THE GREEN BRITAIN FOUNDATION REPORT

THE ROOFTOP REVOLUTION WE NEED

MAY 2023

Executive Summary

We know that Britain can become energy independent - by harnessing our abundant wind and sun to make the electricity we need and our grass to make gas. But what we didn't know until now - was how big a role our homes could play.

Last year I appeared before the Environmental Audit Select Committee and was asked how much rooftop solar potential there is in the UK. I said I didn't know and would find out, but I was later surprised to learn that the data didn't exist. This meant that we didn't actually know how big the opportunity was, so we decided to find out for ourselves.

Getting the data matters, it cuts through the prejudice and myths to show what we stand to gain. So, what does the data show? That by harnessing our rooftops we could make more than 13% of the electricity needs of the entire country, not just our homes but 13% of business needs too. This would cut our reliance on fossil fuels, lower household bills and move us closer to energy independence.

Our research found that over 65% of all homes in Britain can work for solar panels.

Harnessing just these rooftops to make electricity from the sun could provide Britain with 45Billion units of green electricity every year, this is the same amount as we currently generate from all the windmills we have onshore.

These are big numbers and so is the annual retail value – at pre-energy crisis prices the value of this rooftop harvest would be some £8Billion a year - at today's prices it's more like £16Billion. At the peak of the energy crisis it was more like £32Billion. Imagine how much money we could have saved, had we done this already..

A national rooftop solar program would have other benefits - not least job creation. It would also lower household energy bills significantly. And deliver an enormous amount of energy more efficiently - by making it where it gets used. This would avoid the 5% system losses that would otherwise be incurred - £500m worth of energy per year not wasted.

Making the energy our homes need on our own rooftops will reduce our dependence on energy companies and the global fossil fuel market. Excess energy can even be sold back to the grid. Our homes can be like mini power stations.

Executive Summary

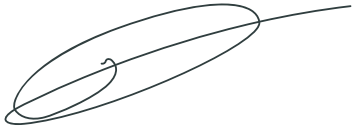
And speed is another big win from a rooftop revolution in solar - the queues to connect large scale generators to the grid right now are 10 to 15 years long, it's a major constraint for big generation but not for micro - each house would hold just 5kW of solar capacity, fitting in more easily with the existing grid.

The opportunity is big and is available right now, but we're not taking advantage of it. While we found that 50% of homes are perfect for rooftop solar, with another 17% having suitable East or West facing roofs, just 3.9% of homes currently have solar panels installed.

We need the government to wake up to the benefits, not block them. After years of cuts, in 2019 the Conservative government tore down the incentive scheme for household solar without any sort of replacement, which saw new installations collapse by 94% in a month.

We need a government that makes it easier rather than harder to install rooftop solar. A government that helps households lower their energy bills. And the country to make its own power.

If we're serious about lowering bills and kicking our addiction to fossil fuels, then we need a rooftop revolution. We have the technology. We have the rooftops. The economics are on our side. Now we need a government that gets it.



Dale Vince OBE, Founder of Ecotricity.

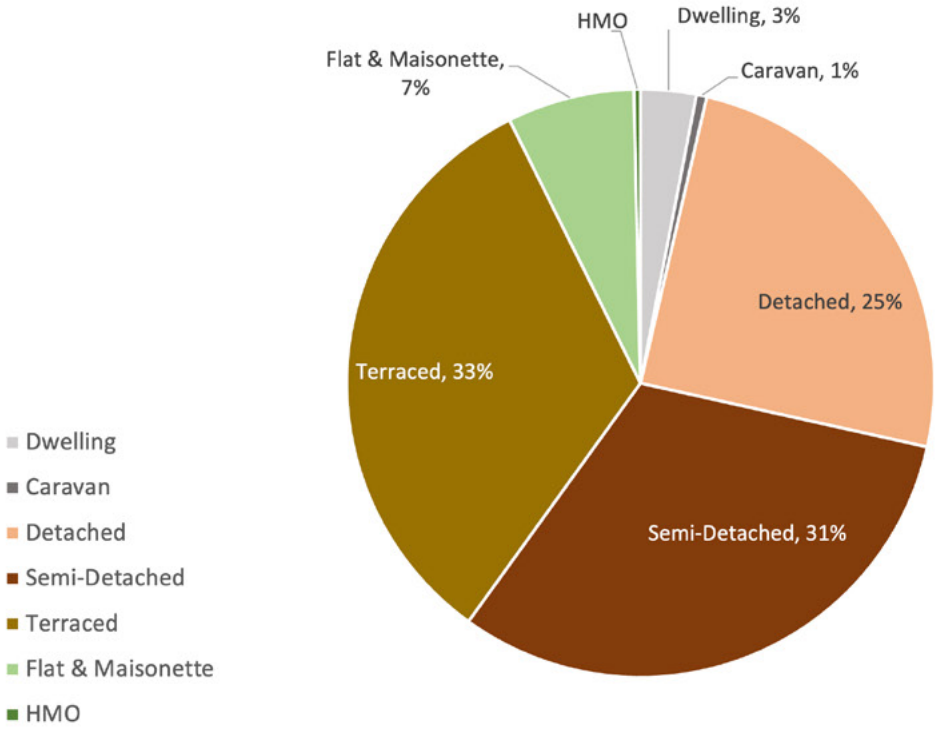
Sampling process

Building size

Architype

Building density

Number of buildings represented by sample

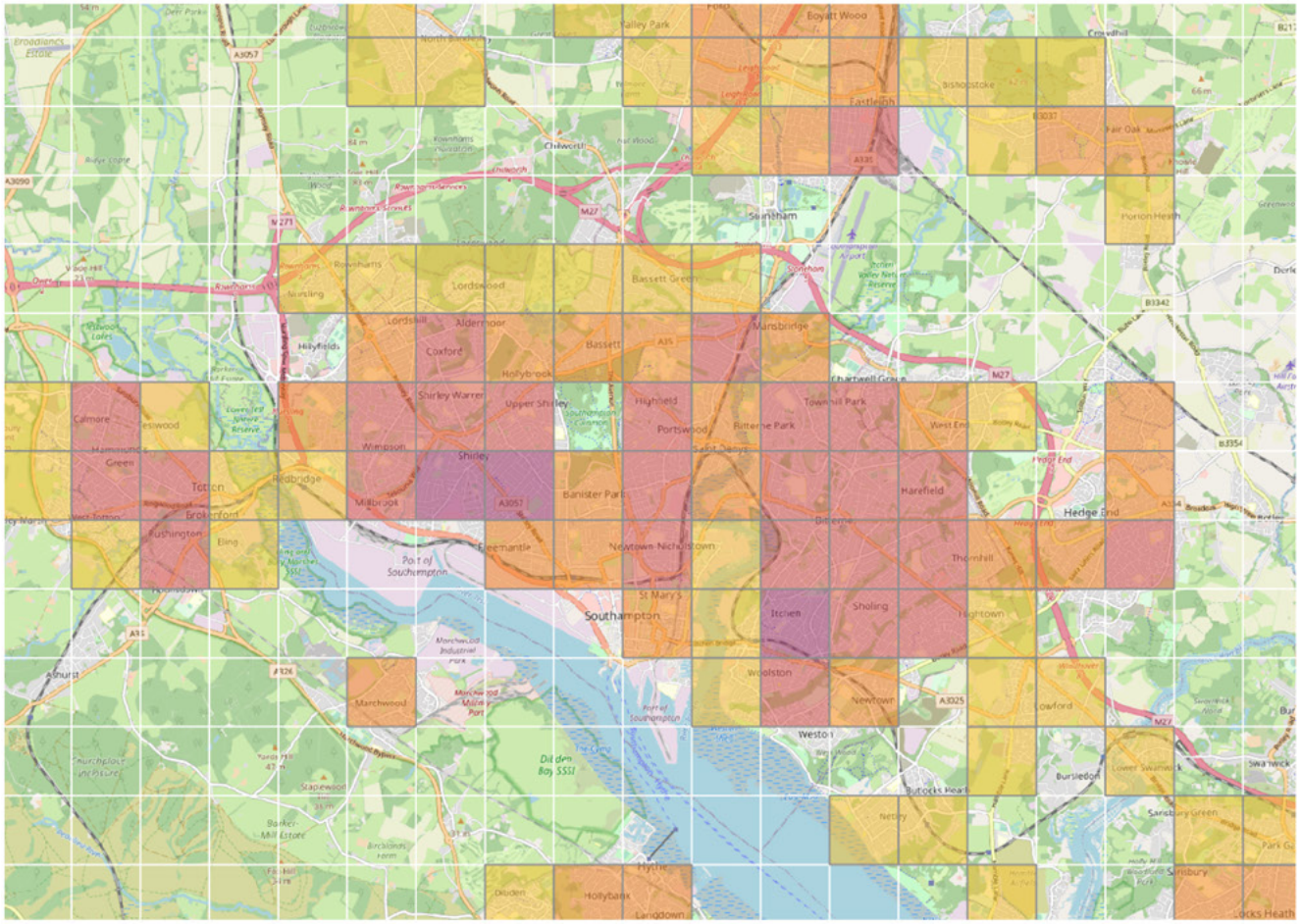


89%

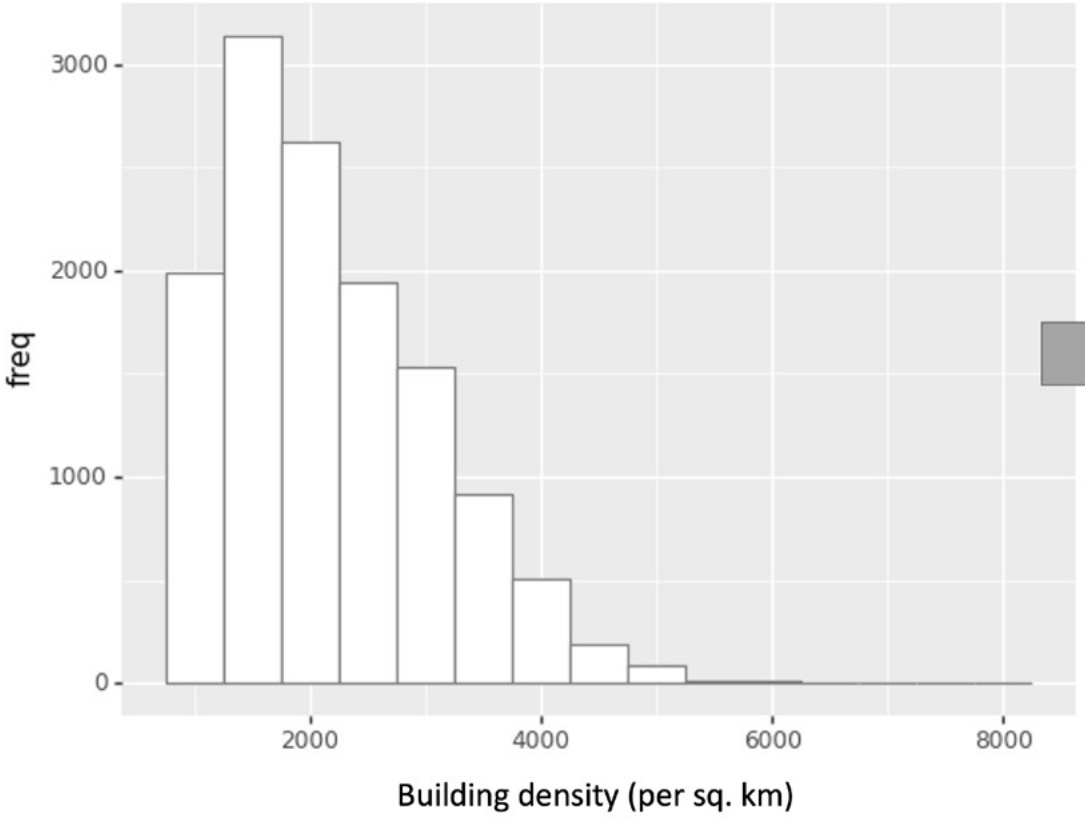
Residential buildings within the UK are found to be houses (including detached, semi-detached and terraced houses). The rest are flats, maisonettes, HMO, caravan and other undefined dwellings.

The houses are used as population base for sampling in this study.

Building density – consideration of spatial features

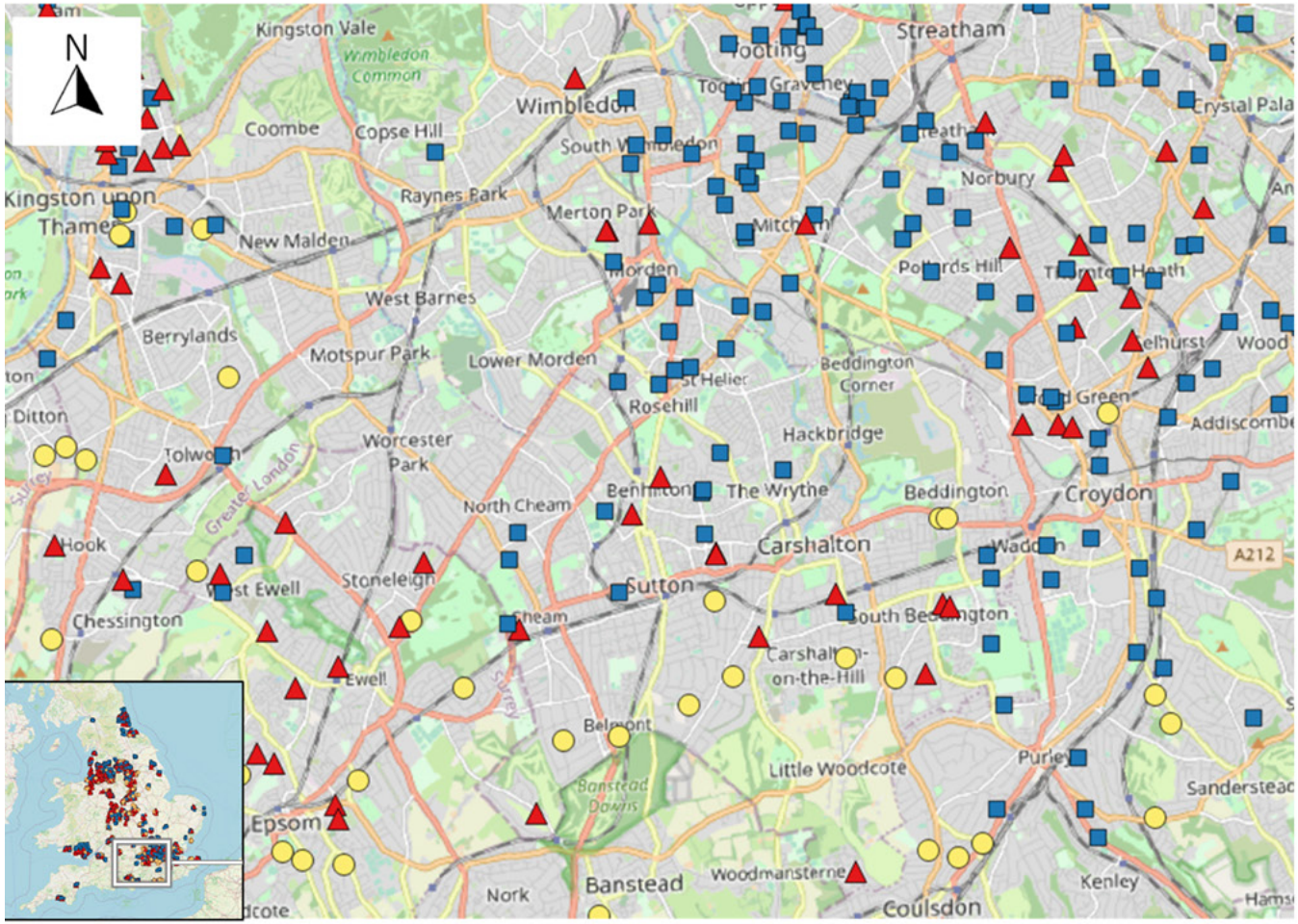


Building density distribution of the UK



Baseline used for sampling, thus representative for UK housing stock

Location of 10,000 samples

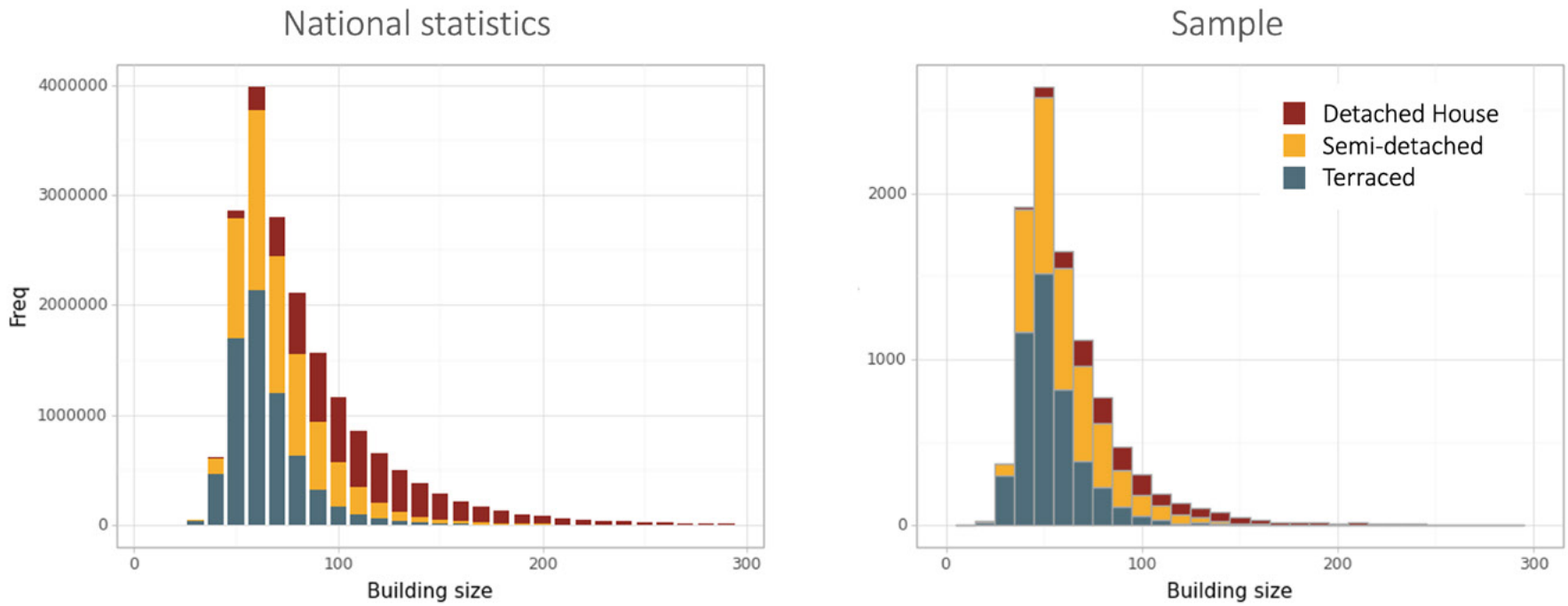


n = 10,000

Legend:

- Detached
- Semi-detached
- Terraced

Sample representativeness comparison



Technology overview

LiDAR & Satellite data collection to obtain structural features of individual buildings

Computer vision modelling to specify roof shape and design solar system layout

Solar radiation simulation to assess shading impact and estimate electricity generation

Model verification: building detection and modelling

Sample #400137

Model result

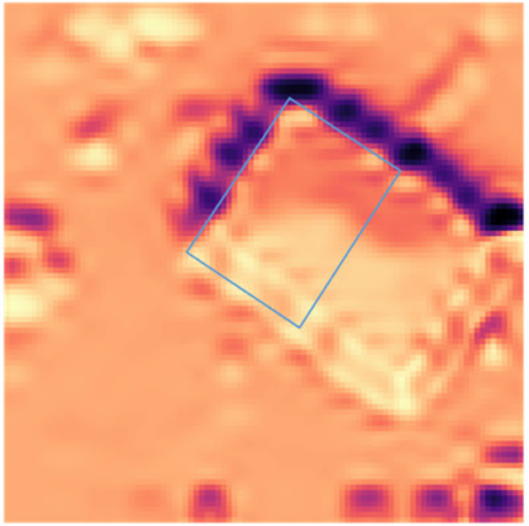
Address:	186 OSBORNE ROAD, HORNCHURCH, RM11 1HL		
Architype	Terrace house	Building size	59 m^2
Latitude	51.56966	Longitude	0.2119573

Model illustration: integration of solar simulation

Sample #327998

Model result

Solar radiation



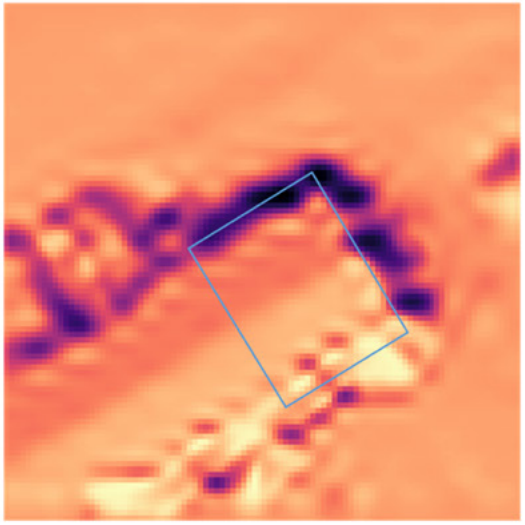
Address:	38 SHACKLIFFE ROAD, MANCHESTER, M40 5QS		
Architype	Semi-detached house	Building size	55 m^2
Latitude	53.5200832	Longitude	-2.1822134

Model verification: Real life comparison

Sample #638002

Model result

Solar radiation



Address:	37 TENBY CLOSE, BLACKBURN, BB1 8JD		
Architype	Semi-detached house	Building size	52 m^2
Latitude	53.7585352	Longitude	-2.4819265

Finding 1: roof ownership and allocation

Sample #2318212

Address:	53 RYELAND CLOSE, WEST DRAYTON, UB7 8AU		
Architype	Semi-detached house	Building size	36 m^2
Latitude	51.5187004	Longitude	-0.467495

- A small number of houses are found to have multiple properties within one construction.
- Therefore, the allocation of roof space for individual properties is unclear.
- As a result, despite the building is suitable for solar panels, the feasibility for the property is unclear.

Finding 2: criteria of feasibility

#724688

1. Size of array (number of modules)
   > 5 modules, equiv. 1.5 kW
2. Solar radiation
   >850 kWh/m^2
3. Orientation of solar panels
   South facing vs East/West facing

Results delivery: ranking of feasibility

#673530

East / West facing roof space with high solar radiation

Possible

#9867254

Radiation on east / west roof is insufficient, but high on the south-facing part

Good

#2941380

Small available roof area, only able to install <5 modules (<1.5 kW)

Small

Results summary

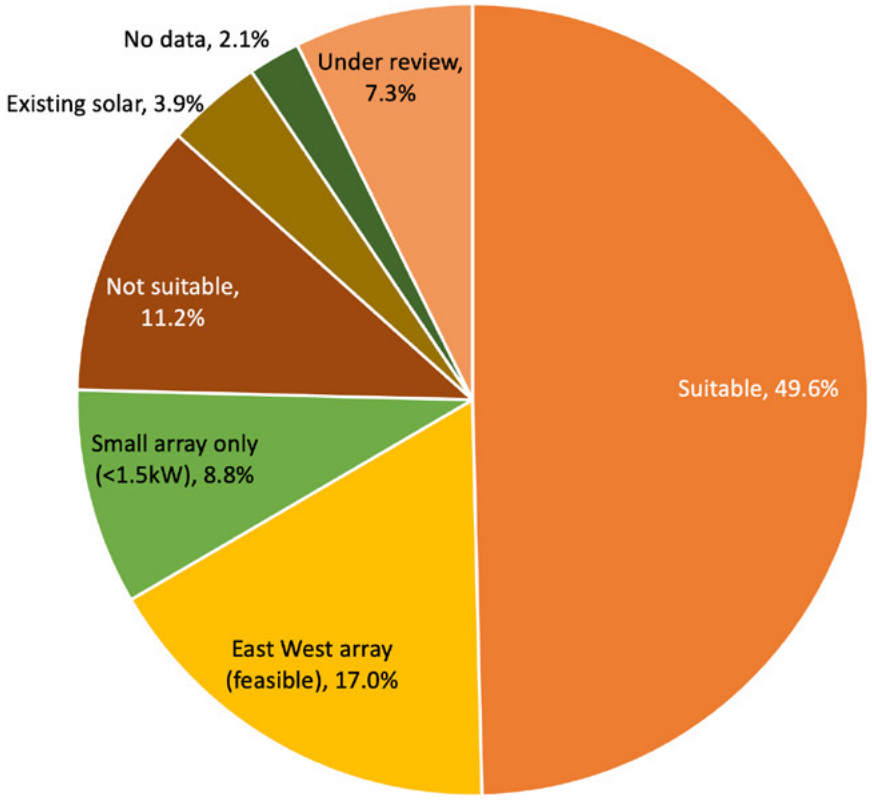
Sample #276831

Address:	4 TWIGG CLOSE, ERITH, DA8 3LD
Local authority	Bexley
Feasibility	Suitable
Solar system capacity	4.9 kWp
Suitable roof area	24 m^2
Power generation	4,361 kWh/year
Solar efficiency	890 kWh/kWp
Architype	Semi-detached house
Building size	55 m^2
Location	53.7585352 , -2.4819265

Additional information

No of E/W panels (if any)	0
Radiation of E/W panels	N/A
No of small arrays (if any)	0
Radiation of small arrays	N/A

Results overview



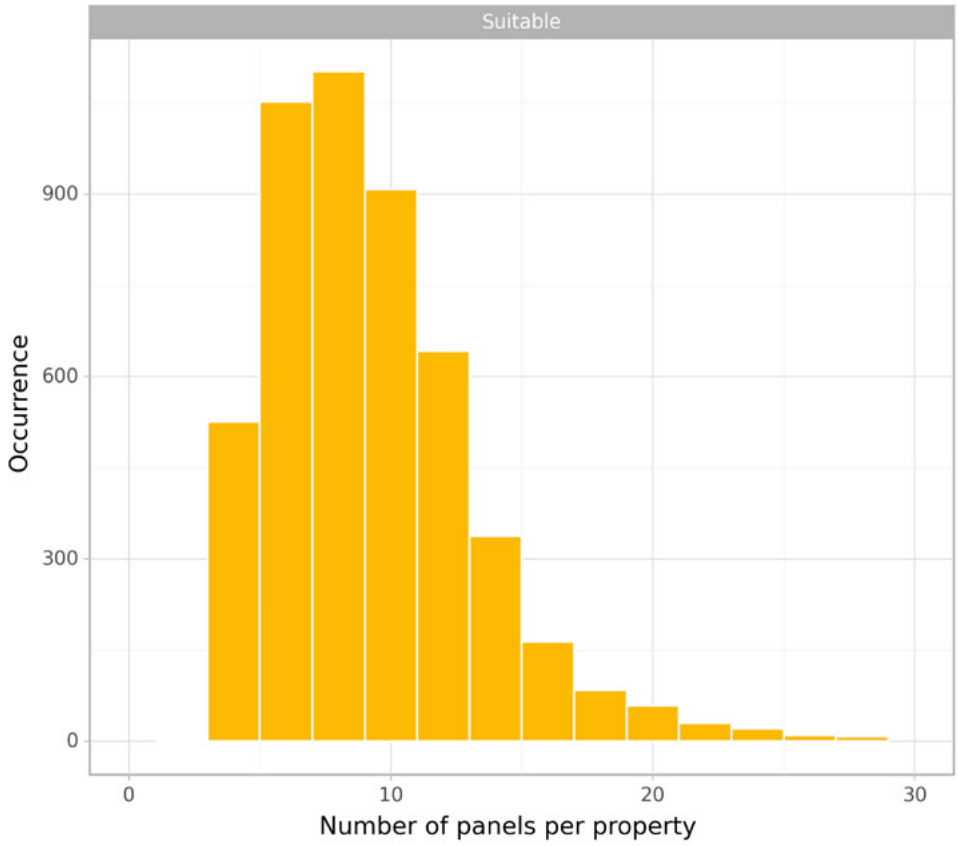
49.6%

Houses among the sample are found to be suitable for solar PV, whilst an additional 17.0% could be added to this list for buildings only having suitable east or west facing roof. 11.2% of houses are found to be not suitable due to insufficient roof space, inadequate solar radiation, shading, and sub-optimal orientation.

3.9%

Houses in the sample are found to have already had solar PV system installed.

Solar feasibility of UK housing stock



3.2 kWp

Most common system size, equivalent to 9 modules. Over half of suitable houses are found to fit <10 panels (3.5 kW).

Based on this average,

Assumptions:

- Size of solar module: 1.6m x 1.0 m
- Module capacity: 350 W_p per module

National impact for ‘suitable’ housing

	Number of buildings	Proportion of suitable	Average capacity, kW	Total capacity, GW	Generation, GWh/year
Detached	5,893,301	50.4%	4.3 kW	12.9	12,019
Semi-detached	7,464,764	50.3%	3.3 kW	12.4	11,428
Terraced	7,751,359	48.8%	3.3 kW	12.4	11,398
National	**21,109,424**			**37.7**	**34,845**

Data visualisation of every dwelling from the sample.

National impact for ‘feasible’ housing

	Number of buildings	Proportion of suitable	Average capacity, kW	Total capacity, GW	Generation, GWh/year
Detached	5,893,301	16.3%	4.3 kW	4.1	12,019
Semi-detached	7,464,764	15%	3.3 kW	3.7	11,428
Terraced	7,751,359	18.9%	3.5 kW	5.1	11,398
National	**21,109,424**	**17.0%**	**3.5 kW**	**12.5**	**10,915**

Data visualisation of every dwelling from the sample.

Appendix

ABSOLAR

Absolar is a technology spin-out company from the University of Southampton. By using unique AI-based remote sensing and GIS technology, Absolar is able to carry out solar surveys for any of the UK's buildings, property portfolios and cities, understanding the solar feasibility of individual buildings at scale. The technology has helped over 25 local authorities and RAF in understanding their renewable energy potential, developing action plans to cut energy costs and carbon emissions.