Peak Power – Written evidence (AUV0043)

Executive Summary

Peak Power is a group of transport users and stakeholders who live in rural communities and work in the major cities of the North and South West. Planned reduction in rural bus services combined with increasing congestion within, and leading into, urban areas triggered our interest in identifying the problems with modern public/private transport and the potential solutions. As research by Leeds University and KPMG shows, buses are essential to the rural economy, education health and social welfare of rural communities. Cuts in bus services may reduce running costs, yet as our own and Leeds research shows, a small investment of 10% will create 1,000s of jobs and other benefits.

Peak Power is a group of expert stakeholders who possess the experience, insight, and capability to act as ‘Intelligent Client’ for government and industry. As we search for alternative transport solutions we have through observation, analysis, and evidence, formulated a set of thoughts on AVs specifically, which we have captured to provide the basis of this submission to the House of Lords. A summary of the key points from our appraisal and this submission are as follows:

- The strategic impact and long term benefits of AVs on the economy, environment, and society is seriously underestimated by UK government and potential suppliers;
- There is a concern current UK AV development and introduction roadmaps/timescales are being held back by automotive industry thinking and starved of funding given a government priority for big infrastructure projects;
- The global reality appears to be that a new generation of global digital businesses are better placed, more highly motivated, and further along the growth curve in the development and exploitation of AV technology;
- UK AV strategy and development lacks cutting edge ambition, well behind international rivals, limited by vision and regulation, influenced and guided by a narrow public sector and a small pool of expertise in traditional auto industry and technology;
- The UK is seriously under resourced, we need to look to other sectors for transferable skills and expertise, we also need to increase spend (R&D), train tech capability, and identify niche opportunities and smart tactics to take market leadership and deliver most impact globally;
- AVs are part of an integrated transport system and massive transformation programme, there is little evidence this is understood and being acted upon by government or industry.

Response to House of Lords Autonomous Vehicle Select Committee

Impacts and benefits:

1. What are the potential applications for Autonomous Vehicles (AVs)?
   Air, water, and land based transportation of goods and people. The modes receiving most public interest, research, investment and political/legal attention are land based, with the main applications being:
To reduce personal transport costs activities e.g. through shared use rather than single ownership/occupancy;
Providing transport for those unable to drive on health or age-related grounds;
Opening up urban and rural community use areas, including commuting, school runs, access to health services, economic hubs such as retail centres, entertainment;
Substitute for cut backs in rural bus services;
Light and heavy freight movement and home deliveries.

Please note: we consider connection essential to AVs. AVs are one component in a physical and digitally integrated transport system, where vehicles are the point of service delivery to the public (other components and processes inc maintenance, storage etc). The digital components are familiar to a traditional IT architecture and processes including communications networks, enterprise master planning/scheduling and operations control, data management, Apps development etc.

2. What are the potential user benefits and disadvantages from the deployment of Autonomous Vehicles?

- Significantly lower running costs from adoption of shared AVs – Barclays estimated (2015) that use of a shared AV would reduce running costs by 56% and use of pooled AVs would reduce running costs by 82%;
- Safer transport as a pedestrian, passenger, and driver of other (conventional) vehicles – guidance and accident detection systems outperform human capabilities, especially if vehicles communicate with each other (V2V) effectively enabling “seeing” around corners and over the brows of hills, etc. As a consequence of the lower accident rates, insurance costs are likely to fall markedly;
- Reduced numbers of vehicles on the roads (Barclays estimate that a single shared AV can potentially replace 18 conventional cars and the efficiency gains from pooled AVs will be even higher). The common view is each AV will be used more than today’s conventional cars are, generating a greater return on the capital and environmental cost of producing a vehicle. This should enable reduced congestion, less ‘clustered’ urban and suburban landscapes, removal of ugly car parks which will make way for much needed housing;
- Optimised networks as AVs collect and pool ‘big data’ for the better planning and use of transport infrastructure – master scheduling, operational control etc;
- Lower environmental impact in operational use as more efficient driving and reduced congestion improve air quality.

The main disadvantages to adoption of shared AVs will be felt by an older demographic who associate vehicles with ownership, status, and as a means of storing personal belongings. These are major barriers to transition and transformation of transport and transport services.

3. How much is known about the potential impact of deploying autonomous vehicles in different sectors?

Hard evidence on the impact of AVs across road use sectors is limited. However, research conducted mainly in the USA, suggests that introduction of AVs will have most impact on:
- Commercial vehicles (avoidance of driver maximum duty times);
Legal and regulatory frameworks will require review and amendment to create an operational environment acceptable (i.e. safe) for AV users and travelling public;

- Taxis and buses (the driver tends to be the single largest cost);
- Virtual elimination of second vehicles in households (apart from a minority who own a luxury/performance/classic car as a hobby/status symbol);
- Marked (estimates vary) reduction in annual vehicle sales, leading to a transformation of car dealership (sales and service) networks;
- Higher annual mileage by AVs leading to shorter vehicle life (forecast AV life is 3.5 years c.f. 14 years for today’s conventional fleet). This should lead to better air quality as only younger vehicles, fully compliant with current emission standards are on the road. However, the loss of older vehicles will lead to the demise of car repairers, dealers, motor factors etc. who base their businesses on servicing older fleets;
- The combination of lower vehicle sales, less complexity, reduced supply chains, and shorter vehicle lives (helps the industry) will have a dramatic impact on the business models of vehicle manufacturers, potentially reducing their influence post-transformation meaning they could well be a key block pre-transformation;
- As the key characteristics of vehicles move towards their electronics and data networks, the role of infrastructure providers (Google, Apple?) will increase;
- As fewer individuals possess their own car, the importance of ride-sharing entities will increase. Transportation-as-a-service (TaaS) is likely to become a significant industry in its own right, subsuming today’s car rental, bus and taxi sectors;
- The vehicle insurance industry will have to develop products that cater for AVs. This should not be too much of a hurdle for the industry as it has recently adapted to user-based insurance drawing on vehicle telematics data.

4. How much is known about public attitudes to autonomous vehicles?

There is a significant body of research and data concerning traditional vehicle performance, human/machine interface, and environmental impacts. Only just recently has Goldsmiths complete a ‘sense tested’ study to find out how our senses and emotional responses respond to various stimuli. There is little or no research into what the public know about AVs, the benefits, and how likely they are to want to use AV’s. Setting up collaborative focus groups ‘Intelligent Clients’ to consider use cases will provide high quality feedback on public attitudes, knowledge, and perceptions of AVs to more accurately guide government and private sector investment.

The existing UK AV demonstrators are anticipated to provide insight and feedback; however the restricted operational (urban) and use limit the value of these; whereas a rural test programme offers much greater benefit across all use cases. A further consideration in evaluation of public attitudes is that like many successful innovations, AVs extend beyond the knowledge horizons of consultation group, who may well discount the value and benefits without proper understanding and vision. The ‘intelligent Client’ role should therefore be able to brief, filter and moderate inputs/outputs of both providers and users of AV technologies and services.

5. What is the scale of market opportunity for autonomous vehicles?
An integrated transport strategy with a properly formulated masterplan would reduce the numbers of vehicles on the roads by at least a 50% of the current UK 30m, possibly by 70%. This would occur through shared commuter use, phased with school runs, health care trips, and economic/leisure trips during the remaining part of the day.

There are multiple challenges for AVs in achieving the replacement/displacement target of circa 15m, these include:

- Sharing space and operation (spatial interaction between human guided and computer guided machines) during a transition period;
- Overcoming the myopia of the teams currently leading the trials and introduction, which are focussed on urban areas, observation shows these areas are already well served by public transport - they offer least AV benefits compared to rural users;
- The annual UK figure for new car sales/registrations is approx 2.2m based on historic methods of marketing/sales and vehicle product introductions it will take 15 years+ to replace all 30m vehicles. To accelerate transition an introduction strategy/plan will need to be carefully thought through to deliver 50% in 10 years or less;
- This is a massive change programme comparable to reversing the side of the road on which we drive. So far the public is vaguely aware and interested in AVs, however a poorly thought through and executed introduction plan could well turn public and manufacturers (AVs will halve UK sales and decimate the supply chain) against the change.

The critical importance of data networking, computing, navigation and sensor technologies demand common standards internationally, or at least regionally. We have already seen this in the software and telecoms industries, which may have national players, but the standards are formulated at a global level. The greatest AV opportunity is international, one for which the UK post Brexit should be targeting, yet we are ill prepared to capitalise upon. This is a function of:

- Under resourced for R&D and manufacturing compared to future global competition – Google, Apple, Uber etc;
- A tendency toward an inward looking mentality, specifically in manufacturing based industries, rather than taking an ambitious international global perspective;
- Test and development programmes that fall well short of other global facilities/capabilities e.g. US Pittsburg, (even though there has been significant investment in Horiba/MIRA recently);
- Programmes are academic/technology led rather than market led by innovative product marketers from the technology sector, as opposed to manufacturing/vehicle industries.

Creating an enabling environment

Research and development

6. Is the scale of current and planned demonstration facilities for autonomous vehicles sufficiently broad and ambitious?

The demo facilities in MK, Bristol, Greenwich appear to be technology based, aimed at creating public awareness rather than being planned, coordinated set of programmes
that deliver a credible and useful transport service. There are several shortcomings with these facilities, specifically:

- Of the main UK manufacturers/tech only Ford and JLR are involved (via Autodrive), Nissan, Toyota, Honda, BMW, VW/Audi and GM are not represented;
- In several of the cases the AV demonstrators are providing a show case for overseas, rather than UK capabilities;
- The demonstrators have failed to identify and engage key players with need for AVs and investment capability;
- Whilst in reality there are likely to be multiple AV suppliers, the demonstration, or test programme, needs to provide a properly structured environment to test and approve systems, interoperability etc;
- Facilities are focussed on urban areas, with relatively little attention given to the opportunities (bus cutbacks) and challenges placed on AVs in rural areas (for example heavy snow which can hide road edges and markings, is much more likely in rural areas);
- At the most fundamental AV demo capabilities don’t appear to map to specific use cases – they appear generalised and of limited benefit which may damage the case for AVs.

7. **Is the government doing enough to fund research and development on autonomous vehicles, and to stimulate others to do so? Should it be doing more to coordinate UK actions?**

Given the resources the US technology players, and European/Japanese car manufacturers are investing in the area (e.g. 10’s $ billions), through differential resource analysis (DRA) it’s difficult to see how the UK is going to address the opportunity and come out ahead. There needs to be a coordinated programme of all stakeholders, with government playing a key role in bringing the parties together, coupled to targeted seed investment in specialist areas e.g. guidance systems algorithms, usability capabilities, master scheduling etc.

R&D funding should be directed at representative environments where AVs meet a specific need, where there are clear use cases and benefits, which the public recognise and relate to.

As part of a coordinated plan of action, leverage and incentive should also be applied to bringing onboard supplementary, and potential, technology partners e.g. mapping and satellite communications companies to further accelerate the development of UK capability. This will require the coordination and management of cross sector, multidisciplinary teams, a capability not generally required, or associated, with government departments – therefore, given what is at stake, suitable programme expertise and facilitation skills set should be sourced elsewhere.

8. **How effective are InnovateUK and the CCAV in this area?**

Clearly these organisations have helped move the agenda forward. However the nature of the opportunities and competition requires a different creative and entrepreneurial mindset in terms of strategic thinking, market delivery, technology, time to market, integrated (not intelligent) transport etc etc. There is no evidence of real success to date, or indication these organisations have appreciated the strategic long term value
of AVs to UK industry, UK economy, and the ‘winner takes all’ urgency to the opportunity.

There is a real concern that the context of AVs is not understood by not only these organisations but other key government departments. It appears that AVs are being considered as a transport/motor industry issue only. In reality, the implications affect virtually every Government department, from the challenge of integrating multi-modal transportation (such as AVs getting people to from HS2 stations), to health and social care (AVs providing greater independence for the elderly), financial services (insurance industry and fleet management industries etc).

It is essential AVs are part of an integrated plan and delivery programme, to which the Transport Catapult, InnovateUK, and CAV are essential contributors, but should not be the principal drivers.

9. Is the environment for small and medium-sized enterprises (SMEs) working in this sector sufficiently enabling?
The scale of the opportunity and size of task is best suited to large corporate players. However the problem is they don’t always have the specialist expertise, or necessarily offer an attractive environment in which innovation can flourish. SME’s can, and will supply, technical and business/programme capabilities, however they will require support from government (contacts, endorsement, funding) and large UK corporates (contracts).

10. Will successful deployment of autonomous vehicles require changes to digital or physical infrastructure?
Absolutely (both). AVs may be autonomous but they do not operate in isolation, they need data and navigation networks to operate. Modern communication systems are data-hungry and there is an ever increasing demand for band-width, these needs to be shared not just between AVs, but also with their occupants who are likely to demand high-speed access to the internet, especially as many of them will no longer be actively driving and will want to work, play, surf etc. Digital services are an area where the UK can take ownership and leadership. To function fully AVs will also need to be integrated with the infrastructure for purposes of optimised movement planning and operational management. Smart motorways will be required to extend across the road network, the most obvious complementary partner technology will be IT and communications network providers.

To re-iterate the point, AVs are essentially a component of a national transport transformation programme, the difficulty of introducing AV’s is similar in scale and difficulty to changing from driving on the left to the right.

11. How might a move from current levels of highly automated vehicles to their extensive deployment best be managed? What do you see as the key milestones?
Firstly we need people with the passion and vision to direct and deliver transformational change- these are needed at all levels, representing all stakeholders, and they need to work together with clarity of vision to a common purpose and agenda (otherwise it’ll be like merging the 1960s/1970s British car industry all over again – foreign
ownership/management is possibly a key enabler......). This then becomes a ‘big bet’ transition programme with the key milestones:

- ‘Go’ or ‘No Go’ decision on a plan constructed from engagement of all stakeholders;
- Coordinated (International supplier) trial across urban and rural catchments – interoperability, safety, trip performance key criteria and measures;
- Public communications roll-out – Brexit means we’d better get moving on AVs if we don’t want to be left behind;
- Align UK supply chain – corporate and specialist SME capabilities;
- Smart transport Infrastructure upgraded along heavily used e.g. key trunk routes;
- Business case tested and benefits assessed – proven realisation of the value of the technology;
- Target and work with key enabling groups/organisations to roll-out at scale.

12. Does the Government have an effective approach on data and cybersecurity in this sector?
No comment – though recent Internet of Things(IoT) /webcam DNS attacks show this is essential.

13. Are further revisions needed to insurance, regulation and legislation in the UK to create an enabling environment for autonomous vehicles?
The operator/supplier of shared use AVs will need to take on legal liability and insurance cover the same as any other public operators e.g. taxi or bus company. Given the fail safe systems of AVs and consequently lower accident rates per millions of miles covered insurance premiums could be expected to fall significantly. However, the liability implications of any systemic faults could be far-reaching and may outweigh some of the accident-rate reduction savings. The UK insurance industry is already actively participating in programmes such as VENTURER and Autodrive (AXA), GATEWay (RSA Insurance) and Lloyds is currently interested in assessing the risks associated with autonomous features.

14. What, if any, ethical issues need to be addressed in the substitution of human judgement in the control of vehicles by algorithms and Artificial Intelligence?
The complicated moral dilemmas are well documented and were first considered in the ‘trolley problems’ introduced as a thought experiment by British philosopher Philippa Foot in 1967. British design engineers and legal teams could well take the global lead in defining a code of practice to govern AVs in all scenarios and eventualities.

15. What does the proposed Modern Transport Bill need to deliver?
- An unrestrictive framework to encourage innovation across all transport infrastructure and transport modes;
- Engagement - providing products services and solutions across a wide cross section of industries;
- A set of investment priorities to in parallel develop any required ‘smart’ infrastructure;
- Change in the people and products servicing the needs of transport users - a change in mindset, perspective, approach to solutions etc;
- A series of innovative solutions that maximise benefits, not only to the economy, but socially to the consumer;
• A technical architecture to control the roll-out and integration of different AV solutions – creating an ‘open’ architecture;
• Protection for the consumer and UK AV industry from one player dominating the market so restricting long term technical development, and increasing costs.

16. How effective is the UK’s education system in delivering people with the right skills to support the autonomous vehicles sector?
We need an educational system that engages at all stages from the young pre STEM through to graduate (the education system tends to focus on preparing young graduate engineers) and mature engineers. We need the expertise and skills to develop businesses, market, service AVs, and support the wider IT and data communications networks.

A big challenge will be convincing a wide demographic as to the benefits and usability of AVs technology. We therefore need mature marketers and engineers, who can listen, note, and design AV’s that meet with universal appeal and acceptance. However, AVs are much more than just an engineering challenge. They could herald a societal change as large as that triggered by the internal combustion engine replacing early EVs and horses. As mentioned in Q3, AVs can transform entire industries, not just vehicle manufacturing.

There is also a huge issue regards lack of courses to produce skilled labour capable of maintaining and fixing AVs. Traditional main, and independent, dealers are already stretched in their capability to understand and fix in-vehicle electronics. A set of dedicated training courses is required aligned with the needs of AVs, the students for which may come from early school leavers, or transferable industries/skills e.g. IT and home electrics, from across a wide range of demographics (sex, age immaterial to aptitude and motivation).

17. Is the Governments strategy and work in this area sufficiently wide-reaching? Does it take into account the opportunities that autonomous vehicles offer in a wide range of areas, not just on the road?
• Government strategy and work needs to consider AVs in the round as one component in the circular economy to embrace other technologies e.g. EVs and traffic control systems, as part of an integrated transport solution;
• The government should be assisting with wayfinding and taking an active funding role, to help inform and seed the AV industry, with the emphasis on differentiation with the aim of global leadership in selected technologies, knowledge areas, and use case niches;
• There is no clarity that AVs are being considered in more than road surface transport – a use-case based approach such as light freight would include surface and AV air e.g. drones;
• The government has set up complementary technology networks e.g. aerospace and satellite, these now need to be focused and brought onboard through intelligent clients (reqts and use cases) and visionary entrepreneurial individual contributions.

18. What are the implications of exit from the European Union for research and development and the autonomous vehicle industry in the UK? Are specific actions
from the Government needed to support or protect the autonomous vehicles sector in the short term or after the terms of Brexit have been negotiated?

Based on publicly available information (information from companies such as JLR will be commercially sensitive) - implications of Brexit are assessed as high risk and in the negative (we require a concerted European partner programme to protect interests and compete globally).

For the reasons outlined above (US and global competition), specific actions to support and protect the AV opportunities is required immediately and on an ongoing basis for the foreseeable future – at least 8 years ahead. The UK, alone among EU states is not a signatory to the 1968 Vienna Convention on Road Traffic and thus may be able to introduce legislation fostering AV usage more rapidly than other EU members can. However, this advantage is not unique to the UK as the US, China and Japan are also not bound by the Vienna Convention. It should also be noted that Sweden, Germany, France, Belgium and the Netherlands are all actively engaged in AV research and finding ways to incorporate AVs into their legislative frameworks.

The size of the UK vehicle market is insufficient by itself to sustain high-volume car manufacturing, exports are vital to the health of the UK industry. In the short-term avoidance of tariff-barriers is essential, but in the longer term ensuring compliance via EU Directive 2007/46 /EC (and its successors) is probably even more important. The UK government needs to derive a strategy to ensure that the research conducted by UK companies and institutions will be compatible with the regulatory standards in force in our major export markets. This challenge is exacerbated by the UK’s likely absence from the negotiating table post Brexit.

The UK also needs to consider how it can maintain participation in the large number of international research projects relating either directly to AVs (such as CityMobil2 or the ERTRAC Automated Driving Road Map) or indirectly such as the UK’s continuing participation in the Galileo satellite navigation system which will provide enhanced navigation data for AVs. Currently participation is only guaranteed within the timescales of Horizon 2020, but as the development of AV technology and infrastructure is a 10 year + mega-project, a long term product and delivery roadmap is essential.

The UK, under the appropriate leadership and direction of a diverse set of experts and proven innovators (as outlined above), must now develop a coherent long-term AV strategy and development framework. The UK should seek out, and address, the most difficult challenges for AVs, recognising that this work will help define and deliver global transport for the next 100 years – ‘establishing a successful platform for future generations of UK industries’

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26 October 2016