Written evidence from JCB (ELV0050)

1. JCB is delighted to provide this written submission in response to the House of Lords Environment and Climate Change Committee's call for evidence on electric vehicles (EVs).

Background to JCB

2. JCB is a UK-based company that employs 8,500 people in the UK within 11 plants. Globally, we employ 18,000 people in 22 plants across four continents producing over 100,000 machines each year.

3. Our machinery plays a huge part in sculpting the modern world. From agriculture to construction, power generation and access, our machines are on site in over 150 countries around the globe.

4. In a world that's increasingly under pressure from environmental degradation, finding innovative and sustainable solutions to our customers' needs and managing the resources that go into our products is more important than ever.

5. JCB is clear that decarbonising transport will require a range of solutions; our fleet now incorporates electric and hydrogen internal combustion engine machines side by side.

6. However, we believe the UK has a particular opportunity for economic, and energy and technology security advantages by pursuing a bolder strategic approach to hydrogen vehicles. This is why we are investing £100m of JCB funds into developing hydrogen technologies.

7. **Of importance to this Committee inquiry, this £100m investment and R&D has gone beyond construction machines, and has included hydrogen engines for vans, and trucks. It is JCB's view that hydrogen engines also have potential for cars and buses.**

8. We believe that, through the R&D experience of having produced these machines, and operating them in real-world situations, we have developed unique and important insights into the challenges and opportunities of decarbonising all forms of transport.

Key points

9. JCB believes that electric vehicles have a major part to play in the decarbonisation of transport. However, it will not be a universal role.

10. Our R&D journey, as well as the practical, real-world experience of widespread use of our EV products, has shown us that significant systemic barriers exist in the EV market that will impede widespread EV adoption.

11. As a result, JCB believes that hydrogen vehicles, especially with hydrogen internal combustion engines (ICE) can provide an important solution to these challenges.

12. Whilst the UK is far behind in the global EV market, we are among the first movers in hydrogen technology. We must learn from previous mistakes from EV and wind turbine production and take strategic policy steps today to ensure we are maximising the opportunity to secure long term manufacturing jobs across the UK hydrogen supply chain.

13. **JCB therefore urges the House of Lords Environment and Climate Change Committee to expand the scope of this inquiry to cover hydrogen vehicles or conduct a separate inquiry on hydrogen to operate in parallel.**

14. JCB would like to invite the Committee to visit our global headquarters in Rocester, Staffordshire, where we can present to members on our R&D journey across electric and hydrogen powered machines.

Summary of response

15. In our response to the Committee's call for evidence, we have focused on the barriers and obstacles faced in meeting the 2030 and 2035 targets, both for industry and the public.

16. JCB, based on our first-hand experience, believes that are four main barriers that are likely to impede the widespread adoption of EVs. These are:

17. **Speed and uneven nature of charging rollout**: This is seen in both:
    a. the worsening ratio of EVs to charging points.
    b. the lack of grid capacity and connections that will be necessary to supply charge points.

18. **Inequality of access:** This is caused by market barriers such as high costs for new machines/vehicles and an underdeveloped second-hand market, as well as price disparities between on street and off-street charging.

19. **Lack of certainty and barriers for business**: Business needs certainty to invest; episodes such as recent political debates on the 2030 deadline, which led to the Prime Minister having to step in to reassure industry, undermines business confidence.

20. **Behaviour change and public willingness to accept alternatives**: The 2030 and 2035 targets are currently seen by a large section of the public as top-down impositions rather than responding to incentives that make EVs a viable alternative to ICE vehicles. The current ULEZ situation can be considered a case study for this issue.

21. **Environmental considerations**: While the transition to electric vehicles is often perceived as beneficial to the environment, there are key environmental consequences from a sudden shift to EVs both in terms of climate change and air quality.

22. JCB has grouped together our detailed answers to the questions listed in the committee's call for evidence.

Charging infrastructure rollout

23. This section covers questions 1, 6, 18, 21, 24, 25, 29-33

24. There are significant challenges with building up EV charging infrastructure, and over the coming years the grid will require £billions of investments in order to deliver enough power to service the increase in electric vehicles.

25. There are currently around 46,000 electric vehicle charging points in the UK. The SMMT advises that the UK will need 2.3 million charging points by 2030. This is an average of 347,000 charging points needing to be installed every year going forward, 7.5 times more than is in the UK today.[1]

26. Whilst EVs are zero emission at the tailpipe, power generation in the grid is still carbon intensive and therefore EVs are not truly zero emission on the whole. Additionally, EV manufacture in countries like China and India increases the lifetime carbon impact of EVs.

27. Connections for charging points lag behind demand and delay installation of charging points. By the Government's own estimation, connections for charging points can take 'many months or sometimes years.[2] This needs to sharply accelerate to keep up with demand.

28. It is estimated that by 2030, providing all targets are met, there will be between 8 million and 11 million electric cars in the UK.[3] Most electric vehicles achieve 3 to 4 miles per kWh, and the average distance a car travels in a year is 12,000 miles. Therefore, a single electric vehicle requires 3,000kWh of energy per year, and the entire fleet in 2030 will require an additional 33TWh of electricity. With a current grid capacity of around 300TWh per year, this represents around an 11% increase in demand from the grid. This is a significant increase that also does not account for additional load placed on the grid by an increase in the use of heat pumps for home heating, as well as other electric vehicles.

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[1] https://smmt.publicfirst.co.uk/

[2] https://www.gov.uk/government/publications/connecting-electric-vehicle-chargepoints-to-the-electricity-network/connecting-electric-vehicle-chargepoints-to-the-electricity-network

[3] https://www.local.gov.uk/electric-vehicles-whats-going-out-there#:~:text=By%202030%2C%20it%20is%20anticipated,to%20Zero%20(RTZ)%20targets

29. There is a significant difference in price between domestic charging and on-the-go (VAT difference and commercial difference) charging, penalising lower income consumers for those without access to charging at home.

30. **JCB recommendation to committee:** We urge the Government to put a greater policy focus on scaling up the rollout of hydrogen vehicles (of all kinds) whilst maintaining current support for scaling up EV infrastructure. Given that, beyond cars and vans, the UK plans to decarbonise buses, trucks, planes, ships, and Non-Road Mobile Machinery (NRMM) by 2050, hydrogen must be seen as an essential technology. At the very minimum, the above evidence suggests the additional power and grid capacity required will make it impossible to decarbonise all of transport by electricity alone by 2050.

Inequality

31. This section covers questions 3, 4, 7, 10, 11, 13-15, 18 and 24.

32. The relative costs of EV adoption and running costs vary widely by income. There are few genuinely affordable EVs on the market and the second-hand market is in its infancy, meaning EVs are inaccessible to many people, while penalties such as ULEZ apply to all. Additionally, given the price differential between home charging, which is largely limited to wealthier households with private driveways, and public charging, EV running costs for those on lower incomes are likely to be higher.

33. Most EVs up until now have been more expensive models aimed at the premium market, rather than more affordable mass market models Currently electric cars have a 70% to 100% premium over their petrol and diesel counterparts, making them largely unaffordable for the general population.[4]

34. Incentives can distort the market or cause additional retention of vehicles in the case of incentives being removed. Timing plans could result in waves of vehicles to market depending on phase-out dates and incentive additions/removals. Type of vehicles being purchased today are luxury premium models, or basic models bought at a price of a premium conventional car. This causes distortion in the market and raises the entire value of the market, limiting entry-level vehicle ownership for lower income households.

35. Some current incentives penalise those on lower incomes. A flat charge such as the ULEZ is a regressive tax on less well-off drivers, who are less likely to be able to afford a compliant vehicle, and on whom the charge has a greater impact. Additionally, it means that discounts such as lower road tax are only available to those who can afford EVs and low emission vehicles.

36. The lack of on-street grid connections means that lower income households face the uncertainty of finding on-street charging points,

[4] https://www.telegraph.co.uk/business/2021/05/12/electric-cars-may-make-driving-expensive-middle-classes-warns/

whereas higher income households with the luxury of access to private driveways benefit both from the certainty that that brings and from the cheaper price of home charging. There is also evidence that this issue is more pronounced in poorer and more rural parts of the UK.

37. There is a significant difference in price between domestic charging and on-the-go (VAT difference and commercial difference) – again penalising lower income population for those without access to charging at home.

38. **JCB recommendation to committee:** We urge the Government to address the significant access and cost differences that exist across society to ensure we do not create a two-tiered system - wealthier households owning EVs, and poorer households stuck on fossil-fuel powered cars and subject to additional taxes.

Business uncertainty

39. *This section covers questions 2 and 33.*

40. A lack of certainty for businesses, such as inconsistencies in local planning decisions, is hampering EV rollout.

41. Businesses require certainty in order to make long-term investment decisions. There have been suggestions that the 2030 or 2035 dates could be moved, which removes the clarity for business investment decisions, and removes the incentive for the public to make the move to EVs.

42. The private sector is primed to facilitate the roll out of EV charging infrastructure, however, this is being held up by grid and planning issues, as highlighted recently by industry body ChargeUK.

43. **JCB recommendation to committee:** Investment decisions require certainty in Government policy and consistency in the planning system. We urge the Government to provide this certainty and reassurance to industry.

Behaviour change

44. *This section covers questions 3, 4, 7, and 16.*

45. Adoption of EVs will require significant behaviour change from the public: from the time required to charge the vehicles to changes in how they are serviced and maintained. This has not yet been adequately communicated to the public and incentives are misaligned; popular adoption will only come about as a result of EVs being made a genuinely practical option that increase utility for consumers.

46. Even with the required charging infrastructure in place, EVs will require significant behavioural change on behalf of consumers.

47. Adoption of EVs will require a large degree of behaviour change; solutions need to be affordable, easily adoptable, with minimal behavioural change, and accessible to entire population (from low income to high income).

48. There has not yet been the necessary level of communication to raise the level of public awareness around the behaviour changes that will be needed.

49. Consumers are resistant to change, particularly when it comes across as a top-down imposition, rather than a voluntary and beneficial response to favourable incentives. Imposing a technology which is not affordable to all, creates inconvenience and relies on materials from foreign powers will be difficult to receive broad public acceptance and approval.

50. **JCB recommendation to committee:** We urge the Committee to look more in depth at the behaviour change that EV adoption will require, and whether there is public awareness and appetite for this. We urge the Committee, and the Government, to consider the lesser need for behaviour change that comes with hydrogen vehicle usage.

Environmental considerations

51. This section covers questions 6, 26, and 27.

52. The primary justification to shift to electric vehicles is for environmental benefits (climate change and air quality). There is a perception that electric vehicles are 'zero emission', however this is not the case when considering the wider impact of the vehicles. Namely, emissions from vehicle manufacturing (in particular from battery manufacture), emissions from power generation to charge EVs, and the non-tailpipe emission sources affecting air quality.

53. EV batteries contain significant quantities of rare earth elements. Rare earth element mining is highly inefficient, the Harvard International Review reported that "for every ton of rare earth, 2,000 tonnes of toxic waste are produced"[5]. To put it another way, 99.95% of earth mined is wasted.

54. The global battery cell manufacturing supply chain is heavily dominated by China, which hosts 75% of all battery cell manufacturing capacity.[6] Batteries take a significant amount of energy to produce (50 to 65kWh per kWh of battery capacity[7]), and as a country China is highly dependent on coal power generation. The carbon intensity of electricity generation in China was 531g CO_2 per kWh in 2022. By encouraging adoption of electric vehicles ahead of electricity decarbonisation, and in regions with high grid CO_2 intensity, will result in a dramatic increase in CO_2 in the short term.

55. The UK electricity grid in 2023 is powered primarily by gas-fired power stations, as such every kWh of electricity produces CO_2. Until the UK

[5] https://hir.harvard.edu/not-so-green-technology-the-complicated-legacy-of-rare-earth-mining/

[6] https://about.bnef.com/blog/chinas-battery-supply-chain-tops-bnef-ranking-for-third-consecutive-time-with-canada-a-close-second/

[7] Davidsson Kurland, S. (2019) Energy use for GWh-scale lithium-ion battery production. Environmental Research Communications, Volume 2, Number 1

electricity grid is completely decarbonised, electric vehicles in operation cannot be considered zero CO_2.

56. To assess air quality impact, historically vehicle emissions have been measured at the tailpipe due to being the primary source of particulate matter and NOx emissions. EVs do not have a tailpipe, however emissions are still prevalent from other sources, namely brake wear and tyre degradation. To date, these emissions have been widely ignored and not legislated against. Within the Chief Medical Officer's annual report 2022 on air pollution, it states "While EVs are an important part of a decarbonised, cleaner transport system, the term 'zero emission' is widely used and even displayed as badges on some vehicles, without clearly defining what the 'zero emissions' are. Although these vehicles emit neither carbon dioxide (CO_2) nor other air pollutants from their exhausts, there are still emissions of PM2.5 and PM10 from the brakes and tyres, and from wear of the road surface and agitation of road surface dust." It goes on: "The public may become disengaged or angered, much as they were by the change in narrative around diesel vehicles, to hear that they need to invest in additional technology or use their cars less to limit the emissions of PM2.5."[8]

57. These concerns surrounding tyre wear and brakes are amplified by the increase in mass of electric cars. To give an example, a popular mid-size SUV electric car in the UK is powered by a battery the size of a king-size mattress and weighing 770kg – equivalent to 35 large 22kg suitcases. To support the additional weight of the car requires wider 255mm width tyres, 10% larger than a petrol equivalent car with 235mm width tyres and resulting in increased particulates from the rubber loss through the life of the tyre.

58. **JCB recommendation to committee:** We urge the Committee to challenge the widely used term 'zero emission' to ensure that the environmental impact of EVs is fully understood both by policymakers and the public. We urge the Government to look holistically at all technologies (battery-electric, hydrogen fuel cell and hydrogen combustion) and their environmental impacts both for climate change and air quality; to rapidly develop testing processes to quantify non-tailpipe emissions and to fairly consider the evidence, ensuring legislation surrounding emissions (tailpipe and non-tailpipe) is fit for purpose.

Conclusion

59. In light of the above, either as a part of this call for evidence or in a future inquiry, JCB urges the Committee to:
    a. Challenge the zero-emission vehicle (ZEV) mandate, forcing electric vehicles on the UK general public at any cost.
    b. Consider the use of hybrid vehicles in the short term. More prevalent use of more fuel-efficient vehicles would result in real world CO_2 reductions.

[8] Chief Medical Officer's Annual Report 2022: Air Pollution, UK Government

c. Reflect that government policy is driving an acceleration in number of imported low-cost electric cars from China; meanwhile, the manufacture of hybrid cars in the UK is being actively discouraged.
d. Consider the significant role of hydrogen in decarbonising transport, both for road vehicles and for non-road mobile machinery.

60. JCB would be delighted to host the Committee at our global headquarters in Rocester, Staffordshire, to demonstrate our electric and hydrogen machines.