Luton Rising
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February 2023

London Luton Airport Expansion

Planning Inspectorate Scheme Ref: TR020001

Volume 5 Environmental Statement and Related Documents

5.02 Appendix 4.3 Energy Statement

Application Document Ref: TR020001/APP/5.02
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The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

London Luton Airport Expansion Development Consent Order 202x

5.02 ENVIRONMENTAL STATEMENT APPENDIX 4.3 ENERGY STATEMENT

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EXECUTIVE SUMMARY

This Energy Statement has been produced to support the application for development consent for the expansion of London Luton Airport to accommodate 32 million passengers per annum. It describes energy use across the airport site including for ground based operations and surface access, where, as a result of the Government's Electric Vehicle strategy, power will be supplied at the airport.

The energy strategy for the airport reflects the increased importance of mitigating fossil fuel use and thus carbon emissions from airport activities. This statement fundamentally reconsiders the energy flows across the airport to enable the airport to move towards zero emissions for ground based activity through implementing an energy hierarchy as described in section 1.4.

In particular, natural gas, diesel or petrol will be phased out for airport ground operations by 2037. Instead space conditioning (heating and cooling) and most vehicle operations will be electrified. This, together with the electrification of the vehicle fleet from customers, employees, taxis, and service vehicles, implies a significant transition to electric power.

This in turn requires an upgrade to the grid connection from 11kV to 33kV by the mid-2020s and a second 33kV connection is needed by the mid-2030s, both of which are included in the Proposed Development. For further details refer to **Chapter 4** of the **Environmental Statement (ES) [TR020001/APP/5.01]**.

The airport can generate a significant percentage of demand from on-site solar sources within the Order Limits, largely from solar car ports over car parks which are included in the Proposed Development, along with an energy centre and battery storage facility. These elements can make a significant contribution to the airport operator's existing commitment of 25% of electricity used by the airport (or LLAOL) to be supplied from on-site (or connected to site by private wire) renewable sources by 2026. The Applicant and operator will continue to explore renewable energy opportunities onsite or connected directly to site, to increase the generation of renewable electricity used to supply airport operational requirements to 50% by 2030. However, achieving the higher target will need further projects to be considered that are not within the DCO application.

The energy flows in this statement are converted into emissions assessments of both the with and without development cases, within the Environmental Statement. The timetable for the changes is laid out in the **Outline Greenhouse Gas Action Plan** in **Appendix 12.1** of the **ES [TR020001/APP/5.02]** and the consequences of not achieving real change is set out in the **Green Controlled Growth Framework [TR020001/APP/7.08]**.

Contents

Tables

Figures

1 INTRODUCTION

1.1.1 The aim of this Energy Statement is to support the application for development consent for the expansion of London Luton Airport ('the airport') to accommodate 32 million passengers per annum (mppa), (hereby referred to as the 'Proposed Development') by London Luton Airport Limited ('the Applicant')[1]. The document considers the passenger loads as defined in the **Need Case [TR020001/APP/7.04]**, likely energy demands, demand reduction, and energy supply options, to enable the Proposed Development to align to both national and local policy on carbon emissions.

1.1.2 The Energy Statement has two functions:

a. To inform the size and scale of assets (such as the grid connection, on and off-site generation) included in the Proposed Development, and which will serve the wider airport development, (including Luton DART and Green Horizons Business Park) which whilst outside this application, may be supplied by assets within the application boundary.

b. To inform the scenario assessment of 'with' and 'without' development within the ES. The impact assessment explores only those loads and forms of generation that are within the Order Limits (the red line boundary of the application) and which are additional to current loads, and which are the subject of this application.

1.1.3 This Energy Statement focuses on airport buildings, ground operations and surface access. Decarbonisation of aviation will follow implementation of proposals in the Government's Jet Zero Strategy and are not impeded by this proposal. Emissions management in construction is dealt with in the **Code of Construction Practice** in **Appendix 4.2** of the **ES [TR020001/APP/5.02].**

1.2 Policy framework

1.2.1 The Policy Framework which has informed this Energy Statement includes targets to cut greenhouse gas emissions, as summarised below:

a. In 2019, the Government amended the Climate Change Act to set a target for net zero emissions rather than an 80% cut in emissions (Ref 1.1).

b. The Government has set the sixth carbon budget based on advice from the Climate Change Committee (Ref 1.2), and requires 78% reduction for the sixth budget period (2032-37), bringing forward by 15 years the previous commitment to an 80% cut by 2050. From the sixth carbon budget period onwards, international aviation and shipping will be included within UK targets, but legislation to achieve this has yet to be put before Parliament.

c. The Jet Zero Strategy sets out a target for aviation to be net zero by 2050, but with domestic aviation to achieve net zero by 2040 and for airports to

[1] Luton Rising is the brand name and that London Luton Airport Limited remains the legal entity and owner of the airport.

be zero emission by 2040[2], though this latter target is subject to further consultation expected shortly. The Jet Zero Strategy updates assumptions surrounding carbon emissions in the Government's Airports National Policy Statement (ANPS) (Ref 1.3) and The Future of Aviation: Making Best Use of Existing Runways (Ref 1.4).

d. Luton Borough Council has an objective of achieving net zero by 2040 for the borough including ground operations at the airport (Ref 1.5).

e. Carbon emissions reductions policy is discussed further in the **Planning Statement [TR020001/APP/7.01].**

1.3 Interaction with other documents in the application

1.3.1 The Energy Statement interacts with the following documents:

a. It builds on data and assumptions consistent with the proposed increase in passenger numbers, and Surface Access assumptions as discussed in the **Transport Assessment [TR020001/APP/7.02]**.

b. It assesses energy flows, and mitigation options on the site, that are then carried forward into the greenhouse gas emissions assessment in the **Environmental Statement [TR020001/APP/5.01]**.

c. Projected emissions are then also carried forward into the **Outline Greenhouse Gas Action Plan** in **Appendix 12.1** of the **ES [TR020001/APP/5.02]** (which itself builds on the Carbon Action Plan (Ref 1.6) associated with the planning application by LLAOL to increase capacity from 18 to 19 mppa (LBC ref. 21/00031/VARCON).

d. The projected emissions are then carried into the **Green Controlled Growth (GCG) Framework [TR020001/APP/7.08]** which forms part of this application.

e. The projected energy infrastructure issues are carried forward into the Proposed Development, including new grid connections; a new energy centre for low carbon heat provision; and electric vehicle (EV) charging, photovoltaics (PV) to be built into the proposed car parking and battery storage.

1.4 The approach to the energy hierarchy

1.4.1 This Energy Statement proposes the airport move towards zero emissions for ground based activity through implementing the following energy hierarchy:

a. Conserving energy where possible in both retrofit of existing building and in the design of new buildings and facilities.

[2] The Government's Jet Zero Strategy (DfT 2022), p.9, included an ambition for all airport operations in England to be zero emission by 2040. Government commissioned initial work by Mott McDonald on Feasibility of Zero Emissions Airport Operations in England by 2040 (Catapult 2022) and will issue a Call for Evidence this autumn to gather information on the scope and implementation route to see this achieved

b. Moving all energy use (space conditioning for buildings, and on-site operations, and airport vehicles) towards electricity which can be provided from renewable sources.

c. Supporting customers in their increased use of EVs.

d. Replacing diesel generators with batteries to provide security of supply.

e. Where possible renewables (solar) will be delivered within the Order Limits and aligned to the wider development timetable. The airport operator has already published targets of 25% renewables from on-site or near to site by 2026 and to work with Luton Rising to increase the generation of electricity used to supply the airport operational requirements to 50% by 2030 (Ref 1.6). Though the analysis here is based on all electricity use associated with the airport (I.e. including Luton DART, as well as EV use) rather than just airport own electricity use.

f. The DCO makes a substantial contribution to the renewables target. To meet the airports published targets would need additional renewable generation beyond that envisaged within the DCO, within the airport boundary, or outside the airport to be directly connected to the airport site. However, within the airport boundary solar could be permitted development[3], outside the airport solar or wind would require a separate planning application.

g. Power not provided from the above sources would need to be zero emission and bought via the grid.

h. Sizing electricity supply to the site to meet this increased need as a result of switching into electricity for space conditioning and vehicle use.

i. Subject to the Government's further consultation on zero emission airports, there may need to be further measures, or carbon offsetting measures for any remaining emissions.

[3] Schedule 2, Part 8, Class F of the Town and Country Planning General Permitted Development Order 2015 (England GPDO) enables certain types of operational development to be undertaken at airports without the need to apply for planning permission.

2 MODELLING ENERGY AND CARBON DEMANDS

2.1 Energy use and carbon emissions baseline

2.1.1 The baseline for the assessment is the 2019 London Luton Airport Carbon Footprint, based on energy use data (Ref 2.1), and shown in **Table 2.1.**

2.1.2 Carbon accounting is based on energy use as follows:

a. Scope 1 emissions arise directly from combustion of energy that are owned or controlled by the airport, for example from fuels used in boilers or vehicles owned and used within the airport boundary.

b. Scope 2 emissions are generated by purchased electricity consumed by the airport.

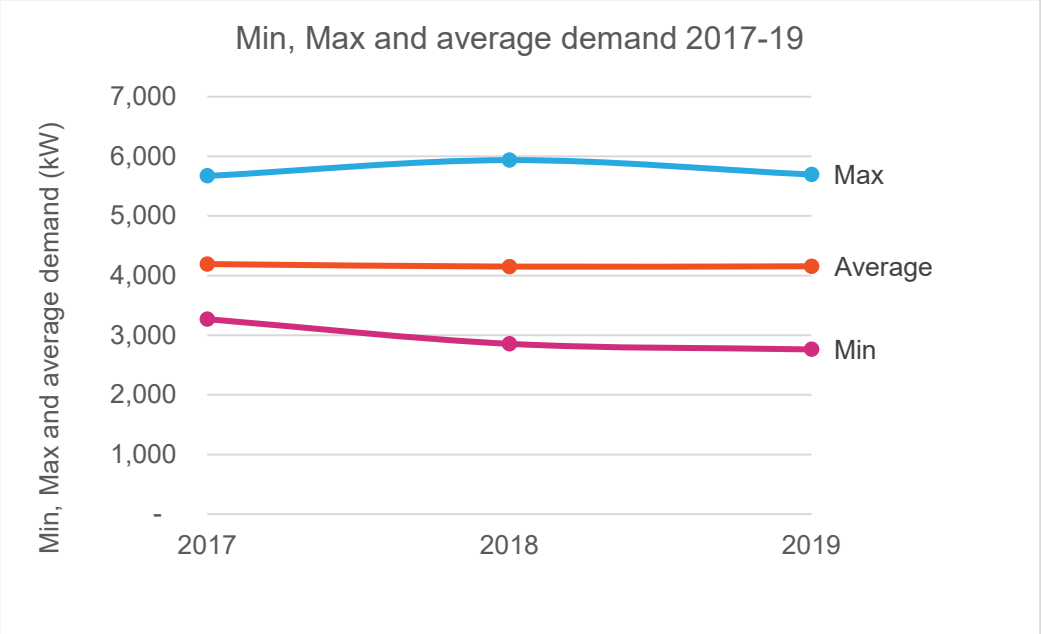
c. Scope 3 emissions are those emissions essential to service the airport but occur from sources influenced, but not directly controlled by the airport or airport operator. This includes: emissions by tenants or subcontractors (e.g. Ground Handling Agents); travel to and from the airport by passengers and employees; emissions from aircraft departing from and arriving at the airport; and from procurement, waste, and water use.

Table 2.1: 2019 London Luton Airport Carbon Footprint

	Energy Consumption (MWh)	Emission (tCO2e)	% of Scope	% of Total Emissions
Scope 1 - Total	**13,836**	**2,966**	**100.0%**	**1.0%**
Natural Gas	8,495	1,562	52.7%	0.5%
Airport operational Vehicles	4,485	1,137	38.3%	0.4%
Fuel (heating and power)	787	203	6.9%	0.1%
Refrigerants	-	55	1.9%	0.02%
Fire Training	69	8	0.3%	0.003%
Scope 2 - Total	**19,488**	**4,981**	**100.0%**	**1.7%**
Airport Electricity	19,488	4,981	100.0%	1.7%
Scope 3 - Total	**65,765**	**278,268**	**100.0%**	**97.2%**

	Energy Consumption (MWh)	Emission (tCO2e)	% of Scope	% of Total Emissions
Aircraft movements	-	136,145	48.9%	47.6%
Passegner surface access	-	131,923	47.4%	46.1%
Tenant electricity	16,920	4,325	1.6%	1.5%
Staff commute	-	1,010	0.4%	0.4%
Electricity T&D	36,408	790	0.3%	0.3%
Third party operational vehicles	12,437	3,179	1.1%	1.1%
Aircraft engine tests	-	608	0.2%	0.2%
Water	-	136	0.05%	0.05%%
Waste	-	50	0.02%	0.02%
Business Travel	-	103	0.037%	0.036%
TOTAL	**99,089**	**286,215**		**100.0%**

Figure 2.1: Minimum, maximum, and average power demand at the airport



2.2 Future energy demands

2.2.1 Two models have been used to estimate future energy demand. The first is for energy use in airport buildings and operations. The second is to estimate EV charging demand.

Modelling energy use in airport buildings and operations

2.2.2 An introduction to the first model is described here and assumptions in the model are described in section 3.2. As described above, 2019 data has been used as a baseline to derive current energy use per passenger, or energy use per Air Traffic Movement (ATM) (e.g. for airside vehicle movements) or energy use per m^2 (e.g. for space conditioning within the terminal buildings).

2.2.3 The model assesses a 'with development' and 'without development' case and is used to assess emissions in the two cases as part of the Environmental Statement. This chapter explores the energy implications of 'with development' scenario.

2.2.4 Changes will need to happen to decarbonise the airport to meet Government policy targets even if the DCO does not go ahead, such as:

a. The transition to EV (both for customers and employees, and for the airport and contractor fleets).

b. The Jet Zero Strategy set a target for airport operations to become net zero, and possibly zero emission by 2040, subject to further consultation. Thus some measures, like the decarbonisation of Terminal 1 with heat pumps, and installation of Fixed Electric Ground Power, would need to be delivered with or without the DCO consent.

c. The airport will need to make appropriate provision for Sustainable Aviation Fuel and zero emission aircraft (including but not limited to hydrogen and battery technologies) even without DCO consent.

2.2.5 The model:

a. Takes proposed building areas ($m^{2)}$, passenger numbers and ATMs, and scales up demands that are dependent on each driver.

b. Estimates improvements over time in energy use per passenger, per ATM or per m^2 of building.

c. Estimates the potential fuel switch into electricity from gas for space heating or for diesel for generators, or diesel and petrol for vehicles.

2.2.6 At the same time, the model explores how the electricity used is provided:

a. The Government has policy in place to decarbonise electricity supplied from the grid over time, and assumptions are taken from Treasury Green Book Guidance about the electricity grid emissions factor over time (Ref 2.2). The assumed emissions factor is a calculated grid emissions on a locational basis (i.e. based on where power is actually taken from), not electricity purchased from renewables on a market basis (so short term contracts to buy renewable power are not considered for the purpose of impact assessment).

b. Where power is generated on-site, or potentially off-site but connected by 'private wire' (i.e. connected directly to the site behind the meter, so power is supplied directly to site without passing over public networks, and under a supply agreement which lasts for the lifetime of the asset) then that power can be counted as supplied on a locational basis.

Modelling EV uptake

2.2.7 A second model estimates demand to charge EV from visitors and staff. An introduction to the model is described here and more detailed modelling assumptions are described in section 3.3.

2.2.8 Again the model assesses 'without development' and 'with development' because if the DCO is not consented, the airport will need to cope with EV charging for up to 18 mppa given Government policy to phase out sales of new petrol and diesel by 2030 and hybrids by 2035, and the expectation in the Transport Decarbonisation Plan (Ref 2.3) that zero emission vehicles (assumed here to be battery electric vehicles) will exceed 99% of the stock by 2050.

2.2.9 The EV model:

a. Uses journey data from recent surveys of passenger journeys to the airport and projected journeys.

b. Takes projected EV uptake from DfT TAG modelling[4].

c. Makes a range of assumptions about EV use and technology. For example, increasing battery size over time means even if an increased portion of vehicles are EVs, a reduced proportion of EVs would need to charge because they can make longer journeys to and from the airport without charging.

d. Splits vehicles into long stay, short stay and drop off vehicles, because they may need an appropriate mix of trickle and rapid chargers dependent on traffic and spaces.

e. Combines this data to calculate overall demand (kWh) and instantaneous power demand (kW) in any given year.

[4] Government Transport Analysis Guidance (TAG) (2023) Fleet Assumptions Table 1.3.8. and Government Transport Analysis Guidance (TAG) (2023)Forthcoming Change Fleet Assumptions. TAG was revised in May estimates 36% by 2030

3 TRANSFORMING ENERGY DEMAND AND SUPPLY

3.1.1 Energy demand and supply will be transformed across the airport. The model assesses the changes proposed as part of the Proposed Development, including building loads; Luton DART; electric vehicles used in surface access; public service vehicles; airport service vehicles; and airport apron loads.

3.2 Energy use in airport buildings and operations

Buildings

3.2.1 Energy demand from buildings will increase due to additional passenger numbers, but this would be counteracted by:

c. Designing new buildings to deliver net zero over their lifecycles.

d. Refurbishing existing buildings. Space conditioning (heating and cooling) options include improving fabric insulation, and removing gas use. After 2037, no natural gas is to be consumed and space conditioning is expected to be replaced with heat pump technology. A major improvement in space conditioning can be made from retrofitting chillers which collect and store waste heat, rather than expelling it to the atmosphere, so it can be used elsewhere on-site or stored for use at a different time.

e. Improving the efficiency of lights and appliances in both new and existing buildings. Much work has been done to upgrade e.g. to LED lights, and further work is planned. However, much of the lights and appliances load is from tenants or service providers and the airport operator will need to work with its tenants and service providers e.g. through a Green Lease framework, as proposed by the Better Buildings Partnership (Ref 3.1),to improve buildings efficiency.

Luton DART

3.2.2 Luton DART (Direct Air Rail Transit) from Luton Parkway Station to the airport is not part of the loads that would follow from a consent. Luton DART currently has a separate electricity supply from the airport.

3.2.3 Luton DART when operational will have a maximum demand of 4 MW.

3.2.4 Luton DART would be extended to Terminal 2 (T2) and so the associated energy demand is included in the impact assessment. The extension to T2 will increase demand by a further 2MW.

3.2.5 If directly connected renewables constitute a significant portion of supply of power to the airport, there would be logic in re-wiring Luton DART to be supplied from this supply, either in the mid 2020s when the connection is expected to be upgraded to 33kV, or in 2035, when the Luton DART extension is installed. The existing energy demand of Luton DART has thus been considered in asset sizing but is not part of the impact assessment.

Airport airside and apron loads

3.2.6 Future demands from apron loads include retrofit of existing Terminal 1 stands with Fixed Electric Ground Power (FEGP), as well as new stands in T1, and in T2.

3.3 Electric Vehicles

3.3.1 EVs will markedly increase electricity demand and reduce petrol and diesel use.

Service Vehicles

3.3.2 Electricity can be used to power the airport's own vehicles and public service vehicles:

a. Buses are now becoming electrified not only for local journeys but for longer journeys of up to 100 miles especially between city centres. Hydrogen is also a possible future energy vector (Ref 3.2).

b. Airside buses will be electrified by 2035.

f. All airside vehicles will be zero emission by 2035 (including Ground Servicing Equipment (GSE), tugs, buses) where available for the vehicle type.

g. After 2037, no natural gas, diesel or petrol is to be consumed for airport ground operations.

Electric Vehicles for passengers and employees

3.3.3 A move towards EVs would result in more power demand at the airport but lower UK wide emissions. To quantify demand from passengers and employee electric vehicles, the modelling takes into account the following:

a. The Government (as part of its obligations under the Climate Change Act) have banned sale of new petrol only or diesel-only vehicles from 2030 and hybrids from 2035.

b. The provision of EV charging capability at the airport needs to consider increasing demand by customers, employees, taxi companies, and public service vehicles. There is significant uncertainty surrounding uptake of EVs, as shown in various projections by National Grid and Department of Transport in **Figure 3.1** below. In this analysis it is assumed the Transport Decarbonisation Plan is delivered, that is, that Figure 9 of the TDP shows emissions from cars approach zero by 2050. This implies all petrol and diesel vehicles have left the stock by then or use zero carbon fuel. Government has not published projected stock assumptions to support this case, but projections from National Grid Future Energy Scenarios (Ref 3.3) do show up to 100% penetration of EVs (see **Figure 3.1** for a comparison of assumptions in NGFES and WEBTAG).

c. A switch to EVs will occur with or without the Proposed Development, as a result of Government policy. The impact of the DCO is therefore the additional load from EVs as passenger numbers increase from 18 up to 32 mppa.

d. The Proposed Development would increase parking provision from the existing 9,000 spaces to just over 22,000 to support 32 mppa.

e. Vehicles parked at an airport are unlike vehicles parked at other facilities. They tend to be left for longer periods than at other car parks, with the time of arrival and space often booked well in advance, and the day and time when the vehicle will be required by its owner on their return in a fully charged state is known. People arriving early in the morning or late at night after a long flight will not want to drive to a charge point. This gives a unique opportunity to manage charging demand, to the economic benefit of the airport. This implies that a high proportion of the charging that is needed will be done on site, and not in off site facilities.

f. The model takes account of a range of factors, including lengths of journey undertaken by car, combined with development of EV batteries. This means a small percentage of EVs visiting the site will need to charge whilst stationary. Battery capacities have already doubled for new models over early models and are expected to more than double again over the next two decades for new vehicles. However, vehicle sales include a range of battery size options, and older vehicles will stay in the stock for perhaps 20 years. The modelling includes assumptions for the range of vehicle and journey types.

g. Key aspects of EV technology are still highly uncertain. This means a degree of uncertainty should be attached to the results of this modelling. Trends will need to be continually monitored, and provision of services adapted, including:

    i. the uptake of EVs in practice;
    ii. the interaction between EVs and Autonomous Vehicles (AV) where vehicles may not stay at the airport for the duration of the customers journey but travel or charge somewhere else;
    iii. Vehicle to Grid (V2G) technologies where the battery can be used for power supply as well as needing charging; and
    iv. the interaction between provision on-site and off-site parking and charging.

3.3.4 Projected electricity demand for EVs, based on current reasonable assumptions, is shown below.

Figure 3.1: Projections for EV uptake: TAG versus National Grid Future Energy Scenarios

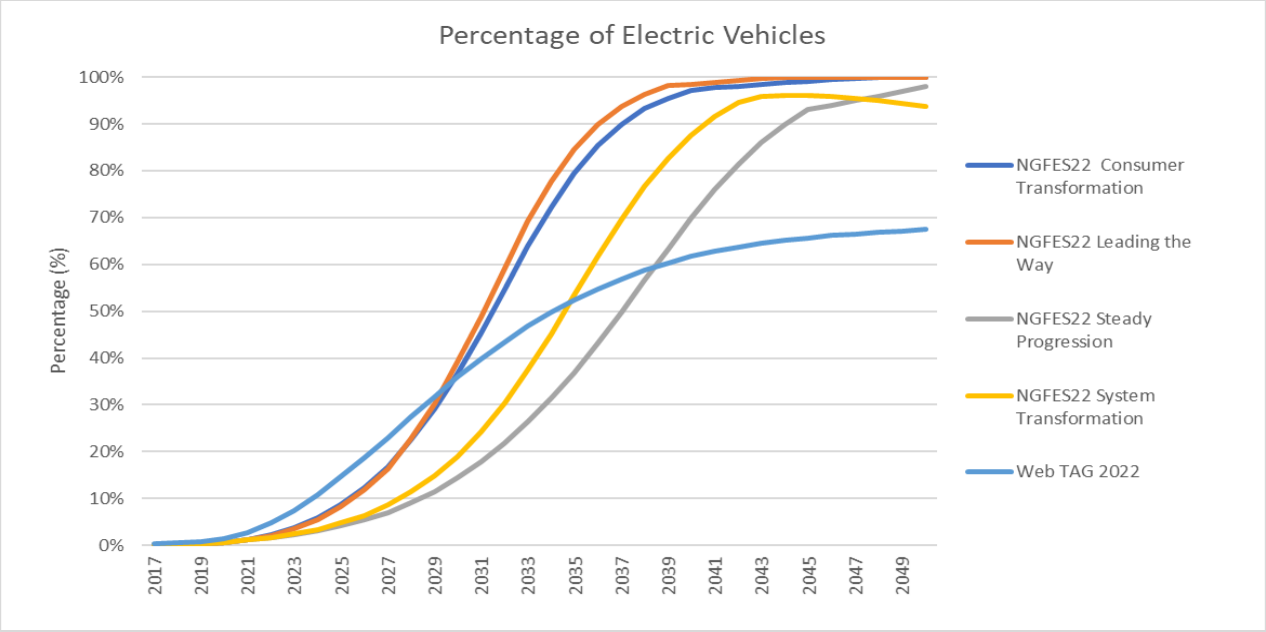


Figure 3.2: Projected EV power demand (MW) (with development)

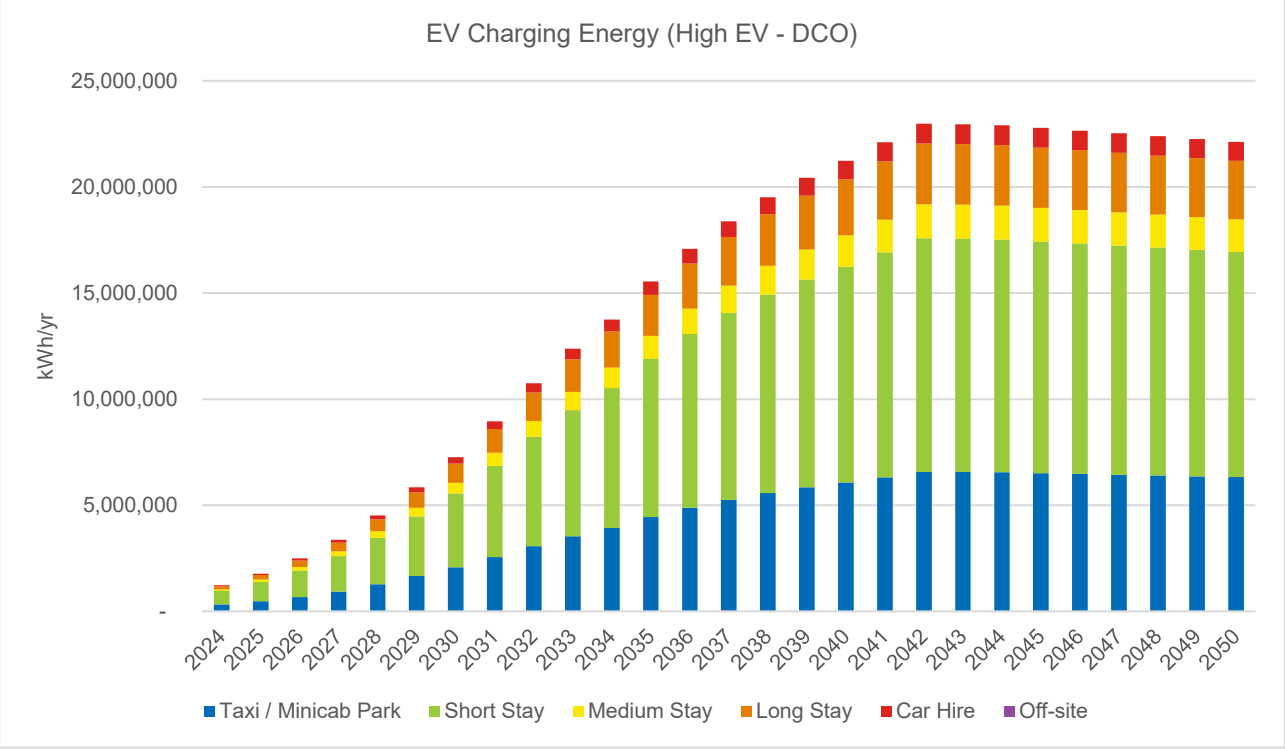
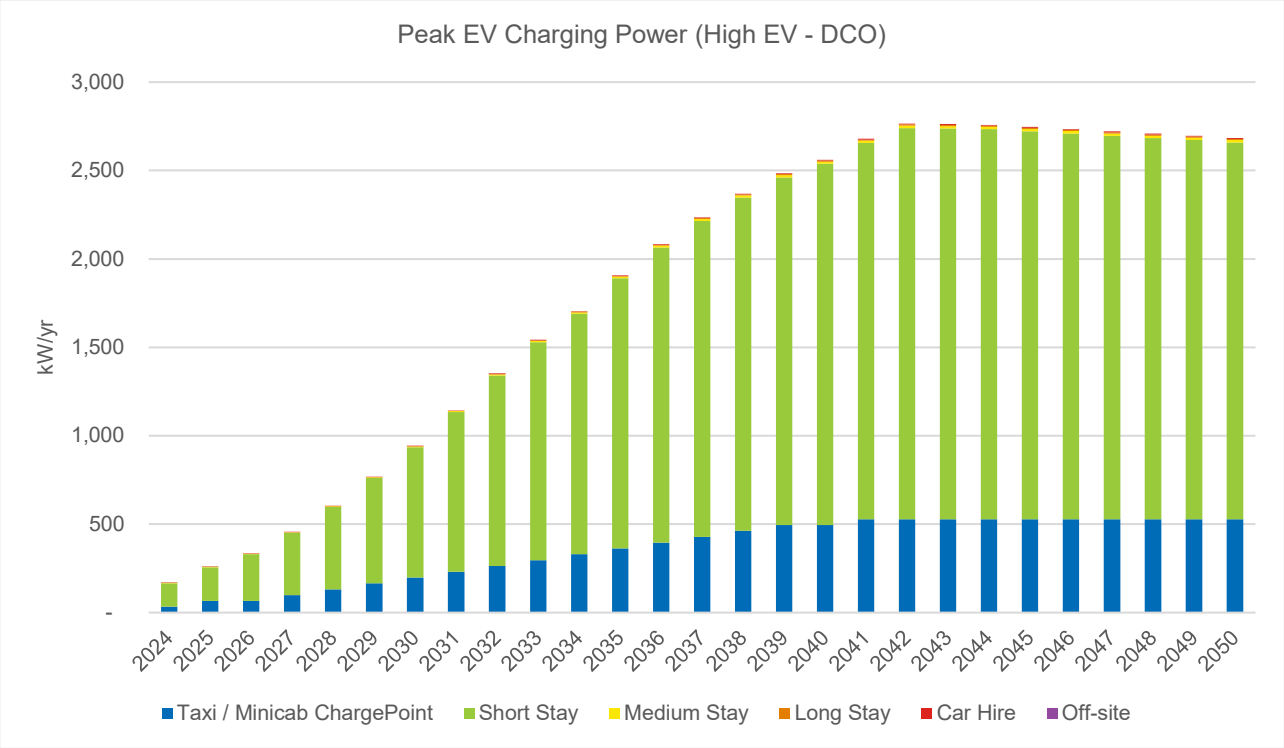


Figure 3.3: Projected EV electricity demand (MWh) (with development)



3.4 Renewable energy

On-site renewable energy

3.4.1 As electricity becomes the main energy vector for airport energy use, the proposals enable the developing airport to build in renewable energy on-site, at a rate that is consistent with the overall development plan, so that demand can be partly met from on-site or local generation connected to the airport electricity network via a private wire. The airport operator has proposed (in an Outline Carbon Reduction Plan), to supply at least 25% of energy used by the airport from on-site renewables by end of 2026, and 50% of the airport operational requirements by 2030.

3.4.2 The airport will still need to be connected to the grid because most of the time even a high level of locally supplied renewable energy would need the balance provided by the grid. The airport has in place (and will continue to have) arrangements to buy 100% renewable power, for anything not supplied from on-site generation, to minimise the residual carbon emissions[5]. There may also be

[5] Carbon foot printing assesses emissions from power demand on both a 'market basis' and on a 'locational basis'. The locational basis is on the basis of average emissions per kWh from electricity supply in the region, so is dependent on grid decarbonisation. The market basis assesses the contract for supply, and some sites buy 100% renewable power. However, since contracts for supply are usually short, they do not lead to additional renewable energy. For this reason locational basis is the preferred measure for planning applications. However, private wire renewables directly connected to a site and with a Power Purchase Agreement for the lifetime of the asset contribute to a locational basis assessment, and so continue to provide carbon reduction against grid electricity.

periods of high generation and low demand where the scheme may export power to the network via the same grid connection.

3.4.3 Renewable energy options include wind, PV, hydro, and biomass. There is no hydro potential in the area, and biomass has impacts in terms of air quality. There is some potential for small wind, but wind has noise, visual and aviation safeguarding impacts. Therefore, the focus is on solar as the main opportunity for significant on-site generation. Solar can be installed on new and existing buildings, above car parks, or on the ground. In terms of locations for PV:

a. Existing airport buildings are often (but not universally) difficult because of roof penetrations, age and structural issues with roofs, and complications with landlord and tenant arrangements (e.g. who legally owns the liability for a roof, who invests, and who benefits from the power generated).

b. New buildings owned and operated by the airport such as the proposed T2 building are significant opportunities for PV.

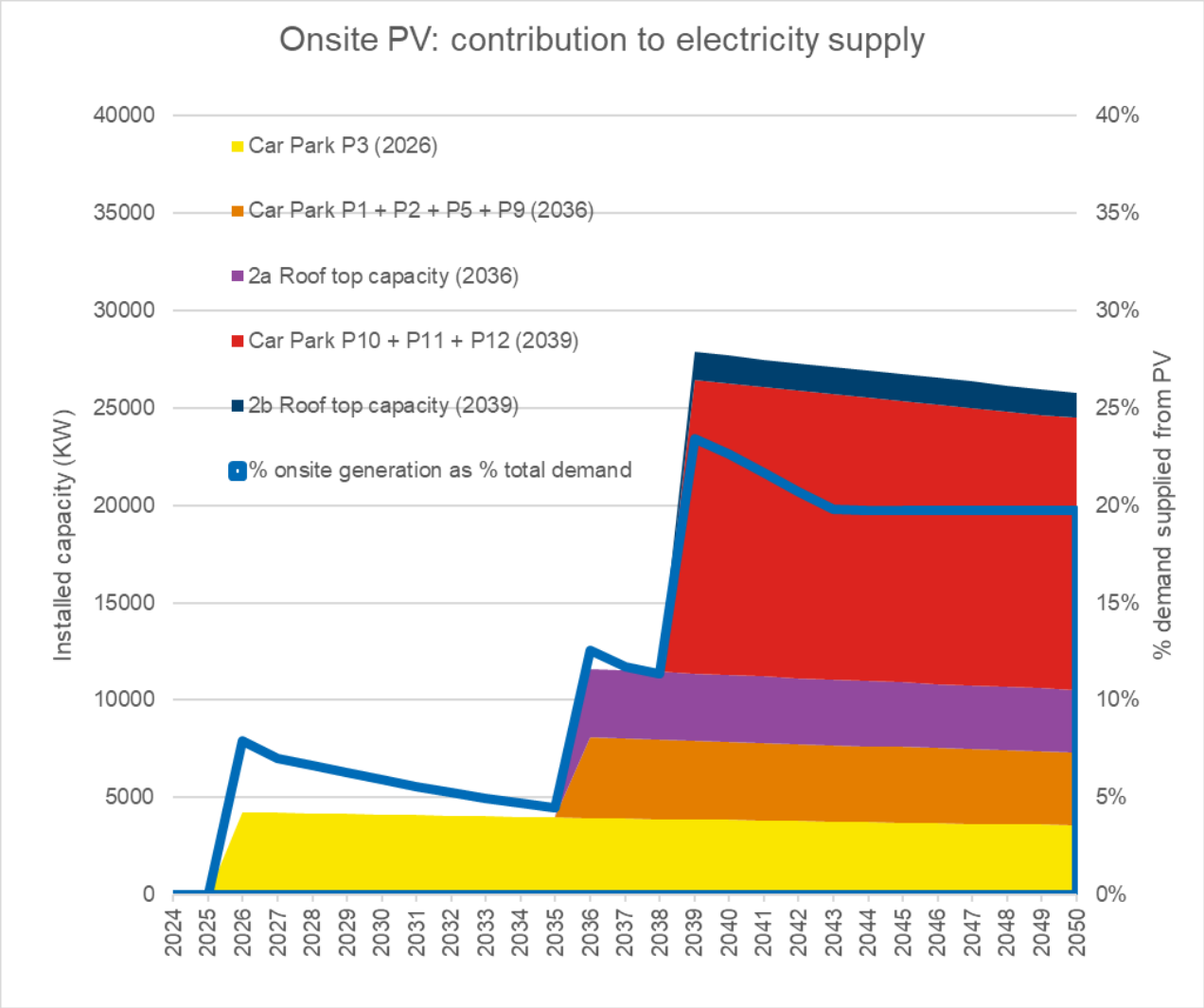
c. Car parks provide good opportunities for PV (usually over the parking space only, to allow access for taller emergency and service vehicles, and on the top layer of multistorey car parks only) and when a car park facility becomes fixed for the long term (there is no value in installing then moving an installation) and when car parks are electrified for EV charging. Around 2.5kW can be installed per surface car parking space.

d. PV can be installed on available land, but this is in short supply within the Order Limits of the Proposed Development. However, there are small areas of land just within the periphery of the airport that could be utilised. There are also areas outside the Order Limits that could be connected by private wire.

3.4.4 PV is built into the Proposed Development, including on buildings and car parks, it makes sense to include these in the plans for the DCO. However, where PV can be permitted separately, either through permitted development, or a separate local authority planning consent, proposals have not been included in the DCO proposals or accounted for as part of the energy modelling.

3.4.5 These measures contribute to, but may not deliver in its entirety, the existing airport operator’s target to supply at least 25% of power from on-site renewables by 2026, and 50% of the airport operational requirements by 2030. Thus, other options including opportunities for ground mounted solar within the airport (under permitted development rights) and outside the airport need more detailed exploration.

Figure 3.4: Onsite PV: contribution to electricity supply



Electricity storage

3.4.6 Security of supply is vital at airports. In times of poor visibility the standby generators are operated such that grid supply becomes the back-up to maintain essential, safety critical, aviation and air traffic functions (the generators are too slow to respond if the grid supply fails). Diesel generators can in due course be supplemented and ultimately replaced with electricity storage, which is much faster to respond, leading to significant reductions in diesel generation. Electricity storage, both dedicated storage and EVs, especially vehicle to grid (V2G) technology, may also have a role to play in smoothing demand and supply to support security of supply, help defer grid upgrade costs, and to maximise the value of on-site renewable generation.

3.4.7 The timing of the introduction of electricity storage as a supplement and replacement of diesel back up generation is uncertain and will depend on the regulatory framework for security of supply at airports. The aim is to remove all diesel generators by 2037 where evolving International Civil Aviation Authority (ICAO) and other regulations allow. Where standalone generators are required by regulations, lower emission fuels would be considered.

3.4.8 The battery storage park has space for container batteries of up to 80MW if single storey containers or double that if stacked. At the present time, no attempt has been made to quantify storage needs because the battery market is evolving so rapidly, but this is more than enough.

3.5 Longer term issues

Off-site renewable energy options

3.5.1 There is the opportunity for further renewable energy development outside the Order Limits, but close to the site and connected directly to the site by private wire and supplying the site under a Power Purchase Agreement that runs for the life of the asset. Consent is not sought for such proposals as part of this DCO application. If outside the Order Limits, they will be the subject of a separate application and impact assessment.

3.5.2 A scheme or schemes could deploy more than one renewable energy technology, subject to planning permission.

3.5.3 Such a scheme would be expected to have a Power Purchase Agreement for the lifetime of the asset, since its grid connection would be via the airport. It would provide long term carbon savings (which would count as savings on a locational basis as well as a market basis). It would make a significant contribution to achieving a zero emission airport.

3.5.4 Given the huge uncertainty over energy prices, such a scheme would provide long term cost savings to the airport.

3.5.5 Over the next few decades, potentially 50% or more of the airport operational requirements could be generated from on-site PV discussed above and further, near to site renewables, which are outside this application, if more than one technology was combined to give a much more diverse generation profile.

Zero emission aircraft

3.5.6 The Jet Zero Strategy anticipates a significant future for electrification of aircraft, ranging from measures to achieve zero emission airport operations (which might include electric tugs to reduce burning of aviation fuel whilst taxiing), to battery electric and hydrogen drive trains, with the expectation of:

a. A target for domestic flights to reach net zero by 2040, with Government undertaking consultation in 2023 on how this will be implemented.

b. The Jet Zero Strategy recognised that the General Aviation sector is well placed to encourage the early adoption of innovative zero emission aircraft, and newly commissioned research is expected to develop ambitious policies to allow this sector to pioneer zero emission flight.

c. Zero Emission aircraft are expected to be 4% of carbon savings under Jet Zero by 2050, including 5% ATMs in 2045 and 27% ATMs in 2050.

3.5.7 The airport plays host to significant domestic and general aviation journeys, though the proposed expansion is only to serve commercial aviation. However, airport operations consultations by Government are expected both on how to

achieve zero emission airports, and on further uptake of battery electric, hydrogen, and hybrid aircraft. At this stage it is too early to make specific provision for such technologies. However it is important to note there is no impediment to this change in future, and the airport expects to retain future operational flexibility to support such technologies over time. Thus:

a. The long term plan for upgrades to facilities to support a zero emission airport as required by policy will be laid out in revisions to the **Greenhouse Gas Action Plan** found in **Appendix 12.1** of the **ES [TR020001/APP/5.02]**).

b. For specific proposals to upgrade assets, the airport can use either permitted development rights accruing to the airport operator as a statutory undertaker, under the Town and Country Planning (General Permitted Development) (England) Order 2015, or submit an application for planning permission as needed.

3.5.8 There is significant uncertainty about future apron loads as Jet Zero proposals are implemented, and thus a need to consider implications for future additional electrical capacity and hydrogen capacity, noting that an increase in use of electric or hydrogen fuels would result in a reduction of another fuel on-site.

4 ELECTRICAL INFRASTRUCTURE

4.1 Baseline situation

4.1.1 The airport's electricity supply arrangements are shown below. The airport is supplied at 11 kV from Luton Airport Primary where other industrial, commercial, and residential loads are also supplied.

4.2 Projected energy demands

4.2.1 **Table 4.1** and **Figure 4.1** show increased power demand with or without the Proposed Development.

4.2.2 Even without development, Airport Buildings and ground operations with low carbon heating reach 15MW with a further 1.7MW for EVs (showing that the first of the proposed 33kV connections would be necessary in due course even without development).

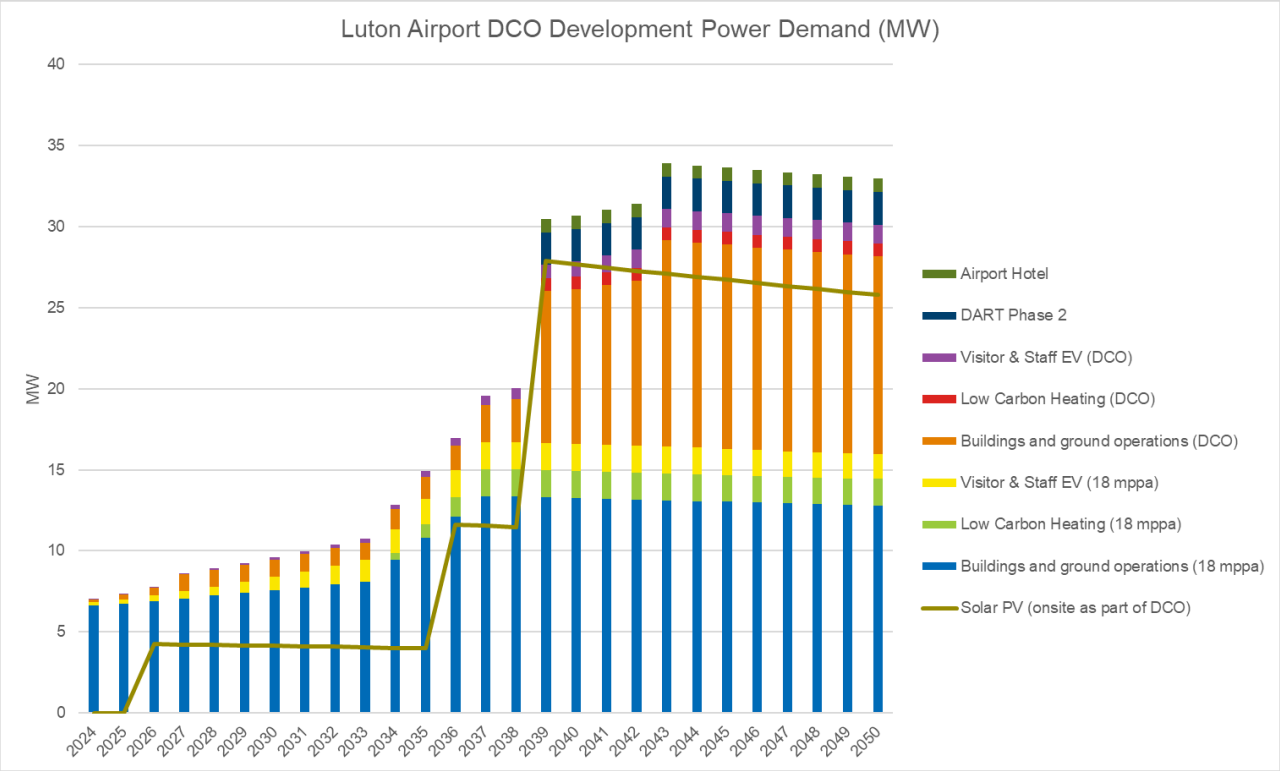
4.2.3 The Proposed Development will increase demand to 47MW. To meet this demand two parallel 33kV connections will be needed.

4.2.4 Further connections are expected to be needed for future demand linked to electric aircraft to meet the objectives in the Jet Zero Strategy, and additional connections will be needed in due course, however these are beyond the scope of the Proposed Development and the DCO application.

Table 4.1: Power demands relevant to asset design particularly grid connection

	Baseline Power MW 2019	Without Development Power MW (Max)	With Development Power MW (Max)
Airport Buildings and ground operations	6.6	15.0	28.3
Visitor and Staff EV	0.1	1.7	2.8
Luton DART	4.0	4.0	6.0
Hotels & Offices	0.0	0.0	3.9
Green Horizons Park	0.0	0.0	6.0
Total	**10.6**	**20.7**	**47.0**

Figure 4.1: Forecast power demand by type (proposed development plus Luton DART and Green Horizons)



4.3 Short and medium term network requirements

4.3.1 The network will need some reconfiguration to:

a. ensure security of supply to critical aviation infrastructure as it continues to both grow and transition to electricity as primary fuel; and

b. facilitate connection of renewable supply on-site and from private wire.

4.3.2 The expected load, with or without the Proposed Development, (mainly as a result of a transition to Electric Vehicles) is likely to begin to exceed the capacity at Luton Airport Primary at peak times. Therefore, the airport will need to implement peak demand management measures and a dedicated 33 kV connection by mid-decade.

4.3.3 Discussions have been held with UK Power Networks (UKPN) regarding supplies to the airport to ensure the additional connection can be delivered.

4.3.4 An application for a solar farm to the north east of the Proposed Development was submitted to North Hertfordshire Council on 5 January 2023 (Application Ref: 22/03231/FP).

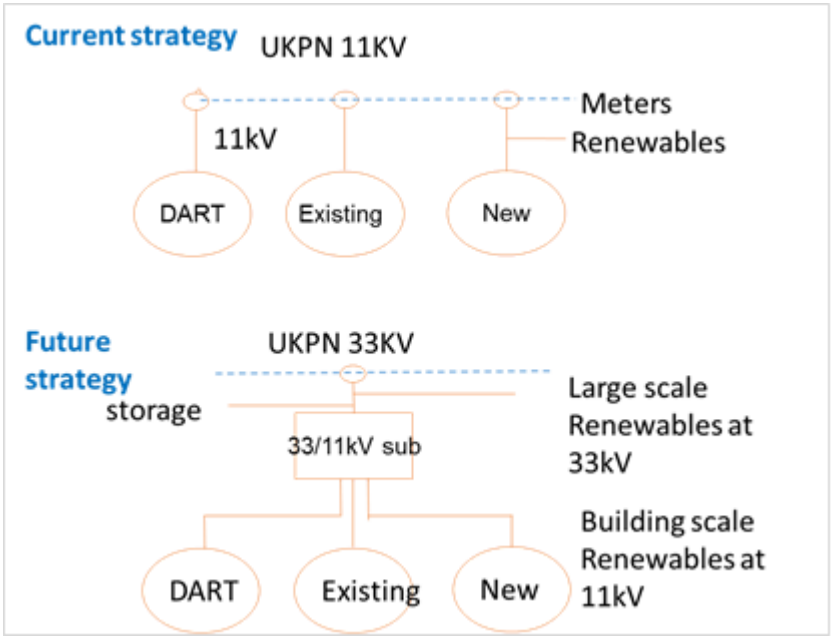
4.3.5 The late emergence of the solar farm proposal means that the impact of the application on the Proposed Development, and on the existing operational airport, has not yet been considered. Accordingly, the Applicant will consider this further during the next stage of the DCO process.

4.3.6 Discussions with UKPN have highlighted a number of prospective new connections in the Luton area that could use all the capacity on the 33 kV network (particularly data centres locating close to London). This could lead to the need for the airport to commission a new 132 kV connection from Sundon grid supply point (GSP) resulting in a higher grid connection cost. The risk of there being no capacity on the 33 kV network can be reduced by applying for a new 33 kV connection at an early date.

4.3.7 A formal application to upgrade the existing connection will need to be made to UKPN (and which is needed with or without the Proposed Development).

4.3.8 The commencement of operations at T2 will further increase electricity demand. Therefore a second 33kV connection will be required in the mid-2030s.

Figure 4.2: The current and mid-2020s strategy for connection to the electricity network



4.4 Long term network requirements

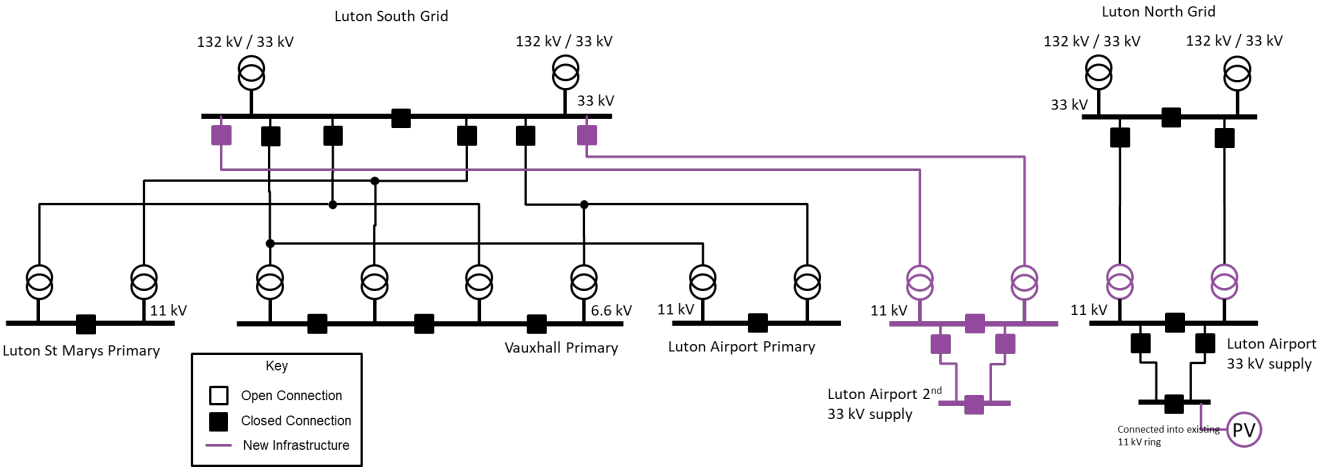
4.4.1 In line with the Jet Zero Strategy, the airport will need to prepare from 2035 onwards, for hydrogen and electric to displace some aviation fuel. Jet Zero anticipated up to 27% of ATMs, with 4% of carbon emissions mitigated in this way by 2050 (implying a focus on shorter journeys in smaller aircraft).

4.4.2 Given the opportunity for battery electric and hydrogen use on-site (and given that hydrogen may well need additional electricity for compression and liquefaction) further grid connections have been explored to the apron, and for security of supply reasons, supplied from another point of connection to the grid.

4.4.3 It is too soon to plan for these transitions in detail, though potential locations (e.g. for further grid connections) have been identified across the site but are not included in the Proposed Development. However, the changes needed to

accommodate future fuel requirements can be delivered through permitted development rights and the DCO is not an impediment to meeting these targets.

Figure 4.3: The mid-2030s strategy for connection to the electricity network



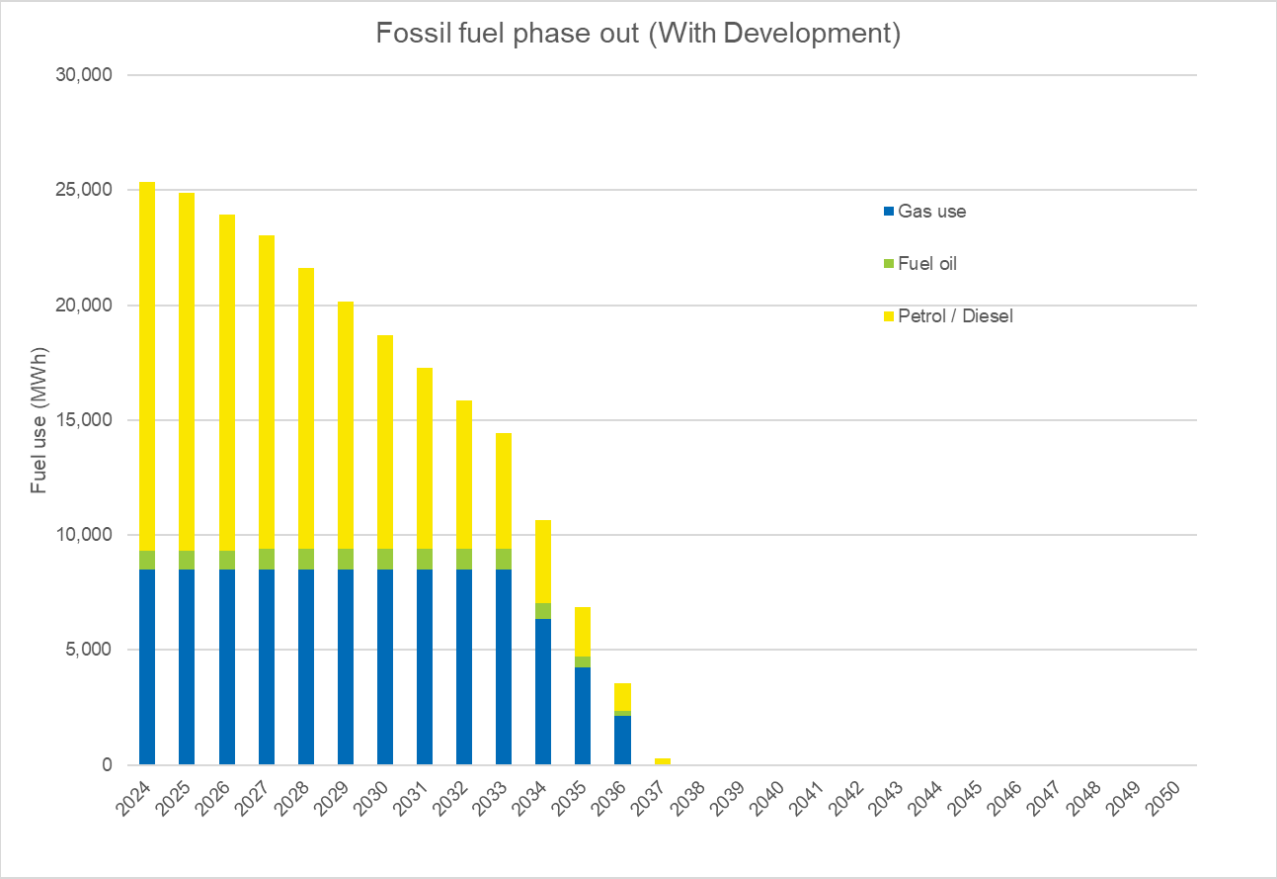
5 THE PROPOSED DEVELOPMENT

5.1 Energy demands relevant to the Proposed Development

5.1.1 The energy demands associated with the Proposed Development are described below.

5.1.2 Remaining fossil fuel use for heating, fuel for emergency power generation and petrol and diesel use in vehicles falls to zero by 2037 as shown in **Figure 5.1**.

Figure 5.1: Remaining fossil fuel use (With Development)



5.1.3 Electricity demand will increase with the addition of T2, removal of gas heating and replacement with heat pumps, removal of fuel oil generation and replacement with battery storage, the electrification of airport vehicles and electricity supply to visitor and staff electric vehicles.

5.1.4 The instantaneous power required by the Proposed Development is shown in **Figure 5.2.**

5.1.5 The annual total energy demand is shown in **Figure 5.3.**

Figure 5.2: Forecast average power demand (MW) (With Development)

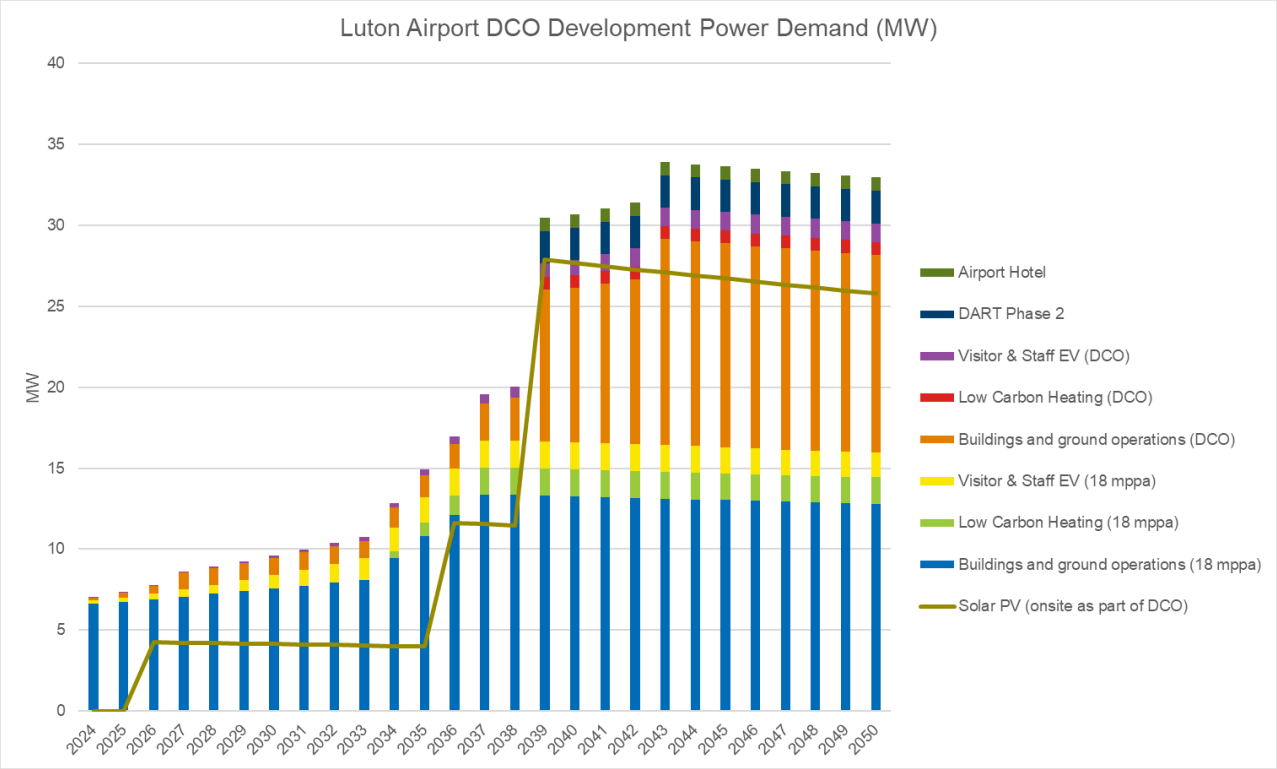
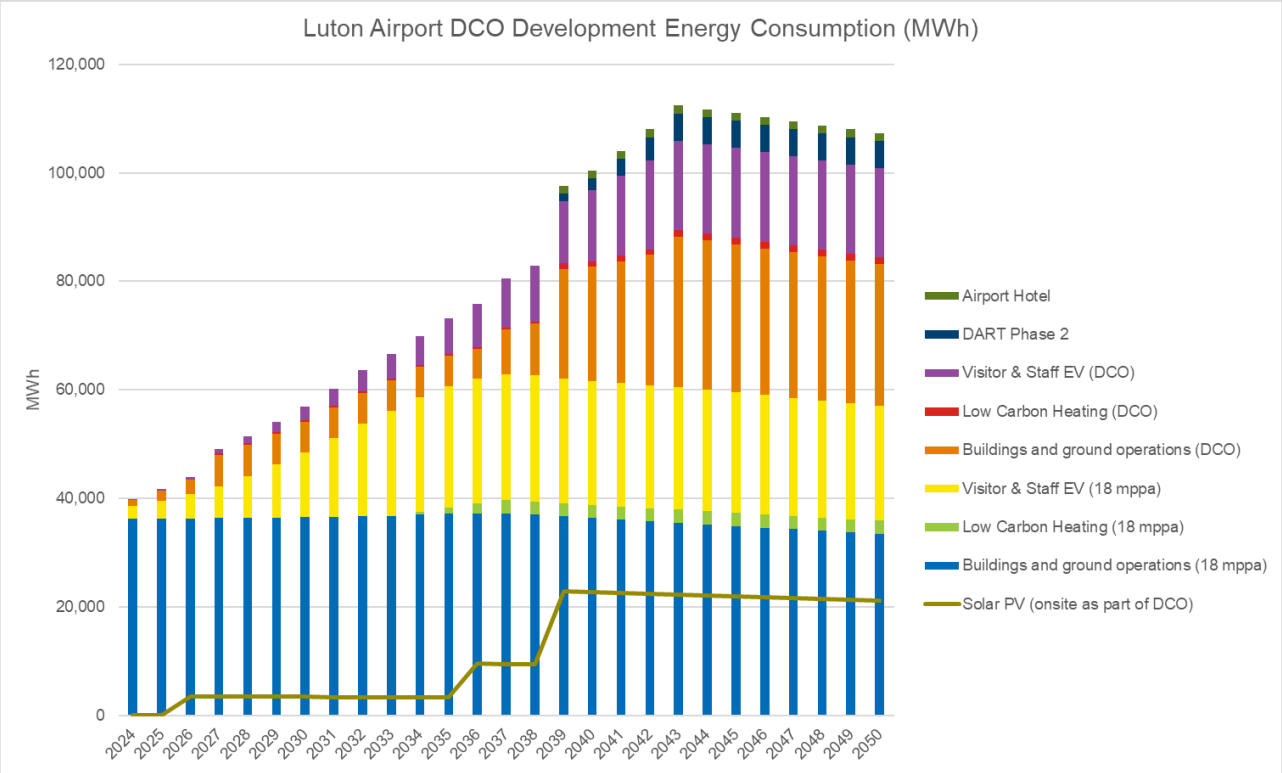


Figure 5.3: Forecast electricity demand (MWh over the year) (With Development)



5.1.6 The proportion supplied by solar which is built into the Proposed Development increases to 20%.

5.2 Energy infrastructure included in the Proposed Development

5.2.1 To support the projected increases in energy demand, reduction in fossil fuel energy usage and increase in green energy generated on site, the following infrastructure is included in the Proposed Development[6]:

a. A new 33kV sub-station is included in assessment Phase 1 (Work No. 4w).

b. A new 33kv sub-station is to be provided in assessment Phase 2a (Work No. 3h).

c. An energy centre is included in assessment Phase 2a (Work No. 3h).

d. Photo voltaic solar panels re proposed in all assessment phases, predominantly on existing and proposed roof spaces and within car parks.

e. A battery storage facility is proposed in assessment Phase 2b (Work No. 4e).

[6] For further details of the assessment phases refer to Chapter 4 of the Environmental Statement [TR020001/APP/5.01]

6 SUMMARY AND CONCLUSIONS

6.1.1 The Energy Statement reflects the increased importance of mitigating carbon emissions from airport proposals and focuses on the airport itself.

6.1.2 This requires a switch to electricity as a fuel source for space conditioning and access (including EVs, airports own vehicles and DART). This demand needs greater electricity infrastructure, and can be supplied from a combination of on site or adjacent to site but directly connected renewable energy. The onsite element of this has been quantified as part of the DCO, and shows a significant contribution to the airport operator's published targets for renewables.

GLOSSARY AND ABBREVIATIONS

Term	Definition
ATM	Air Transport Movement
AV	Autonomous Vehicles
DCO	Development Consent Order
DfT	Department for Transport
ES	Environmental Statement
EV	Electric Vehicle
GCG	Green Controlled Growth
GPU	Ground Power Unit
LED	Light Emitting Diode
LLAOL	London Luton Airport Operations Limited
Luton DART	Luton Direct Air Rail Transit
Private Wire	Private wire systems involve the connection of privately-owned electrical energy generation equipment to the site behind the metering point without ever being connected to public network
PV	Photovoltaic
SAF	Sustainable Aviation Fuel
Space Conditioning	Space Conditioning System provides heating, or cooling within or associated with conditioned spaces in a building, and may incorporate use of components such as chillers/compressors, fluid distribution systems (e.g., air ducts, water piping, refrigerant piping), pumps, air handlers, cooling and heating
TAG	Transport Analysis Guidance
T2	Terminal 2

Term	Definition
UK ETS	UK Emissions Trading Scheme
UKPN	UK Power Networks
V2G	Vehicle to grid

REFERENCES

Ref 1.1 The Climate Change Act 2008 (2050 Target Amendment) Order 2019
Ref 1.2 The Carbon Budget Order 2021.
Ref 1.3 HMG (2018a) Her Majesty's Government Airports National Policy Statement (ANPS).
Ref 1.4 HMG (2018b) Her Majesty's Government The Future of Aviation: Making Best Use of Existing Runways
Ref 1.5 Luton Council (2022) Luton 2040 A Place to Thrive.
Ref 1.6 Luton Council (2021) Outline Carbon Reduction Plan in Variation of Conditions application (21/00031/VARCON).
Ref 2.1 Ricardo (2019) London Luton Airport Carbon Footprint Report 2019 Final 210521
Ref 2.2 Green Book Supplementary Guidance: valuation of energy use (2022) and BEIS (2023) Greenhouse Gas Emissions for appraisal.
Ref 2.3 Department for Transport (2021) Transport Decarbonisation Plan.
Ref 3.1 Better Buildings Partnership (2013) Green Lease Toolkit, 1 August 2013.
Ref 3.2 Ricardo (2023) Ricardo to engineer zero emission buses for UK's first hydrogen transport hub.
Ref 3.3 National Grid (2023) Future Energy Scenarios.