Planning for Roof Mounted Solar Photovoltaics in London

Research

Greater London Authority

Final report

Prepared by LUC

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Chapter 1

Executive Summary

1.1 LUC was commissioned by the Greater London Authority (GLA) to carry out research into the planning approaches to solar photovoltaics (PV) on existing buildings in London. In addition, LUC was commissioned to make recommendations to national Government, the GLA and London boroughs to encourage solar PV installation through the planning system and ensure planning policies do not unnecessarily hinder solar installation on existing properties. The purpose of the research was to understand current planning approaches of London boroughs to the installation of solar PV on existing buildings in London and to make recommendations to promote solar PV installations and ensure planning policies are consistent and supportive as far as possible.

1.2 The research included a policy review, interviews with a select group of London boroughs and analysis that led to a selection of case studies and a set of recommendations. We selected six London boroughs to interview to provide a representative sample for the entirety of London, covering the full spectrum of approaches to solar PV installations. The interviews included development management, planning policy and conservation officers at each of the six London boroughs. The six boroughs that were selected were: Camden, Richmond, Kensington and Chelsea, Bromley, Merton and Redbridge.

1.3 Following on from our policy research and interviews with the six London boroughs, Solar Energy UK and Historic England we have drawn conclusions and provided a set of recommendations. The desk-based research into the approaches of other cities within Europe and North America with regard to solar PV installation specifically within Conservation Areas helped us to understand if there are any lessons that could be applied in London. All the case studies demonstrate the importance of positive renewable energy programmes and policies created at the national, regional or local level.

1.4 The policy review identified the following key points:

- One third of London boroughs have implemented Article 4 directions that specifically restrict permitted development rights for solar PV.
- The majority of London boroughs have created relevant planning guidance documents, however, only fifteen have produced more specific guidance on retrofitting and solar PV.
- While the majority of London boroughs have local plan policies that focus on renewable energy, only one borough has specifically included solar panels within a local plan policy.
- Specific expectations for the provision of solar PV are set out within neighbourhood plans.
- None of the London boroughs has included any discussion on overshadowing and the potential effects it could have on the performance of solar PV within their local plans.

1.5 The findings from the policy review informed the questions for the stakeholder interviews. The London borough stakeholders were asked for their views on two main themes: their borough's response to the climate emergency and their borough's approach to renewable energy and the historic environment.

1.6 The following conclusions were identified in the stakeholder interviews:

- The amount of action being taken to deliver the climate action plans that have been produced or are being produced varies across boroughs.
- The majority of the six boroughs perceive all solar PV installations on listed buildings and within Conservation Areas as harmful.
- There are different approaches across the London boroughs and even within the boroughs on how the public benefit from solar PV should be weighed when deciding planning applications.

1.7 After compiling research on all of the London boroughs as well as the City of London, we have put together a series of recommendations which are summarised below:

Recommendations to the national government

- Make the wording of the conditions related to renewable energy permitted development rights clearer for applicants and planning officers and consider reviewing permitted development rights to ensure they are current and respond effectively to the climate crisis.
- In the absence of any change in the wording of the permitted development rights, technical guidance should be provided to give a clear explanation of permitted development rights for solar PV.

Recommendations to Historic England

- Provide guidance on how the public benefit of solar PV should be weighed against any potential harm to the heritage significance of a listed building or Conservation Area.

Recommendations to the GLA

- Explore whether solar specific policies within the next London Plan would contribute towards the Mayor's Net Zero ambitions and help guide boroughs.
- Explore whether a specific policy that sets out how overshadowing should be considered as a material planning consideration would be effective in promoting and safeguarding renewable energy sources.
- Create technical guidance document/practice note on what needs to be included in a planning application for solar PV installation.
- Create technical guidance/practice note on a sustainable approach to retrofitting, based on the energy hierarchy.

Recommendations to London boroughs

- Create local plan policy on sustainable retrofitting to guide the borough's approach.
- Create local plan policy that sets out how overshadowing should be considered a material planning consideration.
- Create specific guidance regarding solar PV for each Conservation Area or overarching guidance based on area types throughout the borough or borough wide.

Chapter 2

Background and Research Aim

Background

2.1 LUC was commissioned by the Greater London Authority (GLA) to carry out research into the planning approaches to solar photovoltaics (PV) on existing buildings in London and to make recommendations to national Government, the GLA and London boroughs to encourage solar PV installation through the planning system and ensure planning policies do not unnecessarily hinder solar installation on existing properties.

2.2 The Mayor has set an ambition for London to become zero carbon by 2030, thereby providing Londoners with access to affordable, clean and renewable energy. To achieve this ambitious goal, London will need to be supplied by a range of clean and renewable energy sources. Solar energy has a crucial role to play in this. The versatility of solar technologies, with their ability to be installed in a wide range of locations and sizes, makes these technologies a key opportunity for London to increase its uptake of renewables.

2.3 In the past decade, the UK has seen a dramatic increase in the number of solar energy installations. However, installation rates in London are the lowest of any region in the UK – with data showing that 18 of the 20 local authorities with the smallest proportion of households with solar PV are London boroughs. In addition, it appears through correspondence to the Mayor and the GLA, communications from boroughs and the experience of Mayoral programmes, that there is some inconsistency in the approach by London local authorities to the application and interpretation of permitted development rights. This is particularly prevalent in (although not limited to) conservation areas. There is a strong correlation between high installation rates of solar and rural location **[See reference** 1**]**. However, there is also considerable potential in London for roof mounted solar PV, as solar radiation is high and there is extensive roof space.

Mayor's Solar Action Plan

2.4 The Mayor of London's Solar Action Plan (2018) sets out how the Mayor will increase solar energy generation in London through a number of initiatives and actions. The overall aim of the Plan is to achieve one gigawatt of installed solar capacity by 2030 and two gigawatts by 2050. Since the publication of the Mayor's Solar Action Plan, the Mayor has published the Analysis of a Net Zero 2030 Target for Greater London which sets out the Mayor's 'Accelerated Green' preferred pathway which has updated London's solar capacity aim to a total of 1.5 GW of rooftop solar PV to be installed by 2030, and 3.9 GW by 2050 **[See reference** 2**]**. In 2020 there was 152 MW (151,754) installed capacity for solar PV in London **[See reference** 3**]**.

2.5 One of the five key objectives of the Solar Action Plan is to encourage solar energy installations through the planning system to ensure that new and existing developments are utilising this renewable energy source. The GLA wishes to work with boroughs to ensure that planning policies do not unnecessarily restrict solar PV installation on existing properties.

Research Aim

2.6 The purpose of the research was to understand current planning approaches of London boroughs to the installation of solar PV on existing buildings in London and to make recommendations to national Government, the GLA and London boroughs to promote solar PV installations and ensure planning policies are consistent and supportive as far as possible.

Legislative and Policy Context

National Context

2.7 Legislation and policy are increasingly seeking to address the climate emergency. Section 19 (1A) of the Planning and Compulsory Purchase Act of 2004 **[See reference 4]** embeds climate change into the plan making process, by requiring local planning authorities to include in their Local Plans "policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change". This remains a primary consideration during the Local Plan's examination.

2.8 The Climate Change Act 2008 **[See reference 5]** committed the UK to reducing its greenhouse gas emissions by 80 per cent by 2050, compared to 1990 levels. This target was strengthened in 2019 when the UK became the first major economy to commit to a 'net zero' target. The new target requires the UK to bring all greenhouse gas emissions to net zero by 2050.

2.9 To reflect this legislation, the latest iteration of the National Planning Policy Framework (NPPF) **[See reference 6]** places climate mitigation and adaptation at the heart of planning process. Paragraph 152 states that "the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure".

2.10 Paragraph 156 also sets out that "Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning".

2.11 The NPPF also highlights the relationship between climate change and the historic environment. The NPPF sets out that weight should be given to the heritage asset's conservation when considering the impact of a proposed development on the asset's significance. However, paragraph 202 states that "where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use".

2.12 Furthermore, paragraph 58 of Section 14 of the NPPF, Meeting the challenge of climate change, flooding and coastal change, states that local planning authorities should "not require applicants to demonstrate the overall need for renewable or low carbon energy and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions".

2.13 The Planning for the Future White Paper (2020) **[See reference** 7**]** and the Net Zero Strategy: Build Back Greener post Covid-19 (2021) **[See reference** 8**]** also make a commitment to addressing climate change through the encouragement of renewable energy provision.

2.14 The Listed Buildings and Conservation Areas Act **[See reference** 9**]** was introduced in 1990 and created special controls for the demolition, alteration or extension of buildings, objects or structures of particular architectural or historic interest, as well as Conservation Areas. This has introduced greater restrictions on solar PV installations.

2.15 Finally, the High Court ruling in William Ellis McLennan vs. Medway Council and Ken Kennedy (2019) set a new precedent for planning and climate change law. The local authority had granted planning permission for an extension even though it would block sunlight falling on a neighbour's solar panels. This was then challenged in court and the judge overturned the planning permission on the basis that the electricity generated by solar PV panels was helping to mitigate climate change. This is the first time that the courts have determined that the amount of light falling on solar panels should be a planning consideration **[See reference** 10**]**.

Permitted Development Rights for Solar PV

2.16 Since April 2008, under the Town and Country Planning (General Permitted Development) (England) Order 2015 **[See reference** 11**]**, the installation of solar PV is classed as a 'permitted development' on domestic premises, through Part 14 Class A, unless on a listed building or installed on a wall which fronts a highway within a Conservation Area. This was extended to include solar PV systems installed onto commercial, industrial and agricultural roof spaces in England, Part 14 Class J, under the Town and Country Planning (General Permitted Development) (Amendment) (England) Order 2015. Furthermore, Part 14 Class B and K give permitted development rights to stand-alone solar on domestic and non-domestic premises, respectively. However, it should be noted that the permitted development rights for solar PV are subject to various conditions.

2.17 Planning Policy Guidance (2014) **[See reference** 12**]** states that, where a planning application for solar PV is required, factors to be considered include:

- The importance of siting systems where they can collect the most energy from the sun;
- The effect on a protected area such as an Area of Outstanding Natural Beauty or other designated areas;
- The colour and appearance of the modules, particularly if not a standard design.

London Context

2.18 There are approximately 3.59 million dwellings in London and as of 2020 they are the greatest contributors of greenhouse gas emissions within the city. Greater London covers an area of around 1,600km2, around one third of which consists of building rooftops. 80 per cent of the existing building stock within London will remain in use until 2050, therefore retrofitting is vitally important **[See reference** 13**]**. However, about half of the existing residential building stock is flats, which means that the use of roofs for solar PV can be more

complex, with shared ownership of the roof and the need to manage any income equitably. Energy prices have increased considerably since 2020 and are likely to increase further. 15 per cent of households are already in fuel poverty within London which equates to half a million homes. Increasing installation rates of solar PV could provide energy savings and help alleviate fuel poverty within the city.

2.19 Almost one fifth of London is designated as a Conservation Area, with this figure rising to 50 per cent in certain inner London boroughs. Therefore, a key planning issue is the ability to balance climate change mitigation objectives through the installation of solar PV with the conservation of the built environment.

Climate change impacts

2.20 The UK Climate Projections (UKCP18) shows that in 2050 the climate in London will be warmer with wetter winters and drier summers than at present. Specifically:

- Under medium emissions, the increase in winter mean temperature is estimated to be 2.2ºC; it is unlikely to be less than 1.1ºC and is very unlikely to be more than 3.4ºC.
- Under high emissions, the increase in summer mean temperature is estimated to be 2.8ºC; it is unlikely to be less than 1.3ºC and is very unlikely to be more than 4.6ºC.

2.21 A changing climate may place pressure on some native species and create conditions suitable for new species, including invasive non-native species. Although the precise nature of environmental changes is not fully understood, changes to precipitation patterns and flooding have implications for the location, longevity and viability of developments. Conversely, dry and hot summers will cause problems of low flows for some of the rivers in London which will increase demand for water. Extreme weather events may also increase disruption to supply chains, infrastructure and transport.

2.22 The hotter and drier summers and the urban development and densification of London, results in the city being further impacted by the urban heat island (UHI) effect. The UHI effect can cause London to be up to 10 degrees warmer than neighbouring rural areas. Urban growth can contribute to the urban heat island effect, this is due to the land surfaces in towns and cities, which are made of materials like tarmac and concrete. Tarmac and concrete absorb and store heat, which when coupled with concentrated energy use and less ventilation than in rural areas, creates a heating effect. Therefore, heat islands raise the demand for electricity and energy to provide air conditioning in the summer and lead to an increase in air pollution and greenhouse gas emissions because energy is typically supplied by fossil fuels. Furthermore, the poorly insulated/designed existing building stock leads to the inefficient use of energy and increased energy demand.

2.23 Switching to solar energy eases reliance on fossil fuels and has a direct influence on the reduction of greenhouse gas emissions and furthermore mitigating climate change. The deployment of solar panels is locally beneficial in that it decreases the UHI effect through reflection and conversion of solar radiation into energy, particularly in the summer. A study evaluating the influence of solar PV panels on urban weather which simulated solar panels in the Paris metropolitan area provided an indication of the impact of solar PV on the UHI effect. The simulations showed that during summer, when sunlight is strong, the presence of solar panels can reduce the UHI effect by a fifth by day and up to almost a third at night **[See reference** 14**]**.

London Plan 2021

2.24 Relevant planning policy from the London Plan 2021 includes Policy SI2 Minimising greenhouse gas emissions. This sets out net zero carbon requirements applying to major development. Part C states, “A minimum on-site reduction of at least 35 per cent beyond Building Regulations 152 is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in

agreement with the borough [through various options].” (LUC emphasis). The supporting text to this policy notes that, “Boroughs should ensure that all developments maximise opportunities for on-site electricity and heat production from solar technologies (photovoltaic and thermal) and use innovative building materials and smart technologies” (para.9.2.3).

Analysis of a Net Zero 2030 Target for Greater London

2.25 In 2018, the Mayor of London published the London Environment Strategy and Zero Carbon London: A 1.5°C Compatible Plan, which presented a range of energy system scenarios for London consistent with a 2050 Net Zero target. Since their publication, the Mayor has committed to bringing forward London’s net zero target to 2030. The Analysis of a Net Zero 2030 Target for Greater London states that at a national level the UK is committed to achieving a 68 per cent reduction in emissions, and to reach net zero emissions by 2050 **[See reference** 15**]**. The Analysis of a Net Zero 2030 Target report developed four scenarios, which represent different levels of decarbonisation ambition, and the Mayor’s preferred scenario is the ‘Accelerated green’ pathway.

2.26 The net zero 2050 scenarios developed for the 1.5°C Plan (2018) **[See reference** 16**]** all reached close to 10 per cent residual emissions (relative to 1990 levels) by 2050, which would need to be offset. However, all four scenarios from the Analysis of a Net Zero 2030 Target report (2022) including ‘Accelerated green’ achieved greater levels of decarbonisation by 2050 than the scenarios in the 1.5°C Plan (2018),and exhibit more than 10 per cent residual emissions (relative to 1990 levels) by 2030. With regard to policy recommendations, the study notes that the GLA, London boroughs, the private sector, regulated utilities, and other public bodies have a critical role in driving the net zero transition and will need to take a proactive role in both leading local change and in working to put London in a strong position to take advantage of national opportunities as they arise. Solar PV deployment is expected to play an important role in reducing the impact of the electricity grid.

London's Environment Strategy

2.27 The Mayor of London's Environment Strategy **[See reference** 17**]** sets out a number of aims and actions for London including improving energy efficiency in all buildings and increasing solar powered energy generation. Objective 6.2 of the strategy aims to develop clean and smart, integrated energy systems utilising local and renewable energy resources. Building on the objective, Proposal 6.2.1.b aims to increase the amount of solar generation in London, including through community energy projects and on GLA group buildings.

London Borough Policies

2.28 At present, twenty-eight London boroughs and the Mayor of London have declared climate emergencies. While not all London boroughs have declared climate emergencies, almost all are taking action. This has been in the form of setting net zero targets and/or developing climate action plans.

2.29 The research included a survey of all the boroughs' climate change policies and specific policies regarding solar PV. There is a wide variation in policy approach, as outlined later in this report, but it is clear that a key issue is the reconciliation of built environment conservation policies with polices on solar PV. This issue was featured in a recent Guardian article which noted that Merton Council ordered a resident to remove solar panels from their home as it is situated within a Conservation Area **[See reference** 18**]**.

Chapter 3

Methodology

Desk-Based Research

3.1 The desk-based research involved a review of national and regional policy as well as development plan policy, supplementary guidance, Article 4 directions and Conservation Area appraisals and management plans for each London borough and the City of London. Additionally, we reviewed the Mayor of London's Solar Opportunity Map **[See reference** 19**]** created by the GLA as well as various Mayoral programmes, such as the Retrofit Accelerator - Homes and Workspaces **[See reference** 20**]**. Our findings are presented in Appendix A.

Stakeholder Interviews and Case Studies

3.2 The desk-based research provided a baseline against which we were able to select London boroughs to interview. Based on these findings we narrowed down the London boroughs to six that we would interview to further understand their approach to solar PV installation.

3.3 The six London boroughs were selected as they provided a mix of inner and outer London boroughs as well as boroughs that have more supportive solar policies and those that have an absence of or less supportive policies. These six boroughs were chosen to provide a representative sample for the entirety of London, covering the full spectrum of approaches to solar PV installations. Some of the boroughs have proactive climate action plans, have created guidance on retrofitting or have proposed various schemes to increase the installations of solar panels on existing buildings. While others have not yet

declared a climate emergency, do not have specific guidance on solar PV installation or retrofitting and have implemented Article 4 directions within Conservation Areas removing permitted development rights for solar PV installations. The interviews included development management, planning policy and conservation officers at each of the six London boroughs. They gave us insight into what issues they are facing and what they are or are not doing to increase the uptake of solar PV on existing buildings.

3.4 The London boroughs selected and reasoning behind the choice are outlined below:

- London Borough of Camden (two officers interviewed) – The local plan and Neighbourhood Development Plans contain references to retrofitting historic buildings. While the borough has implemented Article 4 directions within a number of Conservation Areas regarding solar, its guidance on energy efficiency within Conservation Areas **[See reference** 21**]** is supportive of installations. The borough has also created guidance **[See reference** 22**]** setting out what types of low carbon measures require planning permission when retrofitting. Not many boroughs have produced similar guidance.
- London Borough of Richmond upon Thames (four officers interviewed) - The borough has a very historic local context with 85 Conservation Areas. With potential barriers to solar PV installation due to the amount of Conservation Areas, it was important to understand how the borough is approaching heritage and mitigating climate change. Their local plan policies note the potential of combining green roofs and solar installation which no other plan does. However, the borough does not currently have any guidance on the installation of solar PV.
- Royal Borough of Kensington and Chelsea (two officers interviewed) – The borough has created a Greening SPD **[See reference** 23**]** which provides guidance on what needs to be considered when installing solar PV. Additionally, the borough is currently in the process of reviewing their local plan and have included an emerging policy that relates specifically to retrofitting with solar panels within Conservation Areas. Furthermore, the borough has just finished consulting on a draft Local Listed Building Consent Order for solar PV, the first of its kind.

- London Borough of Bromley (two officers interviewed) – Bromley's local plan does not have policies focused specifically on solar PV or retrofitting. Additionally, the borough has not produced any guidance regarding solar or retrofitting. It is also one of the few London boroughs that has not declared a climate emergency. Furthermore, Bromley is located within the southeast of London while most of the other boroughs we have chosen are within the west of London, so it was helpful to understand if geography is also a factor.
- London Borough of Merton (two officers interviewed) – Merton's local plan policies focus on renewable energy and new builds. The borough has not produced borough-wide guidance, but rather for the area of Wimbledon which includes a section on sustainability which features retrofitting and solar PV.
- London Borough of Redbridge (one officer interviewed) – Redbridge's local plan policies state that all development should contribute towards mitigating climate change, however there is nothing specific regarding solar PV. Additionally, the borough has implemented a few Article 4 directions within Conservation Areas that are specific to solar PV. A few Conservation Area appraisals include photos of solar PV panels as examples of 'inappropriate development' or a 'negative addition.'

3.5 Additionally, we interviewed:

- Solar Energy UK, an established trade association working for the solar industry, representing 256 businesses and associates. It was essential to understand the industry's stance on how/if the planning process is impacting solar PV installation rates across London.
- Historic England, the Government's statutory agency for conservation and heritage. It was important to understand Historic England's current stance on retrofitting historic buildings especially with regard to solar PV.

3.6 These were informal interviews with open questions. The aim was to give the interviewees the opportunity to relate broadly on solar PV installations within their boroughs.

3.7 In addition to the stakeholder interviews, we researched case studies that reflect good practice and provide support to our recommendations, as set out in Chapter 5. The desk-based research into the approaches of other cities within Europe and North America with regard to solar PV installation specifically within Conservation Areas helped us to understand if there are any lessons that could be applied in London. All the case studies demonstrate the importance of positive renewable energy programmes and policies created at the national, regional or local level. Additionally, evidence indicates that political support is essential. The case studies present different approaches that were applied in various contexts. The case studies are presented in Appendix B.

Approach to Conclusions and Recommendations

3.8 Following the policy review and research and interviews with the six London boroughs we drew conclusions and developed a set of recommendations for national government, Historic England, the GLA and London boroughs. Our policy review of the London boroughs led to the selection of six boroughs to interview as stated above. The findings from the interviews were then fed into the recommendations. Further to this, as stated above, we undertook desk-based research into various World cities and across the UK to understand what approaches were being taken with regard to solar PV and existing buildings and if these approaches could be utilised in London. This research also fed into our recommendations. The recommendations are outlined in Chapter 5.

Chapter 4

Summary of Findings

4.1 This chapter summarises the key findings from the policy review of the 32 London boroughs and the City of London and the stakeholder interviews conducted with six London boroughs. The full review of London borough planning policies is provided in a matrix in Appendix A.

Findings from London Borough Policy Research

4.2 The review identified the following key points:

- Nine of the thirty-three London boroughs have implemented Article 4 directions specific to restricting solar PV within Conservation Areas and two additional boroughs are in the process of proposing Article 4 directions specific to restricting solar PV within certain Conservation Areas.
- While twenty-nine of the London boroughs have created relevant planning guidance documents, such as guidance that contains some information on renewable energy, only fifteen have produced more specific guidance on retrofitting and solar PV. The more specific guidance is either in the form of an entire document on retrofitting, especially within Conservation Areas, or simply a chapter within a more general supplementary planning document. Each piece of guidance notes that the integration of solar PV should be done in a nonintrusive manner. However, it should be noted that a few boroughs, like the London Borough of Islington, are in the process of creating guidance on solar energy specifically.
- Twenty-three of the thirty-three London boroughs have local plan policies that focus on renewable energy especially with regard to the energy hierarchy set out in the London Plan. Sixteen of the thirty-three boroughs' local plans also contain policies on incorporating renewable energy within

new builds while eleven of the boroughs also include a policy on retrofitting or improving energy efficiency within existing buildings. Only one borough, Hillingdon, has specifically included solar panels within a local plan policy. The policy states that solar panels should be carefully located to not adversely affect a building or area. Apart from Hillingdon, the local plans of the London boroughs do not specifically mention solar PV. However, there are more specific policies being drafted, such as the Royal Borough of Kensington and Chelsea's emerging Local Plan that contains a policy on sustainable retrofitting **[See reference** 24**]**. This policy aims to provide guidance for applicants on how to sensitively retrofit their homes specifically with regard to solar PV and buildings within Conservation Areas.

- None of the London boroughs has included any discussion on overshadowing and the potential effects it could have on the performance of solar PV within their local plans. This is despite the case law, William Ellis McLennan vs. Medway Council and Ken Kennedy (2019), that overshadowing is a material planning consideration.
- Specific expectations for the provision of solar PV and retrofitting existing buildings are set out within ten neighbourhood plans **[See reference** 25**]**, all of which are supportive.
- While the majority of London boroughs, twenty-eight, have declared climate emergencies, not all of them have specific policies relating to climate mitigation and adaptation. Twenty of the boroughs have or are in the process of producing climate action plans that contain actions relating to the installation of solar PV. However, climate action plans do not have the same status as local plan policy.

Findings from Interviews with Select London Boroughs

4.3 The findings from the policy review informed the questions for the stakeholder interviews. Interviews were held with a number of different officers from each borough including development management planning officers,

planning policy officers and conservation officers. As noted above, we also interviewed Historic England and Solar Energy UK. The stakeholders were asked for their views on two main themes:

1. Their borough's response to the climate emergency

2. Their borough's approach to renewable energy and the historic environment

Response to the Climate Emergency

4.4 All but one of the boroughs interviewed have declared a climate emergency and have created or are in the process of creating climate action plans. Four of these plans specifically reference solar PV and furthermore have an action associated with solar PV installation, such as installing solar PV on social housing or lobbying the national government to provide additional incentives for solar PV installations. Within all the boroughs interviewed, all interviewees stated that political will is present to support mitigating climate change.

4.5 Out of the boroughs interviewed, the London Borough of Camden has the most supportive policies regarding renewable energy and retrofitting historic buildings. The policies specifically state that renewable energy technologies such as solar PV could be installed on listed buildings depending on the form of the building. The London Boroughs of Richmond and Redbridge and the Royal Borough of Kensington and Chelsea contain quite general local plan policies regarding renewable energy and primarily focus on the energy hierarchy while the London Boroughs of Bromley and Merton only have policies relevant to the incorporation of renewable energy within new builds.

4.6 While there is a great emphasis on green roofs within the London Plan and there are more green roofs coming forward, the boroughs interviewed believe that there is potential for green roofs to be combined with solar PV. However, it was noted within the interviews that there is a definite lack of knowledge about the integration of green roofs and solar PV, the impact of one on the other, and which should take priority.

4.7 Furthermore, Solar Energy UK highlighted that solar panel installations, including roof mounted, are on the rise, so the planning process needs to be able to accommodate the surge. Therefore, a consistent and proactive approach to solar PV across London (and the UK) would help facilitate this. Additionally, almost all the boroughs suggested that it would be useful to have a London-wide approach on retrofitting solar PV to aid them in making decisions on planning applications.

Conclusions

4.8 It was clear from the interviews with the six boroughs, the amount of action being taken to deliver the climate action plans that have been produced/are being produced varies across boroughs. Although, it was noted there is political will within the boroughs interviewed regarding climate mitigation, there is not the same amount of political will regarding the utilisation of solar PV to mitigate climate change.

Balancing the Approach to Renewable Energy and the Historic Environment

4.9 Two of the boroughs interviewed have implemented Article 4 directions to remove permitted development rights for roof-mounted solar PV installations within Conservation Areas. These were introduced in order to ensure that planning controls can seek to minimise adverse impacts on the character and setting of the area.

4.10 Historic England made the point that, given the climate emergency, further guidance is needed to help planners strike the right balance between built heritage conservation and solar installation. Furthermore, Historic England noted that the reasons for refusing a solar PV application should not simply be based on visual impact; the impacts to the heritage significance of the building must be considered and if that significance will not be harmed then the solar PV

should be supported. While impacts on the historic fabric of the building are considered, the majority of boroughs interviewed stated that visual impact is the key issue considered when determining planning applications for solar PV.

4.11 It was noted that a few, but not all, of the boroughs utilise Historic England's planning guidance **[See reference** 26**]** for renewable energy and the historic environment. Many of the boroughs interviewed believe a public benefit is only achieved through larger scale projects that could make a big impact on creating a greener and cleaner electricity grid. However, the London Borough of Richmond upon Thames noted that they consider public benefit in every case no matter the size of the development.

4.12 All the boroughs interviewed mentioned the need for additional guidance with regard to how public benefit should be measured and for residents and businesses to show what they can achieve through permitted development rights and planning applications. Emerging solar technologies were mentioned in the interviews, notably PV panels that resemble roofing slate, solar slate. All of the boroughs interviewed noted that solar slate could help reduce adverse impacts on historic buildings, as it is less visually obtrusive. For example, solar slate has already been used on a National Trust building, Morden Hall Park, within the London Borough of Merton. However, solar slate is currently much more expensive than traditional solar panels and the market is far less mature. Solar slate is therefore not currently a realistic option for most residents and businesses. Furthermore, there is a presumption that historic fabric of significance, which could include historic slates should be preserved; therefore, this could hinder the implementation of solar slate on some listed buildings.

4.13 In order to encourage solar PV on existing buildings, the London Borough of Camden has created specific guidance on how best to integrate solar PVs, where it is least visible but provides the maximum solar gain.

4.14 The Royal Borough of Kensington and Chelsea has recently consulted on a draft Local Listed Building Consent Order, which seeks to realise the potential of listed building roofs which are underused. The Order would allow the installation of solar PV panels on Grade II and most Grade II* listed buildings

within the borough, subject to conditions that the panels are sensitively designed and positioned on the building to ensure there is no visual impact on the building itself or wider area. It was noted that there can be a misplaced assumption that the Council will automatically say no to solar panels, so that their installation is not even attempted. By issuing a Local Listed Building Consent Order the Royal Borough of Kensington and Chelsea sends a strong message promoting the installation of solar PV. Further information about this Order is included within Appendix B.

Conclusions

4.15 The majority of boroughs perceive all solar PV installations on listed buildings and within Conservation Areas as harmful, mainly with regard to the visual impact.

4.16 Furthermore, there are different approaches across the London boroughs and even within the boroughs on how the public benefit from solar PV should be weighed when deciding planning applications.

4.17 Further information gathered from the interviews with London boroughs is included within Appendix C. This information is regarding non-planning barriers to the uptake of solar PV installations.

Chapter 5

Conclusions and Recommendations

5.1 Permitted development rights for roof mounted solar PV apply to around 80 per cent of London's built-up area. Despite this, the uptake of roof mounted solar PV is limited in many areas. This is due mainly to non-planning related factors. Appendix C describes the non-planning factors that arose from our policy research and interviews with six London boroughs.

5.2 The focus of this research was on the planning issues, which are also important. The key issues can be summarised as follows:

- Local plan policies are not supportive or specific enough regarding solar PV installations, especially in relation to the historic environment. Overall, policies within the London boroughs' local plans focus primarily on renewable energy with no specific reference to solar PV.
- Residents require more information about what can be achieved through permitted development rights and the planning process.
- One third of London boroughs **[See reference** 27**]** have implemented Article 4 directions that specifically restrict permitted development rights for solar PV.
- Guidance is needed regarding London's overall position on solar PV, specifically regarding how the public benefit of renewable energy should be considered when determining planning applications.
- Overshadowing of solar PV should be incorporated into local plan policies and considered a material consideration when determining planning applications.

5.3 In light of the research findings, we provide the following recommendations to national government, Historic England, the GLA and London boroughs.

Recommendations to National Government

- Make the wording of the conditions related to renewable energy permitted development rights clearer for applicants and planning officers. For example, development is permitted by Part 14 Class A subject to the following conditions: '*solar PV or solar thermal equipment is, so far as practicable, sited so as to minimise its effect on the external appearance of the building; solar PV or solar thermal equipment is, so far as practicable, sited so as to minimise its effect on the amenity of the area; and solar PV or solar thermal equipment is removed as soon as reasonably practicable when no longer needed*.' There is a need for the definitions of what would constitute as a permissible effect on the external appearance of the buildings and amenity of the area. Given the ambiguity of these terms, applicants are unsure of what to provide as justification within applications and there is a lack of consistency between London boroughs in their interpretation of the conditions.
- Consideration could be given to review permitted development rights to ensure they are current and respond effectively to the climate crisis.
- In the absence of any change in the wording of the permitted development rights, technical guidance should be provided to give a clear explanation of permitted development rights for solar PV. This could take a similar form to the technical guidance developed by the Department for Levelling Up, Housing & Communities on permitted development rights for householders. **[See reference** 28**]**

Recommendations to Historic England

- Provide guidance, possibly in partnership with the GLA, on how the public benefit of solar PV should be weighed against any potential harm to the

heritage significance of a listed building or Conservation Area. This should include an explanation of how the public benefits of a proposal go towards achieving the requirements of the climate change policies in the London Plan as well as an explanation of impact based on an understanding of the building's heritage significance, and what this means.

Recommendations to the GLA

- Explore whether solar specific policies within the next London Plan would contribute towards the Mayor's Net Zero ambitions and help guide the London boroughs' approach to solar PV installation and retrofitting within Conservation Areas.
- Explore whether a specific policy that sets out how overshadowing should be considered as a material planning consideration would be effective in promoting and safeguarding renewable energy sources, given the importance of solar PV in mitigating climate change. Furthermore, such policy could set out how the impact of new development on solar PV should be quantified and how it should be considered in the planning balance.
- Create a technical guidance document/practice note on what needs to be included in a planning application for solar PV installation. In the absence of national guidance, create a technical guidance note setting out what relevant information and evidence is needed to demonstrate compliance with permitted development rights and the associated conditions.
- Create technical guidance/practice note on a sustainable approach to retrofitting, based on the energy hierarchy. For example, proper insulation should be completed before renewable energy generation is installed. This guidance could also outline and describe the types of solar PV that are available, and in which circumstances they might be used. For example, solar slate can be a sympathetic option within Conservation Areas and on listed buildings as they help to ensure that the visual impact is minimal.

Recommendations to London Boroughs

5.4 In the absence of London-wide technical guidance/practice notes, or to complement such guidance, London boroughs could produce borough-specific technical guidance similar to the technical guidance outlined above. In addition, boroughs could:

- Learning from the Royal Borough of Kensington and Chelsea's emerging local plan policy on sustainable retrofitting, formulate local plan policies that are specific to solar that guides the borough's approach to solar PV installation and retrofitting.
- As above, create specific policies that set out how overshadowing should be considered as a material planning consideration. Such policy could set out how the impact of new development on solar PV should be quantified and how it should be considered in the planning balance.
- Learning from the London Borough of Camden's guidance on retrofitting within Conservation Areas, set out clearer guidance on retrofitting existing buildings especially regarding solar PV and how it will be applied within Conservation Areas, World Heritage Sites and Listed Buildings. This could include specific guidance for each Conservation Area, either by updating Conservation Area Management Plans to specifically include the borough's approach to solar PV or through the creation of overarching guidance based on area types throughout the borough or boroughwide.

Appendix A

London Borough Planning Policy Matrix

Table 1.1: Review of Relevant Solar Planning Policies for each of the London Boroughs and City of London as of March 2022

*Denotes boroughs that are currently the most supportive in their approaches to solar PV across their local plans, neighbourhood plans and supplementary guidance documents.

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
Barking and Dagenham	Yes (Adopted 2010). Policy CR1: Climate Change and Environmental Management states that the Council will encourage energy efficiency and renewable energy and implementing climate change mitigation measures, with a focus on Council buildings,	Yes. Emerging Climate Change Strategy [see reference 29] (2008) sets out the ways in which the Council will reduce carbon emissions in a number of areas, including existing homes, and schools. With regard to solar, the Council pledges to promote renewable energy	No.	No.	No.	Yes. The Barking Town Centre Energy Action Area Implementation Plan (2006) sets out options to Barking Town Centre becoming a low carbon community. A 11% reduction in CO2 emissions by 2020 is recommended for the borough and a number of strategies are	Yes. There are 4 Conservation Areas within the borough. Non-listed buildings in the Barking Town Centre and Abbey conservation area need planning permission for a number of changes. In relation to solar, permission would be required for new openings

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	school buildings, Council fleet, street lighting and waste management. [see reference 30]	initiatives and grants such as the Solar for London scheme that help businesses to install renewable energy technologies. Barking and Dagenham declared a climate emergency on the 30th January 2020.				proposed to aid the adoption of a community heating network and renewable energy technologies. [see reference 31] The Residential Extensions and Alterations Supplementary Planning Document (SPD) (2012) [see reference 32] has a section on Domestic Microgeneration Equipment. It states that householders have a degree of permitted	in external elevations and roofs and extensions. [see reference 33]

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
						development rights regarding the installation of a variety of equipment used for domestic energy generation. In circumstances where planning permission is required, equipment should be positioned so as to minimise the impact it has upon neighbour's amenity.	
Barnet	Yes (Adopted 2012). Policy CS13 [see reference 34]: Barnet will	No. Note: has not declared a climate emergency.	Yes. Draft local plan [see reference 35] – submitted	Yes. West Finchley Neighbourhood Plan June 2021 [see reference	Yes. There are 10 Conservation Areas with	Yes. Local Plan SPD: Sustainable Design and	Yes. There are 17 Conservation Areas within Barnet.

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	promote high levels of sustainability and high environmental standards. Will expect all developments to be energy efficient and seek to minimise wasted heat or power. Barnet will support *solutions* that minimise or avoid harm to a heritage assets significance whilst improving energy generation/performance.		for examination (2021) Policy ECC01: Mitigating Climate Change states that the Council supports retrofitting existing buildings and encourage solutions that minimise or avoid harm to a heritage asset's significance while delivering improved energy performance or generation.	36]: One of the objectives in the plan is to encourage use of sustainable materials, construction methods and support low-carbon development.	Article 4 directions. Hampstead Garden Suburb – Article 4 mentioned in Character Appraisal [see reference 37] - *various types of permitted development are controlled.* Hendon, The Burroughs – proposed Article 4 specifying solar [see reference 38] Finchley Garden Village – proposed Article 4 specifying solar	Construction (2016) [see reference 39]. 2.10 – Retrofitting existing buildings - Planning permission not normally required (except for Article 4 CAs). Where the panels are attached to a building they should not project more than 200mm from the roofslope and should not protrude above the highest part of the roof	Railway Terraces Cricklewood Conservation Area, Character Appraisal and Management Proposals 2016 - states some historic buildings have inappropriate alterations (rooflights, solar PV panels, dormer windows) which are highly visible. Notes that Barnet has an SPD for sustainable design which gives advice on solar installation

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	(States that its priority is energy efficiency through high quality design, rather than *unproven technologies).*				[see reference 40] Moss Hall Crescent – possible Article 4 for solar [see reference 41]	(excluding the chimney). 5.4 Development Plan Document (2012) [see reference 42] - Retrofitting: Barnet's housing stock has high level of carbon emission for London. 2/3 of stock pre-1944, so great potential to reduce emissions if energy efficiency measures fitted/renewable energy	[see reference 43]. Hamsptead Garden Suburb – *Installing standard equipment, such as solar panels and wind turbines, on visible elevations will not be acceptable. However, the use of non-visual renewable technologies (e.g. heat pumps, air pumps) will be strongly encouraged in line with national and*

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
						technologies installed.	*local policies* [see reference 44] does have Article 4 (see column). Hendon, The Burroughs 2012 – specifies proposed Article 4 for solar panels in Character Appraisal and Management Proposals [see reference 45] Finchley Garden Village 2013 - specifies proposed Article 4 for solar panels in Character Appraisal and Management

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
							Proposals [see reference 46] Moss Hall Crescent 2015 – potential Article 4 for solar [see reference 47]
Bexley	Yes (Adopted 2012). Policy CS08 Adapting To And Mitigating The Effects Of Climate Change, Including Flood Risk Management states that all development should contribute to the	No. Note: has not declared a climate emergency.	Yes. Regulation 18 document (2019): DP19 Decentralised Energy states that renewable energy schemes will be strongly promoted in the borough and encouraged as part of development	No.	No.	Yes. Thamesmead and Abbey Wood SPD (2009): Sustainable design and development TSD1: High quality development in Thamesmead states that all development in Thamesmead	Yes. Bexley has 23 conservation areas across the borough. Each Conservation Area Appraisal and Management Plan contains a section on Solar panels and wind turbines (section 9). This

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	delivery of sustainable development by planning for, adapting to, and mitigating the impacts of climate change, by reducing the carbon emissions related to the construction and operation of all development. [see reference 48]		proposals where they are effective, viable and practical. It notes that the Council is working closely with partners such as the GLA on the development of a heat network within the borough, which capture affordable low carbon heat from waste to energy facilities, supplying it to residential and commercial buildings in the Bexley Riverside area, in the form of			and Abbey Wood will be required to be of a high design quality with proactive use of sustainable construction. Further to this, the SPD also supports consideration of current supply and future demand for energy in relation to opportunities for district heat networks and low carbon technologies. [see reference 49] The Lamorbey Planning Brief	states that the installation of solar panels and/or wind turbines within or adjacent to a conservation area would introduce alien features and by their inherent design they will be visually intrusive. In terms of the main conservation principle that any proposed development should “preserve or enhance” the character or appearance of the

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
			hot water and/or steam through a system of pipes to where it is needed. [see reference 50]			SPD (2007) contains a section on sustainability. Importantly, it states that developers should address the issues of location and orientation relating to solar gain, energy use and efficiency, alternative power sources, waste minimisation, construction materials from renewable, sustainable, etc. [see reference 52]	conservation area any installations may be problematic. [see reference 51]

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
						The Erith Western Gateway Development Framework SPD (2012) states that a main requirement for regeneration regarding sustainability is the incorporation of the latest standards in energy and water efficiency, sustainable drainage, waste reduction, use of renewable and non-polluting materials and renewable	

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
						energy. [see reference 53] The Residential Design Guide (2007) provides the following principle: - Maximise opportunities for the use of renewable energy, such as solar power, combined heat and power systems and wind turbines. [see reference 54]	

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
						Chapter Five: Conserving resources and reducing carbon emissions of Bexley sustainable design and construction guide promotes decentralized energy networks. It notes in Guidance 19 that in providing renewable energy it is important to ensure that building is energy efficient by design (e.g. incorporate passive solar	

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
						design). [see reference 55]	
Brent	No.	Yes. Brent's Climate & Ecological Energy Strategy 2021-2030 [see reference 56] highlights its Solar Together Scheme and one of its aims is to undertake a number of retrofit pilots to improve the energy efficiency of a number of specific void properties in the council's stock. Brent Council declared a climate	No.	No.	Yes. Barn Hill, Brondesbury, Buck Lane, Homstead Park, Kensal Green, Kilburn, Mapesbury, Mount Stewart, Neasden Village, North Kilburn, Northwick Circle, Queen's Park, Roe Green Village, St Andrews, Sudbury Cottages and Wembley Hight Street Cas [see reference 58] restrict the	Yes. The supporting text of principle 3.6 in the Design Guide (2018) [see reference 57] states that sustainable technologies, for example solar panels should be integrated into the design from the outset rather than retrofitted.	There are 22 Conservation Areas within Brent. See Article 4 column.

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
		emergency in July 2019.			installation or alteration of solar equipment on domestic premises, but with exception of rear roof slopes.		
Bromley	Yes (Adopted 2019), only for new builds. Policy 124 Carbon Dioxide Reduction, Decentralised Energy Networks and Renewable Energy states that the Borough will apply the carbon reduction, decentralised	No. Note: has not declared a climate emergency.	No.	No.	No.	No.	Yes. There are 47 Conservation Areas within Bromley. The borough has also designated certain areas as areas of special residential character. Reference is made to the General Permitted Development (amendment)

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	energy and renewable energy policies in the London Plan directly to major development proposals. [see reference 59] Objective 7 supports the development of local energy networks and low-carbon and renewable energy facilities. [see reference 60]						Order 2008, which states that solar panels and solar thermal equipment are not permitted in a Conservation Area if they are to be installed on a wall forming the principal or side elevation of the dwelling house and would be visible from a highway or on a wall of a building within the curtilage of the dwelling house and would be visible from a highway.

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
							[see reference 61]
Camden*	Yes (Adopted 2017). Paragraph 7.62 in Listed Buildings section of Local Plan [see reference 62] Proposals that reduce the energy consumption of listed buildings will be welcomed provided that they do not cause harm to the special architectural and historic interest of the building or	Yes. Camden Climate Action Plan 2020-2025 [see reference 63]: sets out actions to install solar on housing estates. Camden Council declared a climate emergency in 2019.	No.	Yes Dartmouth Park Neighbourhood Forum Neighbourhood Plan (2021) [see reference 64] Policy ES4: Energy Efficiency supports the installation of solar panels that are sensitively incorporated and (where the development is located within the Conservation Area and does	Yes. Belsize Conservation Area restricts use of Solar PV [see reference 65]. Hampstead Conservation Area [see reference 68] restricts use of Solar PV. Frognal Way Conservation Area [see reference 69] restricts use of Solar PV. Swiss Cottage Conservation Area restricts	Camden Design SPD (2021) [see reference 66]: Section 3.61- 'Addressing Sustainability in historic buildings' [see reference 67] highlights the role that renewable energy technologies can play in historic buildings. Energy efficiency and adaptation	Yes. There are 40 Conservation Areas within Camden, covering around 50% of the borough. See Article 4 directions column.

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	group. Energy use can be reduced by means that do not harm the fabric or appearance of the building, for instance roof insulation, draught proofing, secondary glazing, more efficient boilers and heating and lighting systems and use of green energy sources. Depending on the form of the building, renewable energy technologies			not constitute permitted development) either are not visible from the street or are physically and visually integrated into the roof and do not project above the plane of the roof. Highgate Neighbourhood Plan (2017) Policy SC2 [see reference 73]: Community Facilities outlines solar panels as a recommended priority for Community	use of Solar. [see reference 70]	(2021) [see reference 71]: includes guidance on using Solar PVs in Camden. Retrofitting Planning Guidance (2013) [see reference 72]: developed to help residents understand the planning process required to install low carbon technologies in homes. Energy efficiency planning guidance for	

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	may also be installed, for instance solar water heating and photovoltaics. Paragraph 7.56 within Sustainable design and retrofitting section of the Plan: Historic buildings including those in conservation areas can be sensitively adapted to meet the needs of climate change and energy saving while			Infrastructure Levy.		conservation areas (undated) [see reference 74]: provides guidance to residents who are considering making energy efficiency improvements to residential properties in conservation areas.	

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	preserving their special interest and ensuring their long-term survival. In assessing applications for retrofitting sustainability measures to historic buildings the Council will take into consideration the public benefits gained from the improved energy efficiency of these buildings, including reduction of fuel poverty.						

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	Policy D1 Design requires all development to be sustainable in design and construction, incorporating best practice in climate change mitigation and adaptation. Policy D2 Heritage: states that the Council will not permit the loss of or substantial harm to a designated heritage asset, including conservation areas and Listed Buildings,						

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss. Policy CC1: Climate change mitigation will require all development to reduce carbon dioxide emissions through the energy hierarchy.						

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
City of London [see reference 75]	Yes, (Adopted 2015) [see reference 76]. Policy DM 12.3 Listed Buildings – grant consent for alteration/change to Listed Buildings only if it doesn't detract from heritage value/significance of building or setting. Policy DM 15.2 Energy and CO2 emissions assessment – carbon compliance level required to meet national targets using	Yes. Climate Action Strategy 2020 - 2027: aims to be net zero by 2027 in the City Corporation's operations, however does not include anything specifically about solar PV. Note: has not declared a climate emergency.	Yes. New City Plan 2036 [see reference 77] Policy HE1: Managing Change to Heritage Assets - *Where proposals would result in harm to, or the loss of, a non-designated heritage asset, the City Corporation will have regard to the scale of any harm or loss, the significance of the heritage asset and the wider public*	No.	No.	Yes. Sustainable development planning requirements [see reference 8] Information needed for major new development or refurbishment applications: Energy Statement - *Innovative solutions to integrate photovoltaic and solar systems with alternative colours and finishes,*	Yes. 17 of the 27 Conservation Areas have CA appraisals and management plans. Trinity Square is the only CA Plan that states - *Development, including the incorporation of climate change adaptation measures, should have regard to the need to protect the historic significance of heritage assets.* [see reference 79]

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	low/zero carbon technologies. Core policy CS5 – developers must use innovative design to mitigate climate change and address challenges of historic buildings and respecting their significance. Core Policy CS12 Historic Environment – to safeguard City's listed buildings & setting while allowing		*benefits proposed.*			*considering siting and overshadowing issues, glint and glare to the ground and in views of the historic townscape.*	

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	appropriate adaptations.						
City of Westminster*	Yes (Adopted 2021). Policy 36: Energy states the Council will promote zero carbon development and expects all development to reduce on-site energy demand and maximise the use of low carbon energy sources. Policy 38: Design Principles encourages strategic design principles, such as design of	Yes. Zero Carbon City 2040 (2021) [see reference 80]: sets out the need to increase availability, affordability and use of low and zero carbon energy. Westminster City Council declared a climate emergency on the 18th September 2019.	No.	Yes. Knightsbridge (2018) [see reference 81] Policy KBR 35: Renewable Energy states that it is essential that buildings within Knightsbridge minimise energy use and maximise energy efficiency. Policy KBR 36: Retrofitting Historic Buildings for Energy Efficiency	No.	Yes. Retrofitting Historic Buildings for Sustainability Supplementary Planning Document SPD (2013) [see reference 82], but will be replaced by: Environmental SPD (Consultation Draft) (2013) [see reference 83] - Opportunities to incorporate solar technologies may be reduced	Potentially. Westminster has 56 designated conservation areas [see reference 84] which cover over 76% of the City. Development and Demolition in Conservation Areas SPG (2022) [see reference 85] includes the following: DES7J: Roof extensions, telecommunications equipment,

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	facades to capitalise on solar gain, to be utilised. [see reference 86]			states that the sensitive retrofitting of energy efficiency measures in historic buildings will be encouraged. Soho (2021) [see reference 87] Policy 21: Refurbishment and Retrofitting of Existing Buildings states that measures to retrofit and improve the sustainability of existing buildings and reduce their emissions will		in some instances given the prevalence of listed building and conservation areas in Westminster, however the council strongly advocates such technologies and wants to work with applicants to find the best solution – this can be discussed at pre-application stage. **contains an entire chapter on retrofitting existing buildings and	other plant or ductwork - *Roof extensions, should always complement the appearance of the existing building and, where appropriate, its neighbours. Telecommunications equipment, satellite dishes, ductwork or other roof plant should be sensitively located and should not adversely affect the character or appearance of conservation areas.*

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
				be strongly supported. Specifically, where retrofitting involves adaptation to heritage assets, these will be supported provided adaptations safeguard the historic characteristics.		includes solar panels	
Croydon	Yes (Adopted 2018), only for new builds. Policy SP6: Environment and Climate Change states that the Council will reduce greenhouse gas	Yes. Croydon Climate Change Mitigation Action Plan (undated) [see reference 88]: sets out measures to retrofit homes	No.	No.	Yes. Article 4 directions apply to the Chatsworth Road Conservation Area. It states that the installation of	Yes. The Suburban Design Guide SPD (2019) contains a section on visible ancillary items, noting that solar panels should	Yes. There are 21 Conservation Areas in Croydon. Planning permission is required for the installation, alteration or

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	emissions and deliver development that is adaptable in a changing climate. Minimizing carbon dioxide emissions will include a requirement for major development to be enabled for district energy connection unless demonstrated not to be feasible or financially viable to do so. [see reference 90]	including solar technology. Croydon Council declared a climate emergency in July 2019.			solar PV or solar thermal equipment (solar panels) require planning permission. [see reference 89]	be integrated into the design from an early stage with a regular layout and a discreet appearance. If located on a flat roof, they should not be visible from street level. Where located on a pitched roof, they should be integrated into the design of the roof so as to minimise impact on the appearance of the development. [see reference 91]	replacement of solar PV or solar thermal equipment on a wall which fronts a highway. Further to this, in conservation areas the design and siting of all photo-voltaic and solar thermal panel should be carefully considered so as to limit their visual impact on the conservation area's character and appearance.

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							[see reference 92]
Ealing	Yes (Adopted 2012). Policy 6.1: Physical Infrastructure Identify and promote improvements needed in respect of water use, sewerage and sustainable urban drainage; energy use and the contribution made by renewable energy on a site by site and a neighbourhood basis [see reference 94].	Yes. Climate and Ecological Emergency Strategy (2021) [see reference 93]: Contains an energy objective to increase solar PV installations on Council owned properties. Ealing Council declared a climate emergency in April 2019.	No.	No.	Yes. Ealing Town Centre Conservation Area restricts the installation of solar PV on dwelling houses.	No.	There are 29 Conservation areas within Ealing. 6 Conservation Areas are subject to Article 4 directions (see column).

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Enfield	Yes. (Adopted 2010) [see reference 95] Core Policy 20: Council requires existing developments, where possible via retrofitting, to address causes and impacts of climate change. Council will support appropriate measures to mitigate impacts of climate change & reduce	Yes. Climate Action Plan 2020: Aims to retrofit all council buildings with an increase in solar capacity. Enfield Council declared a climate emergency on the 8th July.	Yes. New Enfield Local Plan 2019-2039 [see reference 96] just finished Regulation 18 stage. Draft Policies SE1 Responding to the climate emergency and SE3 Whole-life carbon and circular economy state proposals should prioritise retrofitting first. Draft policy SE6 renewable energy	No. No plans available from Hadley Wood or Angel Edmonton neighbourhood forums.	Potentially. Abbotshill Conservation Area has an Article 4 for risks to historic roofs, but does not specify solar.	Yes. Renewable Energy and Low carbon development study – LB Enfield (2010) [see reference 97] Notes that constraints on use of roof space in Conversation Areas may limit use of solar technologies. Enfield Development Management Document (2014) [see reference 99]	Potentially. There are 22 Conservation Areas within Enfield. Abbotshall Conservation Area Management Proposals [see reference 98] - identifies satellite dishes and risks to historic roofs. Has Article 4 but doesn't specify solar (see column).

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	carbon dioxide emissions. Core Policy 31: Ensuring interventions in the public realm that impact on heritage *assets have regard to their special character and are based on an understanding of their context. Proposals within or affecting the setting of heritage assets will be required to include a thorough site analysis and character appraisal which*		development states development involving renewable and low carbon energy will be supported.			DMD 53 States that Local opportunities to contribute towards decentralised energy supply from low and zero carbon technologies will be encouraged, where there is no overriding adverse local impact including identified impacts to historic assets.	

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	explicitly demonstrates how the proposal will respect and enhance the asset;						
Greenwich	Yes (Adopted 2014). Policy E1 Carbon Emissions requires developments to incorporate decentralised energy and encourages the use of sustainable energy sources. [see reference 101]	No, however Greenwich Council declared a climate emergency in June 2019.	No.	No.	Yes. The Ashburnham Triangle 2016 Article 4 Direction notes that planning permission is required for the installation of solar equipment if it would be located on a wall fronting a road or if it would protrude more than 0.2 metres beyond	Yes. The Spray Street SPD (2015) [see reference 100] considers the importance of sustainability: the Illustrative Masterplan places an emphasis on creating a high quality public realm, and accordingly the design and orientation of	Yes. All houses within the 23 conservation areas are subject to conservation area controls. However, only one of these is subject to Article 4 Directions specific to solar PV (see Article 4 column).

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					the wall or roof slope; or if it would be within the curtilage of a listed building. Otherwise solar equipment is permitted development, but should be sited to minimise its effect on the external appearance of the building and on the amenity of the area. [see reference 102]	buildings and spaces within the Illustrative Masterplan thus have been designed to maximise solar gain throughout the development. The Greener Greenwich SPD (2014) [see reference 103] provides guidance on what measures developers can include in their building designs. It states that the borough expects new buildings in new developments	

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						to utilise solar passive design features to reduce heat impacts. All development is encouraged to incorporate renewable energy into its design. Further to this, the SPD states where possible, outdoor lighting should be solar powered. The Kidbrooke SPD (2008) [see reference 104] promotes energy efficient buildings and seeks a minimum of 10% of energy	

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						requirements to be provided by renewable sources. The Residential extensions, basements and conversions guidance SPD (2008) [see reference 105] provides guidance for the placement of solar panels, noting that the optimal location is to the rear of the property wherever possible so as not to cause visual harm to the street scene.	

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Hackney	Yes (Adopted 2020). Policy LP55 Mitigating Climate Change [see reference 107] Development including the re-use or extension of existing buildings should achieve the maximum feasible reductions in carbon emissions and support in achieving the strategic carbon reductions target in the London Plan,	No, however Hackney Council declared a climate emergency in July 2019.	No.	No.	No.	Yes. Sustainable Design and Construction SPD (2017) [see reference 106] Provides guidance for the use of Solar PV in the Borough. SPD Residential Extensions and Alterations (2009) [see reference 108]: “In accordance with Planning Policy Statement 22, the London Borough of Hackney supports the	There are 30 Conservation Areas within Hackney. They are seeking an Article 4 Direction for the Beck Road Conservation Area but it is unclear what it will include at this time [see reference 109]. Householder Planning Advice in Conservation Areas (2011) [see reference 110] – can use Permitted Development Rights to install solar panels, however there

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	while protecting, heritage and character of the buildings. Policy LP54: Overheating and adapting to climate change aims to ensure the design of buildings take account of ways to reduce their contribution to the urban heat island effect, are low carbon and remain comfortable to the occupants. Policy LP3 Designated Heritage Assets:					incorporation of 'small scale renewable energy schemes utilizing technologies such as solar panel, biomass heating, small scale wind turbines, photovoltaic cells and combined heat and power schemes' into residential extensions and alterations.	are various restrictions such as they can't extend more than 200mm above the slope of the original roof.

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	Development that leads to less than substantial harm will not be permitted unless the public benefit of the proposal, including securing the optimum viable use of the site, outweigh the harm.						
Hammersmith and Fulham	No (Adopted 2018), but the supporting text of Policy DC4: Alterations and Extensions (including outbuilding) notes that	No, however Hammersmith and Fulham Council declared a climate emergency in July 2019.	No.	No.	No.	Yes. Planning Guidance SPD (2018) [see reference 111]: CAG5: External Installations in	Yes. There are 44 Conservation Areas within Hammersmith and Fulham. Barclay Road Conservation

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	proposed installations to existing buildings such as solar panels should be designed and positioned to minimise their impact.[see reference 112]					Conservation Areas: Any external installations, such as solar/PV panels, satellite dishes and antennas, must be integrated into the design of a building by installing these within the envelope of the building or in a discrete manner in the least intrusive locations to minimise their visual impact both in ground level and high level views. Such	Area Character Profile (2017) [see reference 113] states a*ny external installations, such as solar/PV panels, satellite dishes and antennae, must be integrated into the design of a building by installing these within the envelope of the building or in a discrete manner in the least intrusive locations to minimise their visual impact both in ground*

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						installations within a conservation area will require planning permission and need careful consideration. To be noted: Hammersmith and Fulham have just published an informational page on their website about how they are offering free duty planner advice if you are considering solar energy installations. The borough also has a Solar	*level and high level views.*

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						Together scheme.	
Haringey	Yes (Adopted 2017). [see reference 114] Policy SP4. States *tackling climate change will also require a move towards more sustainable energy …..including the use of low carbon and renewable energy.* Council aims to reduce carbon footprint by requiring	Yes. Haringey Climate Change Action Plan (2021) [see reference 115] - seeks to expand number of solar installations and support installations on council buildings. (See Parity Project) Parity Project (2013) [see reference 119] - worked on 'Retrofitworks'	No, very early stages.	Yes. Highgate Neighbourhood plan (2017) [see reference 116] - List solar panel schemes as one of its recommended priorities for CIL. Non-statutory action – *seek out opportunities for environmental improvements, such as projects encouraging*	Yes, in 3 conservation areas. Noel Park CA – not to be carried out on street elevations of properties….installation or alteration etc of solar equipment on domestic properties [see reference 117] Peabody Cottages CA - not to be carried out on street	Yes. Sustainable Design & Construction SPD (2013) [see reference 118] *Home energy retrofit should be approached by adopting the energy hierarchy and design approaches.*	Yes. There are 28 Conservation Areas within Haringey. Bruce Castle and All Hallows (2019) Conservation Area Appraisal and Management Plan – identifies incremental changes which detract from character such as satellite dishes on front elevations.

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	generation of energy on site using renewable energy. Improving energy efficiency of existing building stock is a necessary measure to meet CO2 reduction targets. Consideration will be given to minimising impact on historic fabric and making it reversible where possible. *it is necessary to improve the*	[see reference 120] with support from Haringey Council. Haringey Council declared a climate emergency in March 2019.		*renewable energy.* Crouch End Neighbourhood plan [see reference 121] – no reference to solar/retrofitting on website. Finsbury Park and Stroud Green Neighbourhood plan (2018) - no reference to solar/retrofitting on website [see reference 122].	elevations of properties….installation or alteration etc of solar equipment on domestic properties [see reference 123] Tower Gardens CA - - not to be carried out on street elevations of properties….installation or alteration etc of solar equipment on domestic properties [see reference 125]		Permission is required for solar panels. Discretely located installations on hidden elevations or rear roof slopes may be appropriate. [see reference 124] Noel Park Conservation Area Appraisal and Management Plan – States it is *not appropriate to install solar panels facades or roof slopes that are visible from the street,*

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	energy efficiency of the existing stock to achieve local, regional and national aspirations for carbon emission reductions. The Council envisage that by 2026 nearly all feasible carbon emissions reduction measures will have been carried out on existing housing stock….. Retrofitting measures must have due regard for						*and other interventions should be considered in the first instance.* Identifies satellite dishes as a negative factor [see reference 126]. Has Article 4 which specifies solar (see column). Peabody cottages Conservation Area (2019) Appraisal and Management Plan 2019 – States permission is required to install solar

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	historic significance (as per NFFP).						panels on a wall or roof slope facing the street. Also, no appropriate to install solar PV visible from street – discreetly located on hidden elevations/roof slopes may be appropriate [see reference 127] [see reference 128]. Has Article 4 which specifies solar (see column). The following applies in the six conservation

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							areas listed below; Permission is required to install solar panels on a wall or roof slope facing the street. Solar installation will be limited in Conservation Area and other interventions considered first. Also, no appropriate to install solar PV visible from street – discreetly located on hidden elevations/roof

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							slopes may be appropriate Tottenham Cemetery Conservation Area Appraisal and Management Plan 2019 [see reference 129]. North Tottenham Conservation Area Appraisal and Management Plan [see reference 130]. Scotland Green Conservation Area Appraisal and Management

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							Plan [see reference 131]. Bruce Grove Conservation Area Appraisal and Management Plan Tottenham Green Conservation Area Appraisal and Management Plan. Seven Sisters/Page Green Conservation Area Appraisal and Management Plan

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							Tower Gardens Conservation Area Appraisal and Management Plan - States permission is required to install solar panels on a wall or roof slope facing the street. Solar installation will be limited in Conservation Area and other interventions considered first. Also, no appropriate to install solar PV visible from street – discreetly located on

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							hidden elevations/roof slopes may be appropriate [see reference 132]. Has Article 4 which specifies solar (see column).
Harrow*	Yes (Adopted 2013) [see reference 133]. Policy DM 7: Heritage Assets – impact of proposals assessed regarding the need to mitigate climate change and to ensure that heritage assets are resilient to the effects of	Yes. The Climate and Ecological Emergency – Harrow's Interim Strategy and Actions [see reference 134] – mentions retrofitting with energy conservation and generation measures, such as all existing and new homes	No.	No.	No.	Yes. Harrow on the Hill SPD (2008) states that it is likely that sustainability measures such as solar panels and wind turbines will increasingly be proposed on properties within the conservation areas. If well	Yes (see SPD column). There are 29 Conservation Areas within Harrow. However, there are SPDs for only three of these Conservation Areas.

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	climate change; and the reversibility of any change. Policy DM 12: Sustainable design and layout – development proposals should use natural systems such as passive solar design. Policy DM 14: Development proposals should incorporate renewable energy technology where feasible. Proposals for appropriate	should be carbon neutral in operation. Additionally, they aim to ensure all roofs are suitable for solar installation. Harrow Council declared a climate emergency in July 2019.				designed and integrated, these measures should be able to be accommodated without detriment to the character of the conservation area. [see reference 135] Stanmore and Edgware SPD (2013) states that it is likely that sustainability measures will lead to an increase in proposals involving the installation of solar panels and wind	

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	renewable energy technology on existing homes and non-residential buildings will be supported.					turbines on properties within conservation areas. If well designed and carefully integrated, these measures should be able to be accommodated without detriment to the character of the conservation area. [see reference 136] Harrow Weald SPD (undated) states that it is likely that there will be an increase in proposals involving the	

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						installation of solar panels If well designed and carefully integrated, these measures should be able to be accommodated without detriment to the character of the CA. There is potential for harm, especially to traditional built fabric and to the way the building functions. [see reference 137]	

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Havering	Yes (Adopted 2021). Policy 33 Air Quality states that the Council is committed to improve air quality in Havering to improve the health and wellbeing of residents. This includes encouraging choices which include sustainable and active travel, the use of green infrastructure and renewable energy.	Yes. The Havering Climate Change Action Plan (HCCAP) sets out how the borough will become carbon-neutral through nine priority areas, with Transport and Domestic Gas use identified as being the most responsible for carbon emissions. Reference to renewable energy as a decarbonizing strategy. [see reference 138]	No.	No.	No.	Yes. The Residential Extensions and Alterations SPD (2011) provides guidance on the placement of photovoltaic (PV) cells and panels for solar water heating systems, stating that the optimum location is an un-shaded south facing aspect. Further to this, the cells or panels should preferably be integrated into the existing roof tiling systems	No, but there are 11 Conservation Areas within Havering.

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	Policy 36 Low Carbon Design and Renewable Energy states that the Council will seek to optimise the energy efficiency of buildings and support low carbon and renewable energy developments including energy efficiency improvements to existing buildings. [see reference 139]	Note: Havering has not declared a climate emergency.				and laid to the same angle as the roof pitch so as not to appear overbearing. In line with the Council's approach to design, the panels should be located to the rear of the property so as not to cause visual harm to the street scene. [see reference 140]	
Hillingdon	Yes (Adopted 2012).	No, however Hillingdon	No.	No.	No.	No.	Yes.

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	Local Plan Part 1 2012 [see reference 141]. Policy 7: Historic and Built Environment – One of the main challenges is to balance requirements to combat climate change and still protect character of place, especially CAs. Policy HE1: Heritage – encourage reuse/modification of heritage assets if it mitigates	Council declared a climate emergency in January 2020.					There are 31 Conservation Areas within Hillingdon. Eastcote Park Estate Management – states planning permission (if required) is unlikely to be given for adding solar panels to the elevations visible from the public domain. Eastcote village, North Frithwood, Ruislip Village & Rockingham Bridge - Planning permission required for

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	climate change. If there is negative impact seek alternative approaches without damage to the asset. Policy EM1 – Climate Change adaptation and mitigation. Council will work with developers to provide efficiency initiatives to benefit existing building stock. Local Plan Part 2 2020 [see reference 142] Policy DMBH 1: Heritage Assets – development						installation of solar panels (on wall on principal/side elevation of house or if visible from highway, or if protrudes more than 200mm beyond slope of the original roof). The Glen Northwood – permission not granted for solar if sited prominently. Policy to be reviewed as technology becomes more discreet. [see reference 143]

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	that affects heritage assets will not lead to loss of significance/harm, or where there's proved public benefit to outweigh harm/loss. Council may require alternative solution to meet sustainability targets of Local Plan and protect the asset. Householder development policy A 1.29 – Solar panels. Planning permission required. Size						

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	and placement should be carefully located to not adversely affect building/area. Should not be put where they can be seen over great distance/surrounding area.						
Hounslow	No.	Yes. Climate Emergency Action Plan (2020) [see reference 144]: Has various aims in the short and long term to increase installation of	No.	No.	No.	Yes. Chapter 4.10 of the Residential Extensions Guidelines [see reference 145] provides guidance on solar panel use.	No. There are 28 Conservation Areas within Hounslow. There are Article 4 Directions for Bedford Park and Gunnersbury Park

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		solar PV across the borough. Hounslow Council declared a climate emergency in June 2019.					Conservation Areas, but no restrictions on solar. [see reference 146]
Islington	No (Adopted 2011). Core Strategy: Supporting Text, Paragraph 3.2.13 [see reference 147] Developments will also be expected to protect and enhance biodiversity and be adapted to climate change,	Yes. Creating a Net Zero Carbon Islington by 2030 [see reference 148]: One of the main priorities is to Install more solar PV panels on council buildings. Islington Council declared a	No.	No.	Potentially. Most Conservation Areas have Article 4 directions, but it is unclear what the Article 4 directions are for.	Yes. Environment Design SPD [see reference 149]: Section 2: Minimise energy demand and carbon emissions: Use of renewable energy should be maximised to enable achievement of	No. However, there are 41 Conservation Areas within Islington [see reference 150].

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	using measures appropriate to Islington and which respond to the particular local context. Measures such as orientating buildings and use of solar shading to minimise solar gain will need to be addressed.	climate emergency in June 2019.				relevant CO2 reduction targets. It includes Solar PV as 'likely to be suitable for a range of scenarios in Islington'. Islington is in the process of creating guidance on solar energy specifically.	
Kensington and Chelsea*	Yes (Adopted 2019). Policy CE1: Climate Change [see reference 151]: The Council will require that	Yes. Air Quality and Climate Change Action Plan 2016-2021: sets out actions to explore the opportunity to	Yes. The New Local Plan (2022) is at Regulation 18 stage, however it should be noted that there is a	Yes. St Quintin and Woodlands (2018) [see reference 152] Policy C2: Within those streets (and	No.	Yes. Greening SPD (2021) [see reference 153]: Provides an overview to how Solar PV Renewable	No. There are 35 Conservation Areas. [see reference 154] No mention of solar within Area

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	carbon dioxide and other greenhouse gas emissions are reduced in accordance with the following hierarchy: ■ energy efficient building design, construction and materials, including the use of passive design, natural heating and natural ventilation;	install renewable energy technologies in Council's social housing, support and encourage community energy enterprises, increase solar uptake throughout the borough and lobby national government to provide incentives for solar installations. Kensington and Chelsea Council declared a climate	new policy on Sustainable Retrofitting within the draft plan. This policy, G4, states that sensitive installation of solar panels in an appropriate position to maximise solar gain is supported [see reference 155].	part streets) of the Oxford Gardens Conservation Area covered by Article 4 Direction 46/62 to allow minor adjustments to roof ridge heights for insulation improvements, where this does not materially affect the appearance of the roof or create an uneven roofline in a terrace, and to require main chimney stacks to be retained.		Energy Generation works, and the PD rights associated. Earls Court/ West Kensington Opportunity Area JSPD (2012) [see reference 156] makes reference to renewable energy in principle ENE1: Each phase of development must meet the carbon reduction targets set out in the Mayor's London Plan (2011), with all	appraisals. However, a Draft Local Listed Building Consent Order is being consulted on currently. It has been prepared to make it faster and easier for residents and businesses to install solar panels on their properties by removing the need to apply for listed building consent, and to signal the Council's commitment to roll out of renewable

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	■ provision of on-site renewable and low-carbon energy sources; ■ decentralised heating, cooling and energy supply, through Combined Cooling Heat and Power	emergency in October 2019.		Justification: to allow house-owners to improve the energy efficiency of their homes, provided that this does not materially affect the character of the conservation area. Norland (2013) [see reference 157] Policy N6: Small Scale Additions and Architectural Features solar panels and satellite dishes to be discreetly		residential development from 2016 being zero carbon and non-residential development from 2019 being zero carbon.	energy and carbon saving measures where appropriate with the borough's historic buildings and areas. Further information on the Order is set out in Appendix B.

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				located so as not to harm the character of the host building and its setting within the townscape of the Neighbourhood Area.			
Kingston upon Thames	Yes (Adopted 2012), but only general climate policies. Kingston's Core Strategy, Theme 1: A Sustainable Kingston - Climate Change and Sustainability notes opportunities across Kingston	No, however Kingston Council declared a climate emergency in June 2019.	No.	Yes. Kingston Parish (2014): Policy KPNP 7 – Design & Development States that planning permission will normally be provided for development within the Built-up Area	No.	Yes. Residential Design Guidance Interim Document (2016) [see reference 158] - Includes a list of what one must adhere to when proposing an extension under PDR. The installation of	No, but there are 26 Conservation Areas within Kingston. Kingston Old Town/Southborough/Park Road/Surbiton Town centre Conservation Area – no specific references.

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	for potential decentralized energy projects. Policy CS 1: Climate Change Mitigation states that the Council will ensure that all development is designed and built to contribute to climate change mitigation and adaptation. Further to this, the Council aims to identify and promote opportunities for large scale renewable and decentralised energy generation to			Boundary. In the case of the installation of solar panels and/or wind turbines to residential properties, they must sympathetically relate to, be visually integrated, and be compatible with the landscape in both scale and positioning to not intrude upon the skyline, or generate noise or vibration nuisance for neighbours.		solar PV/ solar thermal equipment should comply with a number of requirements, which include: the solar PV or solar thermal equipment must not protrude more than 200 mm beyond the plane of the wall or the roof slope.	

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	deliver low CO2 emissions resulting from energy generation within the Borough. Policy CS 2: Climate Change Adaption states that the Council will adapt to the effects of current and predicted climatic changes by working with its partners to develop a Climate Change Adaptation Strategy which will identify priorities for the Borough and			Policy KPNP 7 - Also states that any new development proposals, will be supported unless it proposes development of any commercial solar array or wind turbine farms for the purpose of electricity generation that will have adverse impacts to landscape, habitats, the historic environment and residential			

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	future work programmes. [see reference 159] Policy K7 of the Kingston Town Centre Area Action Plan [see reference 160] : Housing states that new housing should incorporate renewable energy measures to in order to contribute to sustainability.			amenity. [see reference 161]			
Lambeth	Yes (Adopted 2021). Policy Q11 [see reference 162] :	No, however Lambeth Council declared a climate	No.	No.	No.	Yes. Design Guidance SPD [see reference	Yes. There are 62 conservation areas in

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	Building alterations and extensions. When considering proposals for the alteration or extensions of buildings the council will generally expect proposals: to, wherever possible, include energy efficiency improvements such as more efficient plant, improvements to thermal performance and renewable energy generation; and	emergency in 2019.				163] (2020): Sustainability section; Energy Generation. For highest efficiency of photovoltaic (PV) cells and panelling for solar water heating systems, an unshaded south facing aspect is required, although an unshaded southeast and southwest aspect can still be viable.	Lambeth covering approximately 30% of the borough. [see reference 164] Albert Square, Brixton, Clapham Road, Herne Hill, Hyde Farm, Kennington, Lower Marsh, Mitre Road and Ufford Street, Park Hall Road, Renfrew Road, Roupell Street, South Bank, South Lambeth Road, Vauxhall and Waterloo Conservation Area Management Plans state that

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	climate change adaptation measures such as improved shading on southern elevations and natural ventilation.						roof top PV panels should be carefully considered to ensure no harm is caused, visually prominent locations should be avoided.
Lewisham	Yes (Adopted 2011). The Core Strategy vision for Lewisham states that new development throughout the borough will meet the challenges of climate change, flood risk, the need for renewable	Yes. Climate Emergency Action Plan (2020) [see reference 165]: Various actions associated with solar panels such as launching various community energy funds for carbon	Yes, however the new Local Plan is at Regulation 18 stage [see reference 166]. Policy SD2 Sustainable Design states that sustainable retrofitting measures to existing buildings will be supported.	Yes. Crofton Park and Honor Oak Park Neighbourhood Forum and Area (2019) [see reference 167] Policy BE1 Design of New Development states that all new	No.	Yes. The Lewisham Renewables Energy Evidence Base (2010) [see reference 168] identifies the potential for decentralized and renewable and low carbon energy generation within the	Yes. There are 29 Conservation Areas in Lewisham. Full planning permission would be required to install a solar panel on dwelling houses when the following apply:

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	energy, and the use of sustainable materials and construction practices. Core Strategy Objective 5: Climate Change, states that climate change will be adapted to and mitigated against through the maximizing of generation and use of renewable energy and locally distributed energy, particularly for major	reduction projects. Lewisham Council declared a climate emergency in 2019.		development should promote principles of healthy and sustainable design with a high level of resource efficiency and resilience to climate change. Consideration should be given to the incorporation of features such as living roofs, green walls, passive solar design and zero carbon buildings. Grove Park (2019) [see reference 169]		Borough, and the potential for wider carbon reduction and energy efficiency measures within the period to 2025.	- If it would be installed on a wall in a conservation area which faces a highway. This includes roads, paths and public rights of way; - Your house or flat is a listed building, or within the curtilage of a listed building; - If your house or flat is a listed

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	development sites. Lewisham Spatial Policy 1 states that all new development will need to ensure the principles of good design are addressed and incorporate high standards of sustainable design and construction, including maximising energy efficiency and the provision of on-site renewables.			Strategic Aim 9: ensure all retrofitting considers climate adaptation. Policy SE2: Improving Air Quality states that new development is required to promote high quality building standards, reduce energy use, and require the preparation of low emissions strategies to help to reduce local emissions of air pollutants.			building you must also apply for listed building consent. [see reference 170]

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	Core Strategy Policy 7 Climate Change and Adapting To The Effects, states that the Council will adopt a partnership approach to implement the principles of 'avoidance, mitigation and adaptation' to reduce Lewisham's CO2 emissions. This will be achieved partly through the reduction of natural resources consumption and applying			Policy HR2: Conservation of Areas of Special Local Character: proposals for alterations or side of roof extensions to existing properties should be of a high and sympathetic design quality. Policy BE1: Extensions and Alterations to Existing buildings – proposals should use good quality and sustainable materials to			

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	the London Plan policies relating to renewable energy and retrofitting. Core Strategy Policy 8: Sustainable Design and Construction And Energy Efficiency, states that the Council expects all new development to reduce CO2 emissions. New developments are required to maximise the opportunity of supplying energy efficiently by			enhance energy efficiency. Lee (2019) [see reference 171] Draft Policy GG6.A. states that planning and development must seek to improve energy efficiency and support the move towards a low carbon circular economy, contributing towards London becoming a zero carbon city by 2050. Policy B3 Design of New Development			

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	prioritising decentralised energy generation (clean) for any existing or new developments. [see reference 172] SD3 Minimizing Greenhouse Gas Emissions states that development proposals should help Lewisham to become a net zero-carbon Borough by reducing greenhouse gas emissions by maximizing opportunities for renewable			states that all new development will be required to incorporate design features that maximise energy efficiency.			

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	energy by producing, storing and using renewable energy on-site. SD4 Energy infrastructures encourages a shift from a reliance on natural gas as the main energy source to a wider range of low and zero-carbon and renewable sources. [see reference 173] DM Policy Urban Design and local character: retention and						

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	refurbishment of existing buildings that make a positive contribution to the environment will be encouraged. [see reference 174]						
Merton	Yes (Adopted 2011), but only for new builds. Policy 15 - Climate Change states that combating climate change is a priority for Merton. It refers to the 'Merton Rule', a new planning policy that requires all	Yes. Merton Climate Strategy and Action Plan [see reference 175] - The Council has set a 2030 net-zero carbon target with a number of initiatives proposed to	Yes. Merton is creating a New Local Plan to replace the existing Core Planning Strategy: Policy CC1.1: Promoting Sustainable Design To Mitigate And	No.	No.	Yes. Wimbledon (2020) [see reference 176]: Future Wimbledon Priority 3: Urban Greening And Sustainability states that all development proposals in	Yes. There are 28 Conservation Areas in Merton. Bathgate Road (1989)– Planning permission may be required for solar [see reference 177].

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	new non-residential developments of over 1,000 m2 to incorporate renewable energy production equipment to provide at least 10% of predicted energy requirements, where this is viable. [see reference 178]	help achieve this ambition. With regards to solar, a key transformation will be a shift to low carbon buildings and energy by improving energy efficiency, replacing gas heating with low carbon alternatives (e.g. heat pumps), and increasing local renewable electricity generation. Merton Council declared a climate	Adapt To Climate Change sets out that Merton will reduce greenhouse gas emissions and increase local resilience to the impacts of climate change to make Merton a more environmentally sustainable place and net-zero carbon by 2050. Policy CC2.2: Minimizing Greenhouse Gas Emissions aims to minimise greenhouse gas emissions from			Wimbledon town centre are required to be designed to deliver holistic and multifunctional sustainability benefits. The design of new buildings, and refurbishment of existing buildings must be capable of being carbon free, which can be through a progressive decrease in the use of gas in favour of low carbon alternatives and district heating, and maximising	Copse Hill (2002) – Solar installation will require planning permission if they alter the appearance of the building. Council will look for balance between promoting sustainability and impact on building character. Should be away from principle roof pitch and not extend beyond existing roof slopes [see reference 179]. Cricket Green/ – MP4 (2013): special

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		emergency in July 2019.	development by maximising carbon savings on site. Policy CC2.4: Low Carbon Energy aims to drive the decarbonisation of heat and maximise renewable energy generation in the borough. [see reference 180]			low carbon micro-generation technologies, such as solar PV.	characteristics of Conservation Areas should be taken into account when considering installation of renewable energy systems [see reference 181]. Kenilworth Ave (2005) - Article 4 Direction should be sought to protect the small scale alterations. [see reference 182] Dennis Park (1996)- sited at the rear of property and mounted below

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							eaves level. In some situations planning permission will be required for the installation of solar. [see reference 183]
Newham	Yes (Adopted 2018). [see reference 184] Policy SC1 states developments must be resource-efficient and encourages the uptake of opportunities to improve resource	No, however Newham Council declared a climate emergency in April 2019.	No.	No.	Yes, in 2 conservation areas. Romford Road CA [see reference 185] schedule 2 references solar equipment where it fronts a relevant location* [see reference 186].	No.	No, but there are 9 Conservation areas within Newham, but a few Management Plans state that they will: *Investigate the necessity and desirability of serving an Article 4(1) Direction to*

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	efficiency of existing homes/buildings through retrofitting (subject to SP5). Policy SC2 Energy and Zero Carbon - All development will minimise and reduce carbon emissions by following the lean, clean, green energy hierarchy. Policy INF4 states that proposals will be encouraged that use innovative				Woodgrange Road CA [see reference 187] schedule 2 references solar equipment where it fronts a relevant location. [see reference 188] *relevant location = one where the part of the house affected by the works fronts a highway.		*bring certain "permitted development rights" under planning control. These would be those that adversely impact on conservation of the area and would follow detailed survey and justification* [see reference 188]

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	technologies to reduce the use of fossil fuels. SP5 Innovation will be encouraged to realise the value of (heritage) assets and secure viable, sustainable and appropriate futures for them…reconciling this with the sensitivity to change presented by many (see also Policies SC2, SC4, INF6 and INF7).						

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Redbridge	Yes (Adopted 2018). LP19: Climate Change Mitigation states that the Council will tackle climate change and promote measures to meet carbon dioxide reduction targets by promoting zero-carbon development for example. LP20: Low Carbon and Renewable Energy states	Yes. Climate Change Action Plan (2021): includes actions to ensure new council residential developments incorporate solar panels and to undertake a feasibility study into solar PV. [see reference 189] Redbridge Council declared a climate emergency in June 2019.	No.	No.	Yes. Aldersbrook and Lake House Conservation Area: The installation, alteration or replacement of solar PV or solar thermal equipment on - (a) a dwellinghou se; or (b) a building situated within the curtilage of a dwellinghou se, being developmen	Yes. The Housing Design Guide SPD (2019) [see reference 190] references Policy LP20 of the Local Plan, stating that in most cases solar panels will benefit from permitted development rights. However, householders are advised to seek advice from the Council through its	Yes. There are 16 Conservation Areas in Redbridge. Aldersbrook & Lake House [see reference 191] - Sustainable energy solutions will usually be acceptable on rear elevations, subject to normal amenity considerations. Traditional photovoltaic panels can be visually obtrusive.

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	that the Council will ensure that major developments demonstrate accordance with the following energy hierarchy: be lean, be green, be clean, be green. The Council will seek to support and promote sustainable forms of energy in the borough by supporting the use of on-site renewable energy as a means of meeting energy reduction				t permitted by Class A of Part 14 of Schedule 2 to the Order, and not being developmen t comprised within any other Class. [see reference 192]	preapplication process.	Where they are to be placed on front roofslopes, they should be chosen with care and consideration of the appearance of the primary façade. Sustainable technologies which have been designed for installation on historic roof (such as slate roofs) will be considered on front elevations subject to their sensitive placement and neutral impact on the character and

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	targets for example. LP26: Promoting High Quality Design states that the Council requires developers to incorporate sustainable design and durable construction, observing best practice in energy efficiency and climate change mitigation. LP30: Household Extensions states that the Council will						appearance on the Conservation Area. Where sustainable energy measures can be integrated with minimal harm to the character and appearance of the Aldersbrook Conservation Area, they are encouraged. Rear-facing roofslopes or the roofs of ancillary garden buildings will usually be acceptable locations for their installation. On

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	support householder development that improves energy efficiency and incorporates renewable sources of energy. Further to this, the Council will encourage residents to improve the sustainability of established homes through measures such as small scale renewable energy infrastructure. LP32: Sustainable Design and						front elevations, the impact to the character and appearance of the wider roofslope and of dynamic views in and around the Conservation Area will be a material consideration in determining whether PV or other panels are acceptable. Bungalow estate [see reference 193] - has a photo of pv panels as an example of inappropriate development

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	Construction states that the Council will require all development to contribute towards the mitigation of the effects of climate change. [see reference 194]						due to the potential visual impact. Woodford Broadway [see reference 195] - gives example of solar panels as a 'negative recent addition'. Article 4 consideration to prevent insertion of PV panels. Woodford Green [see reference 196] - small scale negative changes include inappropriately positioned solar panels.

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Richmond upon Thames	Yes (Adopted 2018), but quite general. Policy LP8 Amenity and Living Condition: "The Council will ensure the design and layout enables good standards of daylight and sunlight to be achieved in new development and in existing properties affected by new development". LP 22: Sustainable Design and	Yes. Climate Emergency Strategy 2019 – 2024 [see reference 197]: aims to generate heat from renewable resources, but no direct action for solar. Richmond Upon Thames Council declared a climate emergency in July 2019.	Yes, within the Draft Local Plan (2021). Policy 4: Minimising Greenhouse gas emissions and promoting energy efficiency [see reference 198] states all development must make the fullest contribution to supplying energy efficiently and cleanly, and to maximise renewable and low carbon energy	Yes Ham and Petersham [see reference 199] Neighbourhood Plan (2018) Policy E2- Retrofitting Existing Housing and Residential Extensions Planning applications for the installation of measures on residential properties to improve energy efficiency (such as solar panels and ground heat pumps)	No.	Yes. Air Quality SPD (2020) [see reference 200] Solar power should be used instead of combustion of fossil fuels in AQFA's, LENs and CAZ's in the borough. Residential Development Standards (2010) [see reference 201] states that Solar panels or cells should preferably be integrated into	No, but there are 85 Conservation Areas within Richmond and note many of the appraisals date from 1990s. Ham Common/Ham House - Discourage use of unsympathetic modern interventions (e.g.prominent satellite dishes) [see reference 202].

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	Construction [see reference 204] Developers should contribute to renewable and low carbon energy generation. Also references the 'energy strategy' which promotes the use of renewable energy across the borough. High standards of energy and water efficiency in existing developments will be supported wherever		generation, storage and use, through the deployment of appropriately selected, sized and sited technologies and promote a more ambitious use of available roof space to deliver multi-functional benefits (such as co-location of renewable energy and GI)	will be supported except where the works would adversely affect the appearance of the building or area.		the existing tiling systems. Solar panel provision is included in the Sustainable Construction Checklist (2020) [see reference 203]	Kew Green [see reference 205] - unsympathetic alterations to front elevations. King Edwards Grove [see reference 206] – disproportionate roof additions Mallard Place [see reference 207] – has residents management company which maintains quality of environment.

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	possible through retrofitting. Supporting Text, Paragraph 5.6.5, Policy LP17 Green roofs and photovoltaic panels or solar thermal units can be used together and green roofs may increase the efficiency of solar photovoltaic panels by regulating temperature.						

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Southwark	Yes (Adopted 2022), but only general energy policies. Policy P70: Energy [see reference 208] Development must minimise carbon emissions on site in accordance with the following energy hierarchy ■ Be lean (energy efficient design and construction) ; then	Yes. Climate Change Strategy: has five priority areas including renewable energy which includes solar PV. One action is to maximise solar PV capacity within the borough. [see reference 209] Southwark council declared a climate emergency in March 2019.	No.	No.	No.	No, nothing on existing buildings, but for new builds: The Sustainable Design and Construction SPD (2009) [see reference 210] states (in section 3.1- the Energy Hierarchy) that energy demand should be met through zero and low carbon sources in new developments, such as solar power. Solar thermal energy is listed as a preferred on	No. There are 48 Conservation Areas within Southwark.

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	■ Be clean (low carbon energy supply); then ■ Be green (on site renewable energy generation and storage). All development should minimise carbon emissions through on-site renewable energy generation.					site renewable energy system.	
Sutton	Yes (Adopted 2018), but only for new builds.	Yes. Environment Strategy 2019-2025 [see	No.	Yes.	No.	Yes. Design Principle 6: Building For	Yes. There are 15 Conservation

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	Policy 31: Carbon and Energy states that proposed developments will use renewable energy generated on-site. Major developments will be expected to achieve at least a 20% reduction in total CO2 emissions. [see reference 212]	reference 211] : Aims to investigate the feasibility of installing renewable energy generation and insulation across the Council estate e.g., solar panels. Sutton Council declared a climate emergency in September 2019.		Hackbridge & Beddington Corner (2018) Provides a list of proposed neighbourhood projects. Relating to solar energy, the proposed 'greening-up' works at Hackbridge train station will ensure the building becomes a flagship for sustainability, and will include solar panels, green walls, and water harvesting. [see reference 213]		The Future (2008) states that sustainable design and construction techniques such as solar panels should be designed and located to have the least visual impact on the street scene. Careful design such as locating solar panels on the rear facing roof slopes and using photovoltaic panels that look like tiles, is especially important in areas of	Areas within Sutton. Planning permission is likely to be required for the installation of micro-renewable technologies in the Sutton Garden Suburb Conservation Area. Whilst Historic England is supportive of renewable energy measures, they consider that it is important that a building's overall energy efficiency should be

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						heritage value. [see reference 214] Any solar thermal panels or PV systems that are installed on or in roofs (residential) should not unduly dominate the roof and should be sensitive to the character, colour and style of the existing roof (2006). [see reference 216]	maximised before additional micro-renewables.
Tower Hamlets	Yes (Adopted 2020). Policy S.ES1 Protecting and	No, however Tower Hamlets Council declared a	No.	No.	No.	Yes. Central Area Good Growth SPD (2013)	Yes. There are 58 Conservation

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	enhancing our environment states that proposals should follow the energy hierarchy: be lean, be clean and be green. Policy D.ES7 A zero carbon borough states that the sustainable retrofitting of existing development with provisions for the reduction of carbon emissions will be supported.	climate emergency in March 2019.				[see reference 217] Design Principle 12: The provision of on-site renewable energy is encouraged such as solar panels or roof-mounted solar thermal panels facing south, east or west.	Areas within Tower Hamlets. **Conservation Strategy** [see reference 218]: sets out an objective to consider producing guidance to help resolve the conflict between the desire to retrofit energy efficiency improvements to historic buildings and the need to preserve the special character. Driffield Conservation Area – Design

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
							Guidance for solar panels [see reference 219] Medway Conservation Area– Design guidance for solar panels [see reference 220]
Waltham Forest	Yes (Adopted 2019). Policy 80 Alterations or extensions to locally listed buildings will be expected to achieve a high standard of design, paying close attention	No, however Waltham Forest Council declared a climate emergency in April 2019. In addition, they have initiatives and programmes such as retrofitting 12	Yes. Regulation 19 Proposed Submission Local Plan (currently in examination) Policy 89 – Sustainable Design and Construction states the	No. Highams Park (area of special character) Neighbourhood Plan (2020) [see reference 221] makes no direct reference to solar PV or retrofitting.	No. Note: In February 2020, a decision was made to remove the installation of solar panels from Article 4 Directions for Highams Area	Yes. London Borough of Waltham Forest Energy strategy (2008) [see reference 222] highlights the need to utilise the energy hierarchy.	Yes. There are 14 Conservation areas within Waltham Forest. There are Article 4 directions in 9 Conservation Areas and Higham Area of

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	to the special interest of the locally listed building and its setting. 16:28 council will be preparing an SPD document to provide greater clarity on preserving, enhancing and managing locally listed buildings. Policy 90 Promoting low carbon energy generation and maximising the opportunity for renewable energy following the London Plan	public buildings through the Mayor's Energy Efficiency Fund and Carbon Offset Fund.	sustainable delivery of development will be achieved by supporting the low-carbon retrofitting of existing buildings to reduce carbon emissions [see reference 223].		of Special Character.		Special Character, but they do not relate to solar. Orford Road Conservation Area Appraisal - Identifies satellite dishes and changes to roofs as a negative elements. No specific reference to Solar PV or environmental concerns in Conservation Area Appraisal [see reference 224]. Walthamstow St James

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	energy hierarchy. Policy 92 Supporting the low-carbon retrofitting of existing buildings to reduce carbon emissions. [see reference 225].						Conservation Area Appraisal 2014 - Identifies satellite dishes and changes to roofs as a negative elements. No specific reference to Solar PV or environmental concerns in Conservation Area Appraisal [see reference 226].
Wandsworth	Yes (Adopted 2016). Core Strategy [see reference 227] Policy IS2: Sustainable design, low	Yes. Environment and Sustainability Strategy: aims to increase small-scale	Yes. Policy LP10 [see reference 228]: Retrofitting of existing buildings,	No.	No.	Yes. The Historic Environment SPD (2016) [see reference 229] states that solar PVs on	Yes. There are 46 Conservation Areas within Wandsworth.

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	carbon development and renewable energy: The Council supports measures to improve energy conservation and efficiency and contributions to renewable energy generation. All development will be required to make efficient use of natural resources (e.g. energy and water), employing good standards of sustainable	energy technologies within Council properties including solar PV. [see reference 230] Wandsworth Council declared a climate emergency in July 2019.	through the use of low-carbon measures, to adapt to the likely effects of climate change should be maximised and will be supported.			roofs may be considered in conservation areas. Any external addition of solar PVs to a listed building will require planning permission and listed building consent.	Many Management Strategies [see reference 231] note that *old buildings can be unnecessarily draughty and it is sensible to prevent excessive heat loss before considering installing micro generators such as solar panels and wind turbines.* Also, it notes that there does not have to be a conflict between conserving character and

London Borough	Relevant extant planning policies regarding the installation of solar PV on existing buildings?	Has the borough created or is in the process of creating a Climate Action Plan?	Relevant emerging/draft planning policy?	Relevant Neighbourhood Plan policy?	Has the Borough made relevant Article 4 Directions in relation to solar PV?	Relevant supplementary planning guidance?	Reference within Conservation Area Management Plans?
	design and construction, including sustainable drainage, working towards low carbon and zero carbon standards.						conserving energy.

Appendix B

Relevant Case Studies

B.1 Based on desk-based research we have selected three case studies that are relevant to our research. One of the case studies is an international example while the other two are located within the UK.

Berlin, Germany

B.2 Renewable energy technologies have deployed rapidly in Germany since 1990 largely as a result of energy policies adopted by the German government and the European Union. A 1997 Directive on Renewable Energy Sources adopted by the European Union (EU) also contributed to the cause of renewable energy by aiming to boost the renewable share of the electricity generating fuel mix to 22per cent by 2010. Similarly, the EU's ratification of the Kyoto Protocol has given all EU member states additional legal incentives to reduce their domestic greenhouse gas emissions through the use of renewable energy. The 1990 Electricity Feed Law and 2000 Renewable Energy Law played major roles in advancing the deployment of renewable energy technologies.

B.3 To find solutions for balancing heritage concerns with the provision of renewable energy, the German government has created, through the government-owned bank KfW, a programme of grants and loans, called KfW Efficiency House. This programme aims to 'promote the refurbishment of houses if after refurbishment they do not exceed a specific energy requirement for a comparable new house'. Acknowledging, however, that retrofitting historic properties without destroying their special character is challenging, a specific programme has been created for historic buildings: KfW Efficiency House Monument. The applicability of the monument programme is not limited to listed buildings, but also covers other 'especially preservation-worthy building fabric', such as buildings in monument groups, Conservation Areas, townscape statues

areas and listed historic city centres or buildings deemed otherwise preservation-worthy by local governments **[See reference** 232**]**.

B.4 Furthermore, the city of Berlin has drafted the Berlin Solar Law. The Berlin Solar Law will go into effect on January 2023 and will require private owners to install PV systems on new buildings and include them as part of roof renovations or conversions of older buildings. The Masterplan Solarcity initiative**[See reference** 233**]** was launched in March 2020 by Berlin's Senate in line with the Berlin Energy and Climate Protection Programme 2030 that aims to make the city carbon-neutral by 2050. The initiative includes 27 measures meant to create incentives and better framework conditions that would help accelerate the installation of solar power capacity in the city. A prime example of a historic building integrating renewable energy through the use of solar panels is the Reichstag. The Reichstag runs solely on renewable energy, on the south-facing roof of the building there are 300 square meters of solar panels. The transformation of the Reichstag was focused on the sensitivity to history but also meeting the environmental agenda **[See reference** 234**]**.

B.5 In terms of lessons learned, support from regional and national governments is vital to enable policies and programmes to work. The GLA could utilise the initiatives Berlin has launched as a potential template for solar PV initiatives within London.

Historic Religious Buildings throughout England

B.6 In November 2016, Gloucester Cathedral, Grade I listed building, became the first ancient Cathedral to install solar panels. On the south side of the Nave roof, the Cathedral has 150 solar panels generating around 29,000 kW of energy each year. The scheme responded to the historic nature of the Gloucester Cathedral and its complex design with each panel. Each panel is contained in a weighted frame which rest gently on the roof without damaging the fabric and is fitted with optimisers to ensure that the array provides maximum power output, even in areas where the panels are partially shaded by the parapet wall and buttress. The solar panels were promoted as part of the

Church of England's Environmental Programme 'Shrinking the Footprint' designed to tackle the current climate crisis by reducing carbon emissions to zero **[See reference** 235**]**. The Joint Core Strategy for Gloucester, Cheltenham and Tewkesbury's Policy INF5: Renewable Energy/Low Carbon Energy Development aided the Cathedral's proposal as it states that "proposals for the generation of energy from renewable resources, or low carbon energy development (with the exception of wind turbines), will be supported, provided the wider environmental, social or economic benefits of the installation would not be outweighed by a significant adverse impact on the local environment".

B.7 Furthermore, at least 42 premises in the Diocese of London have installed solar PV panels. This case study has highlighted the importance of well-thought-out solar panel designs for historic buildings to ensure the climate crisis is being tackled while the fabric of the historic buildings remain intact.

B.8 Throughout the Gloucester Cathedral's planning process, Historic England supported the installation of 150 solar PV panels on the roof of the cathedral. They noted the importance of preparatory work to inform the design and planning stages of the project. For example, the Cathedral's architect, Antony Feltham-King, carried out extensive work to develop an innovative and light-touch fixing method and to gather evidence that the solar panels would not be visible from various sites in and around Gloucester **[See reference** 236**]**. As such, when applying for solar PV within the historic environment, informing Historic England from the offset is key to help guide the process.

Draft Local Listed Building Consent Order, Royal Borough of Kensington and Chelsea

B.9 A draft Local Listed Building Consent Order (LLBCO) has been prepared to make it faster and easier for residents and businesses to install solar panels on their properties by removing the need to apply for listed building consent, and to signal the Council's commitment to the roll out of renewable energy and carbon saving measures where appropriate in the borough's historic buildings and areas. It is also intended to signal to owners of listed buildings that the principle

of use of solar panels on listed buildings is an acceptable one provided careful detailing is applied. The overall aim of the Council is to create the LLBCO to allow the installation of solar PV panels on Grade II and most Grade II* buildings. As 75 per cent of the borough lies within Conservation Areas, this will allow residents and businesses to proactively reduce their carbon use **[See reference** 237**]**. However, to ensure that the significance of the historic buildings and area is protected, conditions have been created to ensure that the panels are sensitively designed and positioned on the building, especially with regard to visual impact. The conditions specifically relate to siting, colour and reflectivity.

B.10 This Order seeks to support solar installation on listed residential buildings, subject to the conditions set out within the Order. For non-domestic listed buildings, planning permission would still be required, but listed building consent would not.

B.11 Whilst still in draft form at the time of writing, this case study demonstrates that there are ways to ensure that the planning system does not unnecessarily hinder tackling the climate crisis, but also ensures the historic environment is not adversely impacted. There is potential for LLBCOs to be utilised across the boroughs of London to incentivise residents to install solar PV without compromising on the heritage significance of listed buildings.

Appendix C

Non-planning Barriers to the Uptake of Solar PV Installations

C.1 The research revealed that there are significant barriers to the uptake of solar PV installations that lie outside of the planning system, including:

- Many of London's buildings are tall which means that scaffold costs are high, and the scope for solar PV installation is reduced by lofts and roof windows, dormers, aerials and chimneys, which limit the area available and can also cause shading.
- A lack of fiscal incentive to install solar PV, with long payback periods. Grant funding is needed in light of the increasing energy prices from April 2022 and price of solar PV. There is potential for solar PV to reduce energy prices and help the 15 per cent of households within London that are within fuel poverty, however as solar PV is expensive, local and national governments will need to incentivise the uptake of solar PV installation.
- Logistically, many London boroughs, especially inner London boroughs, are physically constrained. London's rooftops are relatively small, therefore not all roofs are able to accommodate solar PV. Additionally, not all buildings have the most suitable orientation for solar PV. It was highlighted throughout our research, specifically during the interviews, that there is a lack of suitable roofspace that is large enough for solar PV and has the correct solar orientation.
- London has a relatively low number of owner occupiers. Currently, the owner occupier section of the housing market has a lower uptake of solar PV than the social housing sector. Greening homes needs to become more attractive. Furthermore, as 50 per cent of London is made up of flats, there should be an equitable approach to funding, use of energy and associated reduced costs for residents within flats. The creation of

guidance for the public on what they can achieve through permitted development rights for their homes (both houses and flats) is needed.

- The emerging solar technology, such as solar slate, has the potential to neutralise the visual impact for historic and listed buildings. However, there is currently not much of a market for this type of solar panel and it is more expensive than other types of solar panels.

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