

A6. H7 CARBON AND SUSTAINABILITY PROGRAMME APPENDIX

This appendix covers:

- Our Carbon and Sustainability Programme Delivery Objective.
- Further detail around our carbon and sustainability investments and the rationale for including them in our H7 Capital Plan.
- Business case view of H7 investment – including annual spend, gateway maturity and basis for cost estimation.

Our proposed Delivery Objective for the H7 Carbon and Sustainability Programme

A6.1 Since RBP Update 1, and responding to CAA feedback, we have developed the following SMART Delivery objective for the Carbon and Sustainability Programme:

Carbon and Sustainability Delivery Objective

Heathrow and the whole UK and global aviation sector, including all of Heathrow's airline customers, have committed to reach net zero emissions by 2050. Heathrow has developed and consulted on a new net zero plan which sets out carbon reduction goals for H7, 2030 and beyond that will deliver net zero emissions and is also aligned with the UK Government's net zero target. We need to cut carbon to enable Heathrow to operate and grow successfully in future, providing the benefits of affordable global air connectivity to UK consumers and cargo. Cutting carbon will also manage the risk of changing consumer and political sentiment on flying and rising carbon costs, which could all impact demand. We will also address other key sustainability impacts in our Heathrow 2.0 plan to maintain our commitments to the local community

In H7 we will invest £188m, linked to the masterplan, and targeted at areas where direct Heathrow investment in H7 is necessary to deliver our net zero goals. This investment along with airport standards and incentives, investment and action by Team Heathrow companies, and the right Government policies, will reduce Heathrow's annual carbon footprint by 2.30 million tonnes against a 2019 baseline, by the end of 2026; and contribute to a reduction in Heathrow's annual carbon footprint of 3.48 million tonnes, against a 2019 baseline, by the end of 2030. This will keep Heathrow on a net zero trajectory in H7 and deliver improvements to aircraft noise, air quality and road congestion.

This includes the following sub-objectives:

- Net Zero in the air (£110m)– airspace modernisation (including Easterly Alternation), air traffic management efficiency, upgrading Pre-Conditioned Air (PCA) units and enabling design work for zero emissions aircraft; and
- Net Zero on the ground (£78m) – Surface Access projects to change mode share, electric vehicle charging, and design and operational trials for decarbonising heat and upgrading the airport electricity distribution network.
- Easterly alternation will deliver aircraft noise improvements for the local community. Our Net Zero investment will deliver broader sustainability improvements, including

a reduction in airport related air quality emissions and reduced traffic congestion as important secondary benefits.

This contributes to the following OBR measures; Value for money of Overall Journey, Reducing Heathrow's Carbon Footprint and an Airport that meets my needs

Further detail around all our carbon and sustainability investments and the rationale for including them in our H7 Capital Plan

- A6.2 Our Net Zero Plan goals will cut our carbon footprint by 2.3 million tonnes on an annual basis by the end of 2026. That is consistent with a net zero trajectory and is achieved by enabling aircraft to operate more efficiently in the air and on the ground, moving colleagues and passenger journeys to more sustainable transport modes, driving down the carbon intensity of our supply chain and switching more vehicles from diesel and petrol to electric. The largest contributions to the emissions reduction come from improvements in efficiency of conventional aircraft and the increasing levels of Sustainable Aviation Fuels (SAF) used by airlines, which reinforces why this is a priority for the industry, with us playing our part.
- A6.3 The 2.3 million tonne carbon reduction will be delivered through a combination of management actions, building net zero commitments and targets into our contracts, opex investment (e.g. public transport incentives), using pricing incentives, setting the right standards, the impact of broader Government policy decisions, action by airline and Team Heathrow partners, regulations, market development, consumer behaviour, and finally targeted capital investment.
- A6.4 There is an essential role for capital investment, which enables and underpins the targeted carbon reductions in several areas. Without the right level of capital investment, we will not be able to cut carbon through the other levers. For example, government policy and the market is driving a transition to electric vehicles to cut emissions which we can accelerate by setting the right incentives and standards. However, without the right charging infrastructure, airport companies will not be able to invest in electric vehicles
- A6.5 Capital investment also delivers additional sustainability and non-sustainability benefits. Cutting carbon emissions improves local air quality too, airspace modernisation provides more efficient airspace and aircraft noise benefits to local communities. Delivering our surface access strategy enhances public transport connectivity locally and cuts congestion. Providing sufficient EV charging provision responds to the growing proportion of passengers who will travel by electric cars and their expectations for charging.
- A6.6 We have had to make tough decisions on where to target capital investment and we have been guided principally by delivering the biggest carbon savings for lowest cost. The marginal abatement costs for capital investments to cut carbon are set out in the chart below. Capital investment in our plan is therefore heavily weighted towards projects that deliver the biggest carbon savings for least investment cost.

Figure 1: H7 carbon abatement from capital investment

H7 Investment	£/tonne CO2
Airspace modernisation	£8
Surface access mode share initiatives	£14
Air traffic management efficiency	£61
Upgraded Pre-Conditioned Air on stands already served	£76
Installation of Pre-Conditioned Air on unserved stands	£271
Electric vehicle charging	£336 ¹
Decarbonising heat	£360

Source: Heathrow

Investment in electric vehicle charging will support the growing number of electric vehicles that will access Heathrow across all vehicle users, including passengers. The carbon reduction, however, is limited to operational vehicles where Heathrow investment enables the switch to electric and therefore results in a carbon saving.

A6.7 There are other factors that have guided our H7 capital investment plans too. More detail around all our investments and the rationale for including them in our H7 Capital Plan are set out below:

A6.8 Reducing aircraft emissions - Airspace modernisation

Airspace modernisation will provide a once in a generation opportunity to improve airspace delivering benefits that include reduced fuel burn and therefore carbon emissions, and improve the impact of aircraft noise on local communities. We plan to invest £38m in H7 which will deliver an annual carbon saving of up to 80,500 tonnes once the full programme is complete in H8. It offers the best marginal abatement cost across all proposed projects. The investment enables us to play our part in the broader FASI programme, as required by the Government's airspace modernisation strategy. Now is the time to invest to ensure that our plans can be co-ordinated with those of other sponsors to provide optimised designs for future UK airspace. Further investment will be required in H8 where benefits will be realised and contribute to the emissions reduction level we must achieve through our Net Zero Plan by 2030.

The business case is at a G0 level of maturity with a forecast of £70m across H7 & H8, cost build up is based on the principles set out in the Capital Introduction under section 3.3.9

A6.9 Reducing aircraft emissions - Air traffic management efficiency

We also have an opportunity to improve aircraft fuel burn by improving air traffic management efficiency. Our plan includes a £20m investment in several carbon related air traffic management efficiency projects which will deliver annual carbon savings of up

to 22,000 tonnes when fully complete. Approximately two thirds of the carbon savings will be realised in H7, with the remainder in H8. The individual projects include:

- Improvements to ground routing and guidance including automated ground lighting.
- Departure Management (DMAN) to enable enhanced sequencing of aircraft for take-off and provide more stable sequences for airspace planning purposes, enabling greater efficiency. It can be used to balance the queue time at the runway holding point and therefore engine run/fuel burn.
- Tools support for controllers to enable more consistent separations between some departures.

The carbon benefits from these projects are largely on the ground before take-off and primarily from reduced taxi/time in the runway hold queue. There are other initiatives required to be delivered in parallel to ensure that the changes do not negatively impact punctuality.

Investment is also planned to more effectively meter arriving aircraft into the holding stack, reducing holding times and overall delays by prioritising flights by punctuality.

The business case is at a pre G0 level of maturity and the estimation has been built based on the principles set out in Section 3.3 of the Capital Expenditure chapter using historical analysis from B311 Enabling 09L departures

A6.10 Upgrading existing Pre-Conditioned Air provision (PCA)

We currently provide PCA at Terminals 2 and 5, as well as on some additional stands at other terminals. This delivers conditioned air to aircraft whilst they are parked on stand, allowing aircraft auxiliary power units to be switched off, thereby cutting fuel burn and associated carbon emissions. Improving existing PCA provision is strongly supported by airlines and performs well in marginal cost abatement terms. We plan to invest £52m in H7 to install upgraded PCA units which deliver better performance than existing PCA units and like for-like-replacements. This investment, supported by the right incentives and standards, and a willingness by airlines to connect aircraft to PCA, will deliver annual carbon savings of up 46,000 tonnes.

There is also an opportunity to provide PCA on stands where this is not currently installed. The marginal abatement cost is much higher because more significant upgrades are required to the electricity distribution network. We will consider opportunities to deploy PCA to unserved stands to respond to feedback from airlines operating from Terminals 3 and 4. However, we have not planned PCA installation on unserved stands until H8 due to the higher marginal abatement cost and the level of overall investment in H7.

PCA is one of several projects that demonstrate the importance of electricity as the primary energy source for Heathrow, and points to the growing electricity demand we will experience in future as the transition to net zero gathers pace. It is vital to begin designing and investing in the airport electricity distribution network to ensure it is resilient and capable of meeting future demands from airport users.

The business case is at a Pre G0 level of maturity, cost build up has been based on £0.5m per PCA unit with 104 units being installed to the upgraded standard in H7.

A6.11 Enabling zero emissions aircraft

The focus for decarbonising aircraft is scaling up sustainable aviation fuel quickly. In parallel, we will also expect to see the emergence of new generations of zero emissions aircraft from the end of this decade with either electric propulsion or using hydrogen as an energy source. These aircraft will have different infrastructure needs to conventional aircraft and we are working in an Innovate UK funded consortium with airports, airport manufacturers and universities to understand the airport infrastructure implications. It is possible that zero emission aircraft trials or operations will begin at a small scale in H8. We have included a £5m investment to conclude research, including airport trials, and ensure appropriate preparations are in place to support zero emission aircraft trials or operations in H8. Investment by Heathrow is likely to unlock additional government funding.

The business Case is at a Pre G0 level of maturity and aligned with an expected hydrogen aircraft trial by British Airways in H8.

A6.12 Decarbonising surface access and vehicles – Surface Access mode share initiatives and electric vehicle charging

Decarbonising surface access requires a package of capital investment and opex measures. The priority is to create modal shift away from private vehicles to public transport, walking and cycling. This reduces vehicle trips, which delivers decarbonisation, and wider benefits such as reducing congestion and improving colleague wellbeing. Our opex measures focus on improving public transport services, increasing passenger and colleague awareness, improving our Cycle Hub offer and operating our car share platform. The rest of this section sets out measures requiring capital investment, and why they need investment in H7 to deliver surface access and decarbonisation targets. The £13m investment in our plan to deliver surface access modal shift generates an annual carbon saving of up to 35,000 tonnes, and represents the second lowest carbon abatement cost.

Active Travel (Walking and Cycling)

To decarbonise colleague commutes, we need to reduce our single occupancy vehicle mode share (colleagues commuting on their own in private cars). In part, this will be done by increasing the number of colleagues who walk or cycle to the airport. Over 30% of Team Heathrow colleagues live within 10km of the airport and therefore there is a significant opportunity to do this. One of the main barriers to walking or cycling to work is a lack of safe infrastructure on the airport's roads. This is something we must start to address in H7. We plan to deliver a high-quality route to/from the Central Terminal Area using the tunnel side-bores upon completion of the tunnel maintenance project in 2023. In addition to this key project, we will deliver a rolling programme of active travel infrastructure improvements to our perimeter road network, which will remove some of the gaps in safe provision, as well as implement high quality signage and wayfinding to make it easier and safer for colleagues to walk or cycle to work.

Other Surface Access Strategy Interventions

Other Surface Access Strategy interventions, which are important to progress in H7 for decarbonisation and wider surface access benefits such as reducing congestion, include:

- Elizabeth Line integration. This will maximise the modal shift benefits of the Elizabeth Line by increasing awareness and improving signage and wayfinding in terminals.
- Implement taxi and Private Hire Vehicle (PHV) demand management strategies and backfilling. This will reduce the number of taxi/PHV vehicle trips to, from and around the airport, contributing to decarbonisation and wider surface access benefits.
- Improve bus and coach waiting facilities at CTA, Terminal 4 and Terminal 5. Passengers and colleagues are more likely to use public transport if the waiting facilities are high quality. Investing in this will contribute to modal shift from private vehicles to bus and coach.
- Implement bus lanes / high occupancy vehicle lanes on the airport perimeter roads, where appropriate. Prioritising those making more sustainable vehicle trips will contribute to modal shift to public transport and cycling.
- Deliver a Travel Wallet for Team Heathrow colleagues, which will bring together journey planning, information, ticket purchasing and incentivisation in one app. This will make it easier and more beneficial for colleagues to travel sustainably, thus contributing to modal shift.
- Trial zero-emission freight vehicles on a Heathrow-owned fleet. Trialling new technology will demonstrate the benefits to freight operators who access Heathrow as well as enabling us to identify the best way to decarbonise freight movements.

The business case is at a pre G0 level of maturity and the estimation has been built based on the principles set out in Section 3.3 of the Capital Expenditure chapter using studies of previous projects including a Transport for Quality of Life report for the DfT.¹

Electric Vehicle (EV) Charging

It is vital to encourage the uptake of zero emission vehicles to decarbonise the vehicle movements that continue to take place post-modal shift to meet our net zero goal. This is also a clear Government policy priority. The government has banned the sale of any new petrol and diesel vehicles by 2030, sending a clear signal to vehicle manufacturers and consumers. The market for electric vehicles is evolving rapidly and the UK Climate Change Committee's sixth carbon budget assessment shows that electric vehicles will become increasingly cheaper than petrol and diesel models through the decade on a total cost of ownership basis. Some vehicle types, such as buses, have already achieved that milestone.

We have invested in electric vehicle charging points to enable and support early growth. UK Climate Change Committee forecasts suggest that there could be an additional 1,000 operational electric vehicles at Heathrow by the end of 2026, which continues to rise exponentially through H8. Recent electric vehicle charging requests from Team Heathrow companies indicate the transition is likely to be faster at Heathrow than the national Climate Change Committee projections. We also expect an increasing demand

¹ Taylor I and Hiblin B (2017) Typical Costs of Cycling Interventions :Interim analysis of Cycle City Ambition schemes
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742451/typical-costings-for-ambitious-cycling-schemes.pdf

for a convenient on-airport charging service for passengers and colleagues which is a growing market as consumers purchase more EVs and a new commercial opportunity. Our plan includes a £37m investment to deploy sufficient EV charging at Heathrow for all vehicle users based on expected EV forecasts. This delivers an annual carbon saving of 11,000 tonnes. The carbon saving is based on vehicles that switch to electric because of our enabling investment in charging. The investment will also cater for EV charging demand at Heathrow more broadly including from colleagues and passengers.

Without investment in expanding our electric vehicle charging provision, and the necessary upgrades to the supporting electrical distribution network to match anticipated demand, we would need to restrict the numbers of EVs operating at Heathrow and throttle potential carbon emission cuts. This goes against the grain of government policy, market direction and electric vehicle consumer trends. From the end of H7, the slower uptake of EVs will also begin to increase costs for airport companies.

The business case is at a pre G0 level of maturity with the exception of B7234 - E-Buses Charging Infrastructure which is at G0. The estimation has been built based on the principles set out in Section 3.3 of the Capital Expenditure chapter using historical analysis from B7620.03 Surface Access EV Charging

A6.13 Decarbonising heat and upgrading our electrical network

To achieve net zero, we will need to transition to a renewable solution for generating heat and hot water at Heathrow - switching off gas. The shift away from gas heating is economy-wide and an increasing focus of Government policy. The transition is phased over three regulatory settlement periods, including H7, and will be linked to the wider masterplan due to the scale and complexity of this project. Tackling emissions from heat has a higher marginal abatement cost, and therefore the scale of delivery in H7 has been limited to developing the conceptual and scheme design work and trial key technologies. We plan to invest £22m to complete scheme design and to install key assets (e.g. a heat pump) to enable operational testing and validation, and therefore mature and build confidence in the design, and de-risk delivery in H8. These elements are critical to deliver in H7 so that delivery can begin in early H8 and inform the asset replacement investment through H7 to minimise unnecessary spend on legacy assets.

Our electrical network underpins Heathrow's operation today and our transition to net zero. As we, our airlines, partners, colleagues and consumers transition from fossil fuels to renewable energy sources, the demand for electricity will rise significantly. The key areas of growth in H7 include PCA, EVs and heating, which we have covered in this section. Pressures will grow on three different parts of our electrical network over different periods; the ability to bring enough power into the airport, the ability to move power around the airport, and getting sufficient power to where it is needed for new electrical demands such as EVs.

We must also maintain a resilient electrical network that can meet future demand. As airport operations begin to increasingly rely on electricity as the primary energy source for heating, vehicles and increasingly aircraft, improving the resilience of our network becomes even more important. Climate change effects, including more frequent extreme weather events higher ambient temperatures pose an additional resilience risk over time. Our H7 plan includes a £1.0m investment to develop the future design of the electricity network so it can deliver forecast electricity demand, with an aim to begin delivery of necessary upgrades in H8. We will look to maximise capacity and connectivity in the existing network to support growth in EVs and greater use of PCA in H7, with targeted investment in upgrades to support those projects where that is necessary, aligned to the overall future design.

The business case is at a pre G0 level of maturity The estimation has been built based on the principles set out Section 3.3 of the Capital Expenditure chapter using historical analysis from our Expansion scheme including the installation of a Heat Pump at T5.

Business case view of H7 investment – including annual spend, gateway maturity and basis for cost estimation.

A6.14 Below we provide a table summary of the investments within the Carbon and Sustainability Programme, including their current stage in the Heathrow Gateway Lifecycle and cost estimate bases.

Table 1: H7 Carbon and Sustainability investments, including Gateway Status and cost estimate basis

Carbon and Sustainability Programme - 2018 prices	2022	2023	2024	2025	2026	H7	Gateway Status	Cost estimate basis
Reducing aircraft emissions								
Airspace modernisation*	2.0	2.0	14.0	14.0	6.0	38	G0	Order of magnitude
Air traffic management efficiency	0.0	0.0	5.0	10.0	5.0	20	Pre G0	Estimated provision
Upgrading existing PCA provision	2.0	2.0	5.0	10.0	33.0	52	Pre G0	Based on per PCA unit cost
Enabling zero emissions aircraft								
Hydrogen infrastructure design and enabling work (linked to ongoing research)				2.5	2.5	5	Pre G0	Estimated provision
Decarbonising surface access and vehicles								
Surface access mode share initiatives	1.5	1.5	4.0	4.0	2.0	13	Pre G0	Estimated provision
EV charging infrastructure (operational vehicles, colleagues and passengers)	4.0	4.0	5.0	8.0	16.0	37	G1	Order of Magnitude
Decarbonising heat and upgrading our electrical network								
Decarbonising Heat - Develop options, scheme design and Operational trials	0.3	0.3	0.5	6.5	14.4	22	G0	Estimated provision

Electrical Network upgrades - Scheme design to support increase in electricity demand for decarbonisation	0.3	0.3	0.5			1	G0	Estimated provision
Total	10	10	34	55	79	188		

Source: Heathrow

*Delivers aircraft noise benefits as well as reducing carbon emissions