems and the basic functionalities of supercapacitors and hydrogen technologies can be done at a decision-making level. There is emerging evidence of the role of hydrogen power, which could be compared to other sustainable technologies for mobility regarding its real environmental impact. It would be relevant to focus on the role of over-head catenary free power systems in contributing to the implementation of urban LRT tramways in European cities by enhancing efficiency of energy consumption, and on how states and companies have started to invest in hydrogen-powered road vehicles. Key questions to address are:

- *"Are electric catenary free technologies ready for passenger trains?"*
- *"Is hydrogen power supply ready to replace diesel or electric power supply for passenger trains?*
- *"Which technologies can replace over-head electric catenaries for urban tramway LRT systems?"*
- *"What are the other possible developments for hydrogen powered vehicles?"*
- *"Is hydrogen power the best possible industry solution for mass-transit mobility?"*

4. The optimisation of energy consumption by Road Transit Systems

European states and cities are setting up ambitious policies to reduce environmental externalities due to road traffic and to enhance the health and quality of life of citizens, especially in dense urban areas. Cars powered by thermic engines are being progressively banned from global city centres while new types of vehicle technologies and active modes are promoted. Further researches could focus on relevant case studies from European cities and describe their latest policies and incentives to promote sustainable mobility (projects on public space, coercive measures on oil-motorised vehicles, incentives for electric vehicles, parking strategies, toll roads and congestion charging measures). Based on the French and Norwegian experience for the promotion of electric and hydrogen vehicles, a focus can be made on guidelines for national public policies to be implemented at an early stage in Australia. Key questions to address are:

- *"How do major cities progressively shift to clean motorisation for cars and promote sustainable active mobilities?"*
- *"How can clean motorisation be promoted in national sustainable mobility strategies?"*

Transport of goods and people is responsible for most of the greenhouse gas emissions in urban areas and public stakeholders are committed to reduce local emissions in passenger and freight traffic. Bus besides new products released by industry, thinking for "sustainable mobility" for road transit must be done rationally, in a dedicated perimeter and in a life-cycle, long-term perspective. Based on recent international experience, research can describe how major Public Transport Operators and Transport Authorities are implementing major power supply transitions for metropolitan bus fleets. Possible scenarios can be described in a systemic approach, considering available technologies, demand levels, levels of autonomy, sustainability and maintainability. Currently available technologies can be explored and compared (diesel, hybrid diesel, CNG Gas, electric batteries with night charge, IMC trolley-bus, hydrogen bus and others such as flywheel, hydraulic). Complementary initiatives optimising energy consumption and customer experience in public transport can also be studied.

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Case study: Shifting to clean power supply for RATP's bus fleet in Paris, France

With 4500 buses, 25 depots and more than 1.1 billion passenger trips per year in the whole Paris region, French National Operator RATP owns and operates the most important bus fleet in France and the largest network in Europe. Major changes have occurred since 2015 in the specification for bus fleet procurement as well as in infrastructure and system design, to follow the strong corporate ambition to shift to a "100% clean fleet" by 2025. Taking advantage of AECOM's connections with French Public Transport operator RATP, we could facilitate research and lessons learned in the steps taken to implement the "BUS 2025" Corporate Strategic Plan, as well as the legal and regulatory framework in France that drove operators to take such investment decisions. Key questions to address are:

- *"What are the key topics to consider before investing in any power supply transition?"*
- *"Which choices were made by major Cities and Public Transport operators to implement power supply transition for their bus fleet?"*
- *"What was the regulatory and legal context that led operators to implement power supply transition projects in France?"*
- *"What are the different technologies available and what would be the key drivers for choice from the operator's point of view?"*
- *"What kind of innovations have operators implemented to both optimise energy consumption and enhance customer experience in Public Transport"*

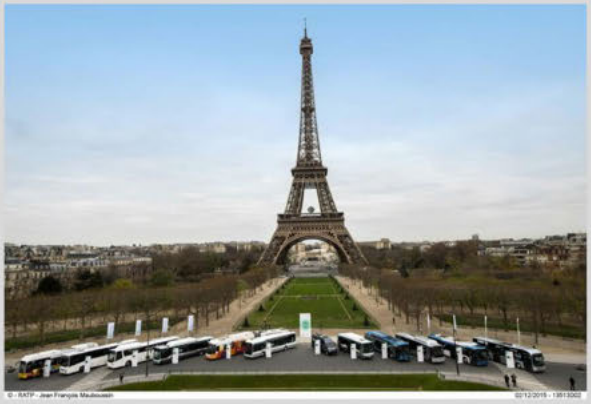

Figure 2: implementing power supply transition for Paris bus network, France. Left: trial for new Aptis fully accessible 12m electric bus (IDFM, RATP, Alstom). Right: comparing various power supply technologies for RATP bus network. Sources: RATP, Alstom.

End of memorandum.