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Solar on the Government Estate: A Senior Leaders' Handbook

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1. Introduction

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Solar is a key technology in achieving the UK's ambitious decarbonisation targets and the government mission to make Britain a clean energy superpower. In the Net Zero Strategy[1] government committed to a sustained increase in deploying renewable generation technologies, including solar, in the 2020s and beyond; - 15 years sooner than planned. As set out in the British Energy Security Strategy and the Energy Security Plan[2], we are aiming for 70 gigawatts of ground-mount and rooftop solar capacity by 2035 - a fivefold increase on current installed capacity.

It is essential that government shows leadership in this area.

This document is a primer for senior leaders, setting out the high-level the strategic arguments for solar on their estate, and signposting more in-depth and comprehensive guidance where appropriate.

Given the paramount importance of solar in helping to achieve net-zero emissions, it is one of the major interventions promoted by the Property Emissions Reduction Calculator (PERC)[3]. This is a tool developed by OGP in collaboration with Energy Systems Catapult (ESC), providing a high-level view of the monetary costs and emissions-reduction benefits of the interventions required to help government achieve net-zero emissions by 2050.

[1] Policy Paper Net Zero Strategy: Build Back Greener, published 19 October 2021, adopted by UK Parliament Research Briefing The UK's plans and progress to reach net zero by 2050, published 26 September 2024
[2] Policy paper Powering Up Britain: Net Zero Growth Plan, published 30 March 2023, adopted by UK Parliament Research Briefing The UK's plans and progress to reach net zero by 2050, published 26 September 2024
[3] Guidance available on Government Property Online- https://gpp.civilservice.gov.uk/guidance/property-sustainability/property-emissions-reduction-calculator/

2. The Case for Solar

Sustainability interventions have the potential to add value far beyond their direct impact upon the natural world. Investment in sustainable technology can help deliver energy independence and create jobs and build supply chains in every corner of the UK. PV (photovoltaic) solar is one of the cheapest electricity generation technologies, can be deployed rapidly and flexibly, and creates new high-quality jobs and economic opportunities throughout the UK.

Deploying solar panels on the government estate will bring several benefits to departments, including reducing electricity bills, increasing energy efficiency, contributing to carbon reduction targets and potentially generating revenue by exporting excess electricity. The payback period for solar will vary depending on factors such as capacity installed, level of revenue from excess generation and whether it is deployed alongside other low carbon assets (such as storage, heat pumps and EVs). However the payback period has significantly decreased as the technology has matured over the last decade. More detail on the payback period can be found under the rooftop-mounted case study, later in this document.

According to The Renewable Energy Hub:

“A typical solar panel will save over 900kg of CO2 per year that results in a carbon payback period of ~ 1.6 years. As solar panels have an expected life of 25 years, even in areas where the sun’s radiation is received at less than 550kWh per m2 such as the northern UK, a typical solar panel takes around 6 years to pay back its energy cost”[4]

[4] Solar Photovoltaics - Cradle-to-Grave Analysis and Environmental Cost 2025, The Renewable Energy Hub UK

3. What Type of Solar?

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3.1 Rooftop-mounted solar

Rooftop-mounted solar projects use no land, have low visual impact, and can contribute to a range of wider departmental and government objectives regarding decentralised and local energy, smart grids and storage, energy efficiency and low carbon buildings.

In many cases, permitted development rights currently allow installation of solar panels up to 1MW on non-domestic properties, without any need for planning permission.

3.2 Ground-mounted solar

Standard ground mounts use metal framing that is driven into the ground to hold your solar panels up at a fixed angle. A ground-mounted system with a solar tracker - which follows the path of the sun throughout the day - can be 10% to 45% more efficient than a rooftop solar system.

For ground-mount installations larger than 50 kilowatts, or if the installation does not meet other criteria for permitted development, a full planning application is required to be submitted to the Local Planning Authority.

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4.1 Case Study - Roof-mounted Solar PV

Department for Education (DfE) Cheylesmore House North, Coventry

After surveying the DfE portfolio, **DfE Cheylesmore House North** was selected as a pilot install for the following reasons:

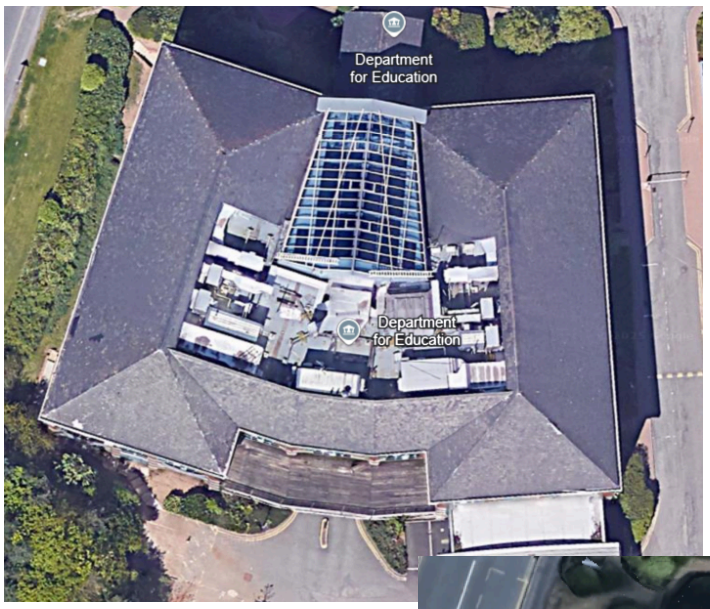
- Potential solar harvest coverage area, the building is 3 (office) stories high, servicing approximately 700 staff, the floor plate is large and subsequently the potential harvest area for panels was ideal.
- The building is situated in an urban but open setting and is not dwarfed by any surrounding high-rise buildings which may obstruct sunlight reaching the panels.
- The roof was due for replacement under LCR project works, it was financially prudent to install the new roof and solar array in parallel, ensuring the solar array and new roof lifespans were synchronised for the next 20+ years, saving on potential conflicting maintenance/repair costs over this period.
- The installation of the new roof meant that a commercial 'mansafe system' could be installed in parallel, without the 'mansafe system' it would not have been possible to service or repair the panels rendering the project unfeasible.
- The DfE met with solar array contractors to consult on project cost, modelled payback (ROI and CROI), infrastructure requirements, programme lead and delivery times, this information was used to produce a business plan which was submitted to key CAPX stakeholders for investment. Investment was secured and installation was completed in parallel with the north building roof replacement in 2022.

The modelling and payback period table demonstrates how quickly the solar array began to pay for itself, with a payback period of just 5.1 years.

Modelling and payback period: The modelling for this array provided the following return on investment (ROI) and carbon return on investment (CROI) data:	
Total cost of solar array, associated infrastructure and install	**£185,000 (ex VAT)**
Total annual energy usage (actual)	**632 MWh**
Modelled annual solar MWH generation	**164 MWh**
Solar array Annual generation offset percentage	**26%**
Solar array annual cost offset year 1 (increasing @3.9% pa)	**£33,960**
Payback period (ROI)	**5.1 Years**
Utilities saving after 10 years based on 3.9% modelled inflation	**£223,846**
CO2 Savings per annum (based on 2024 CO2 conversion rates)	**34.08t**
Equivalent trees planted annually (1t = 45.4 trees)	**1,547**

Additional Lessons Learnt:

- Infrastructure: The north building Low Voltage panel (which, at the time, was over 20 years old) needed to be upgraded to stably transmit the solar array power generation.
- When undertaking the feasibility study, consider the whole associated infrastructure, roof space, roof structure and suitability to support additional weight of the solar array (quantity surveyor required) and the additional supporting electrical infrastructure.
- Consider the condition and point in asset life cycle of the roof you are looking to install the solar array on, if the roof is near to end of life or requires repair it may be financially prudent to repair or replace the roof in parallel.
- Completing the installation during the summer months is preferable, this will ensure fewer delays in the project delivery timescales due to poor weather conditions and H&S requirements.



4.2 Case Study - Ground-mounted Solar PV

Project Prometheus

The British Army's first photovoltaic solar farm opened in September 2021. The solar farm, the size of almost eight football pitches, is based at The Defence School of Transport (DST), Leconfield, Yorkshire, and forms part of the British Army's £200 million Project Prometheus investment which is designed to see the Army using renewable energy.

Built by Centrica Business Solutions, the solar farm is made up of over 4,000 solar panels and is the first of four pilot sites to officially open. Spanning approximately four hectares and with a peak capacity of 2.3MegaWatts, it is projected to save 700 tonnes of carbon emissions and cut electricity bills by one third annually at DST.

The Prometheus Project estimates overall £1 million in efficiency savings and 2,000 tCO2e (tonnes of carbon dioxide equivalent) annually across all four sites, with saving costs due to be reinvested into essential Army infrastructure.[5]

[5] Press release, British Army opens first solar farm, published 29 September 2021

5. Energy Storage and Peak Shaving

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A major barrier to developing solar infrastructure further is a serious lack of grid capacity in the UK to support further solar arrays coming online and feeding back into the National Grid - it may be unclear what to do with any excess energy that is generated on your estate.

However, progress is being made in developing solar storage - though this is still in its relative infancy. Utilities and onsite generators are using energy storage to harness electricity during the day and release at night, to balance peaks in demand. The main obstacle is currently the high price of storage.

Pairing solar storage with solar arrays is a relatively new practice, but an effective one. In addition, solar battery backup power will eventually lower energy costs significantly. Solar battery costs are currently high, but, as the adoption of solar battery storage systems becomes more widespread, their price is expected to follow the same declining trend as solar panel costs. Lithium-ion solar batteries are, at this stage, the most mainstream and cost-effective batteries.

If your solar array is providing excess power during periods where the building is closed - 110 days (Saturdays and Sundays) - you may consider installing battery storage. The stored energy can then be used to run critical Uninterruptible Power Supply (UPS), during a building shutdown or power cut, typical critical services generally consist of Comms Rooms, CCTV, Access Control, Building Safety Services and limited heating & cooling. Should you choose this option, all of these critical services will need to be migrated and concatenated to a critical services board prior or during install.

Peak Shaving: Utilising generated or stored energy during high demand periods, can assist in negating the higher daytime threshold tariffs.

6. Metering, Monitoring and Offsetting

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An energy generation monitoring and data summary portal can form an integral part of the solar array. The data collected can be used to for the following functions:

- Quantifying the modelled return on investment (ROI)
- Quantifying the modelled carbon return on investment (CROI)
- Collecting solar energy generated kWh data and calculate the energy import annual offset
- Reporting renewable generation kWh annual data required for greening government commitments (GGC) and audit and risk assurance (ARA)
- Social, financial and environmental communications/reporting
- Identifying maintenance or repair requirements (via portal)
- Collecting seasonal generation trend data

7. Modern Slavery

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Government is aware of and deeply concerned about reports of forced labour in global supply chains, including the mining of polysilicon used in the manufacture of solar panels. In February 2023, the government published a Procurement Policy Note, issuing guidance on how to tackle modern slavery in government supply chains: PPN 02/23 - Tackling Modern Slavery in Government Supply Chains[6].

The UK solar industry's main trade association Solar Energy UK, jointly with Solar Power Europe, is leading the industry's response by developing and piloting the Solar Stewardship Initiative (SSI), an industry-led protocol to develop a solar certification mechanism to drive a more responsible, transparent, and sustainable solar value chain.
The UK Government has supported this effort by co-sponsoring the development and publication of Action Sustainability's "Addressing Modern Slavery and Labour Exploitation in Solar PV Supply Chains" providing further tools to industry to ensure the responsible sourcing of solar panels. Further information on the initiative, which includes a Code of Conduct and an Assurance System for continued accountability, is available on the Solar Stewardship Initiative website.

The Government is committed to tackling the issue of Uyghur forced labour in supply chains, including the mining of polysilicon used in the manufacture of solar panels, and is taking robust action. We have introduced new guidance on the risks of doing business in Xinjiang, enhanced export controls, and announced the introduction of financial penalties for those who fail to report as required under the Modern Slavery Act[7]. This followed the Government's announcement in September 2020 of an ambitious package of changes to Section 54 of the Modern Slavery Act. These changes will require large businesses and public sector bodies to report on specific areas within their modern slavery statements, including their due diligence processes in relation to modern slavery.

Additionally, the Procurement Act[8] will enable public sector contracting authorities to reject bids and terminate contracts with suppliers which are known to use forced labour themselves or anywhere in their supply chain. The Solar Taskforce, launched in May 2023, has been focusing on identifying and taking forward the actions needed to develop resilient, sustainable and innovative supply chains, to support the significant increases in deployment of solar panels needed to meet the UK's net zero and energy security goals.

[6] Guidance, PPN 02/23: Tackling Modern Slavery in Government Supply Chains, published 10 February 2023
[7] Modern Slavery Act 2015, published 10 June 2014
[8] Guidance, The Procurement Act 2023: A short guide for suppliers, Updated 29 January 2025