

The importance of national solar PV capacity estimates:

A case study of Great Britain

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Important definitions

GB — Great Britain

Figures here are corrected to GB, not UK. PV Live covers GB only; Northern Ireland (~0.4 GW) sits on the all-Ireland system.

PV Live

Data service giving the GB system operator (NESO) solar PV out-turn — half-hourly and 5-minutely — for demand forecasting.

Total installed capacity

DC capacity, used throughout. Inverter (AC) values are corrected to DC; declared net (connection) capacity can't drive out-turn modelling.

PV Yield

Out-turn normalised by installed capacity (Wh/Wp), time-averaged over a settlement period — half-hourly in GB.

Out-turn

Estimated generation of the whole fleet over a given period. Reported in GW at national level.

Embedded

PV systems that are not metered by the Transmission System Operator.

The need for accurate solar PV capacity data

Embedded PV suppresses demand

Dispatch planning needs PV generation forecasts trained against out-turn measurements.

(Most) operators upscale a sample

**Out-turn = PV yield (Wh/Wp)
× installed capacity (Wp).**

In GB, the error in embedded **capacity** is far greater than the error in PV **yield** (Huxley et al)

Today

Co-located PV/BESS and flexibility services make operation more complex — and still demand granular, high-quality out-turn and capacity data.

The challenge

PV spans kW to GW, with different policy, regulation and information schemes at each system size.

Where does capacity data come from (in the UK)?

Certification schemes

RESIDENTIAL SCALE

Microgeneration Certification Scheme (MCS)

- + Historical Feed-in Tariff register

Established planning procedures

COMMERCIAL – UTILITY SCALE

Local Authority planning processes

- Renewable Energy Planning Database (**REPD**)

DSO connections register

- Embedded Capacity Register

Commercial market intelligence

UTILITY SCALE

Solar Media (Informa)

- Ground Mount Assets Report

Direct government data collection

UTILITY SCALE

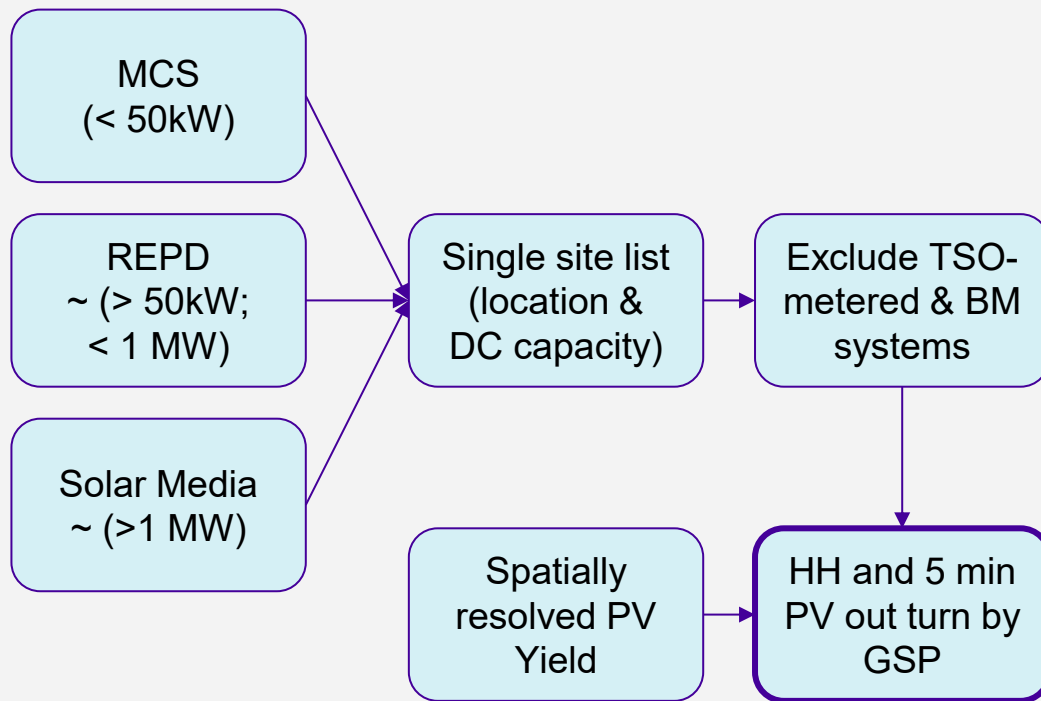
Major Power Producers Survey

PV Live Data Flow



University of
Sheffield | Sheffield
Solar

PV_Live



Live PV generation

(excludes Solar BMUs)

5.81 GW

At **2026-08-14 08:30:00 GMT**

Serving **17.4 %** of GB demand

Modelled using **738** live sites

Installed GB capacity: **23.88 GWp**

(excludes solar BMUs: **0.86 GWp**)

All time peak generation: **16.4 GW**

Also see our API site [capacity](#) page.

What kind of PV capacity data quality issues exist?

Huxley et al (2021)

Capacity error dominates the ~1% yield error
→ overall GB solar PV output is known only to ~5%

GB in 2020

MISSING FROM THE REGISTERS

~200,000 residential systems

MCS covers only ~85% of residential systems (Huxley et al);
a data gap sits at 50 kW–1 MW (DESNZ);
satellite images suggest up to 20% missing (Stowell et al)

CAPACITY INACCURACY

60% of records show < 0.5% variation

Share of commercial / utility systems whose recorded capacity was different to a validated source.

RECORDING LAG

~1 GW_{lag}

Registers are a static snapshot with varying time delays to being operational. Operational capacity varies over time.

DOUBLE COUNTING & OVERLAP

?00 MW over estimate

Overlapping registers are hard to de-duplicate. More sources give greater coverage but increase the double counts.

Looking for examples of these issues

Compare three different cumulative capacity timeseries for GB

1. Official government statistics (DESNZ)

Uses MCS, REPD and Major Power Producers Survey (and other sources)

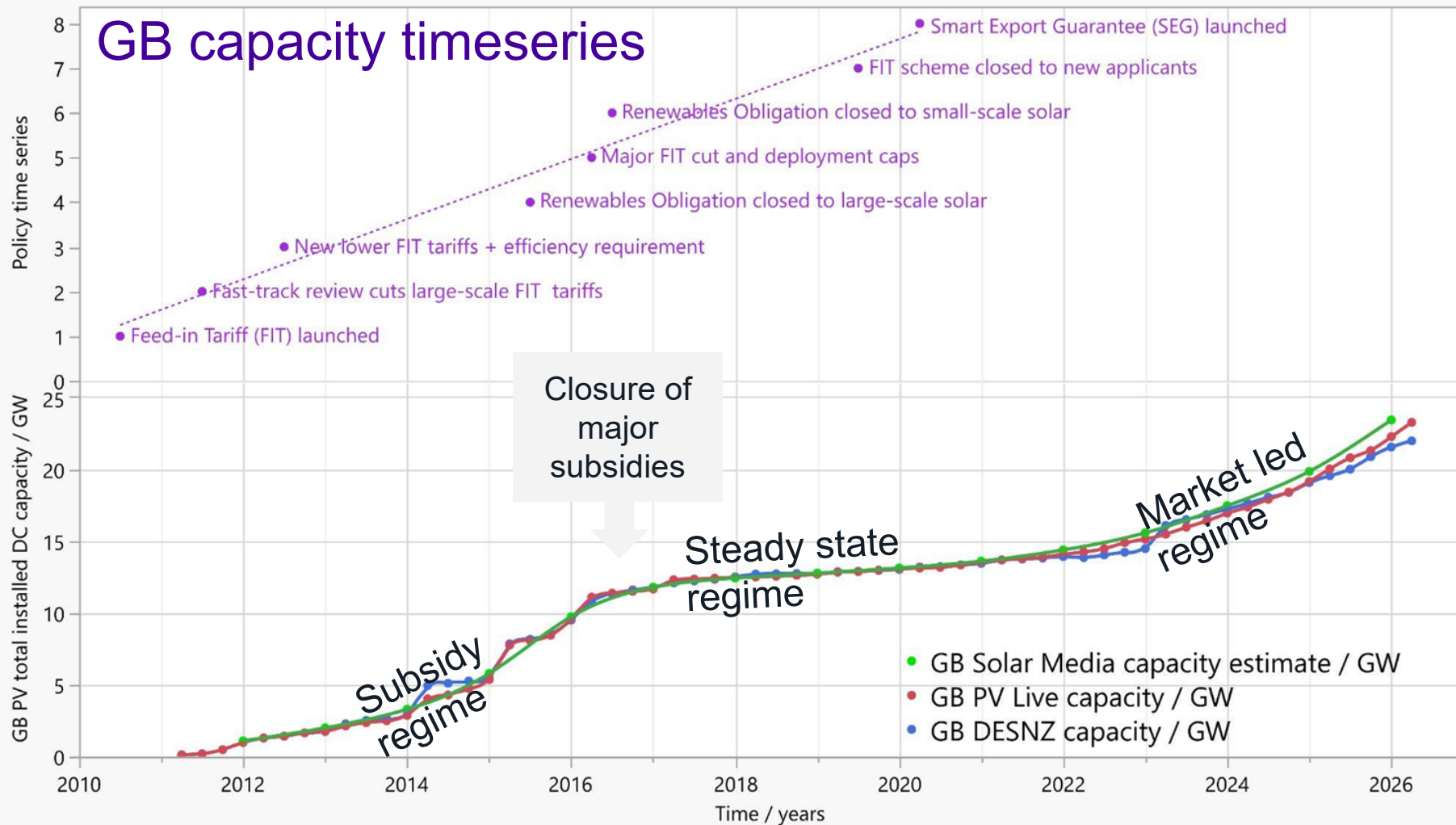
1. PV Live capacity data

Uses MCS, REPD and Solar Media Ground Mount Asset report

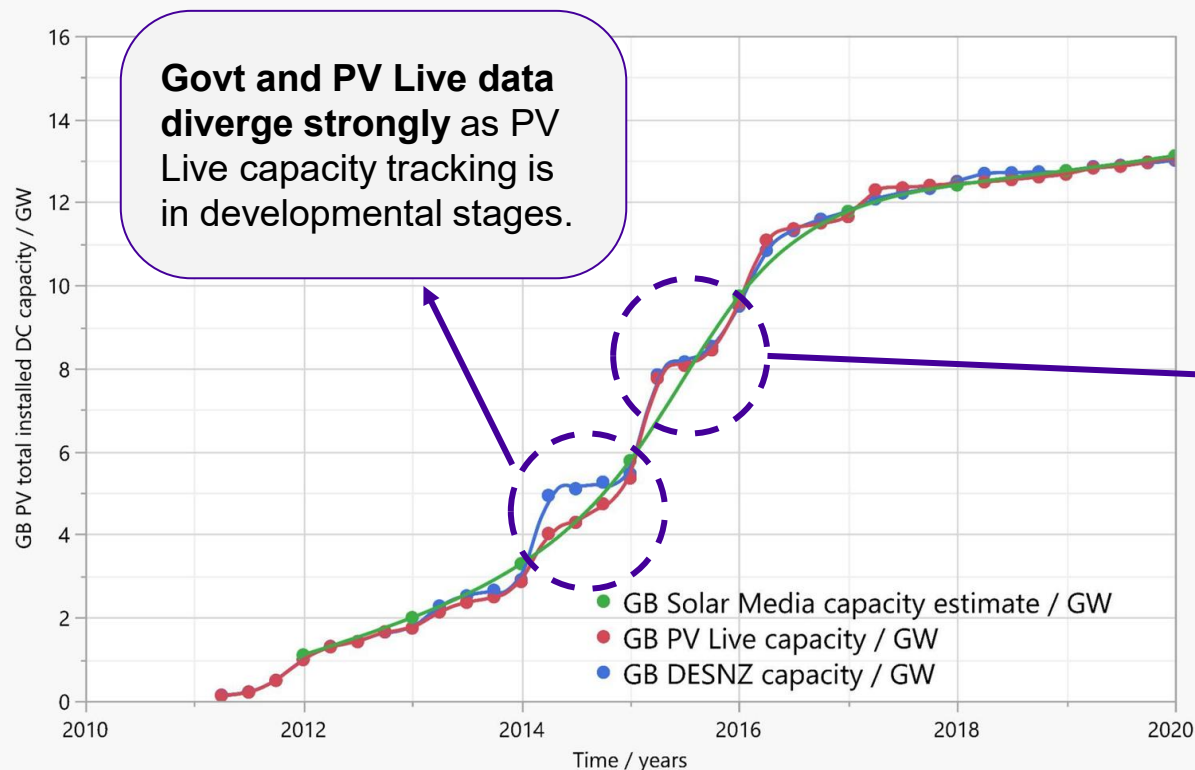
1. Solar Media capacity estimate

Uses MCS, REPD, direct data collection from utility projects and import data for PV modules

GB capacity timeseries

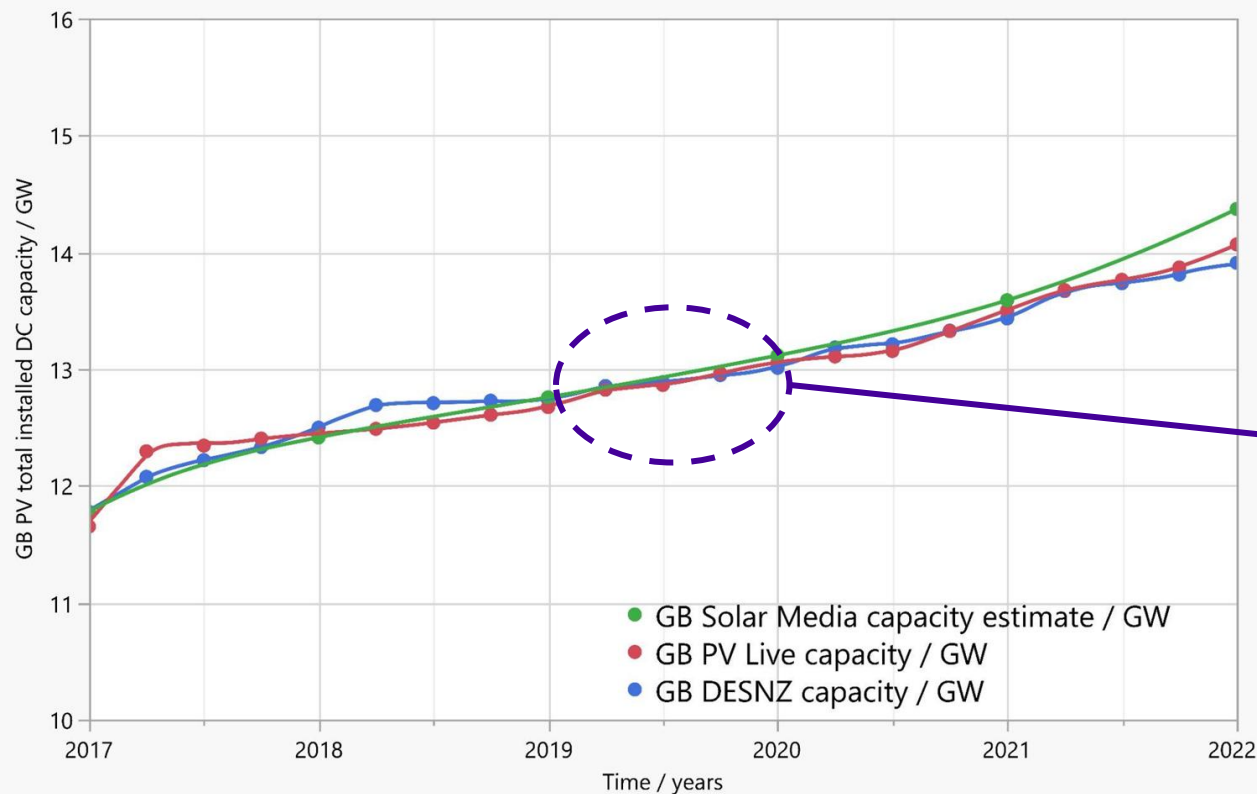


Subsidy led regime



Once mature PV Live follows Govt capacity closely during rapidly changing FIT regime indicating high quality residential capacity data collection as part of the subsidy schemes.

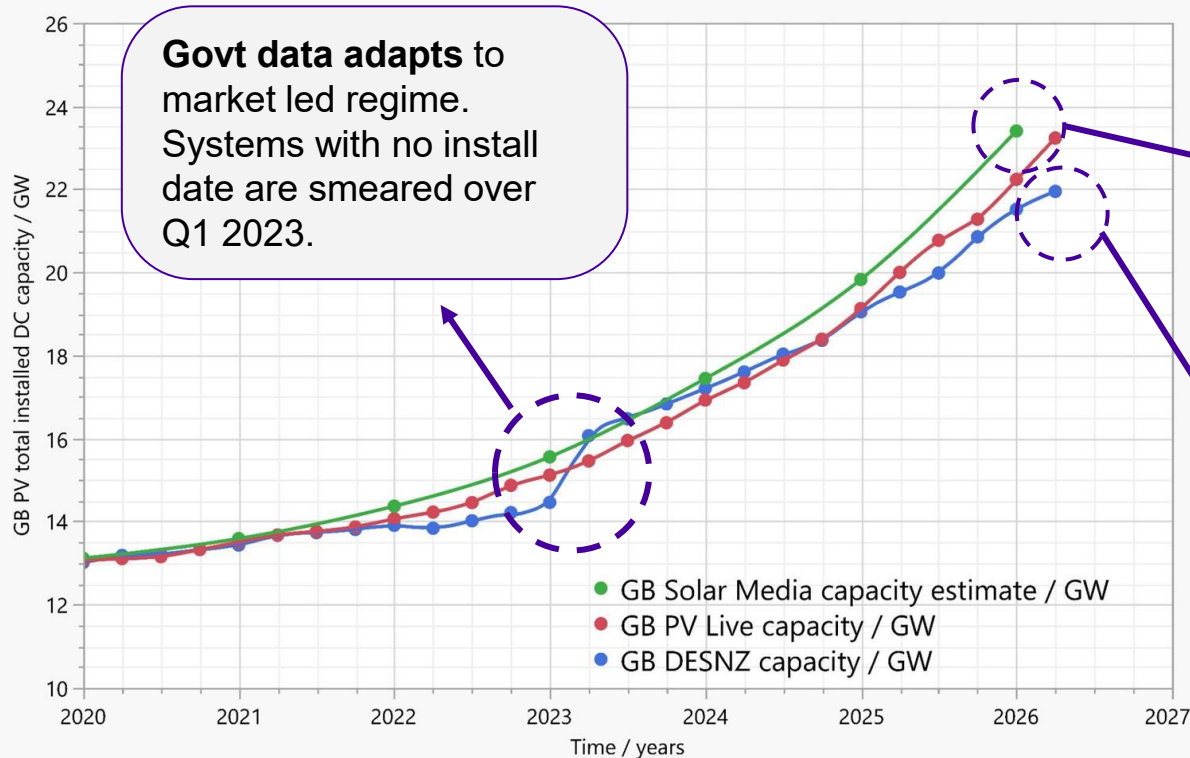
Steady state regime



In 2019 and 2020 - with little market activity - the three capacity estimates converge

This is the period of the studies of Huxley and Stowell.

Market led regime



Missing: PV Live and Govt likely miss up to 1 GWp (in 2026) of commercial systems. But relying on PV module import data does not guarantee systems are operating.

Lag: Govt (DESNZ) data sources lag by at least one quarter shown by the roll over of the Govt curve

What GB capacity data issues exist now?

Govt data ~ 2 GW low

GB in 2026

MISSING FROM THE REGISTERS

~1 GW_{missing}

PV Live is ~ 1 GW less than Solar Media

RECORDING LAG

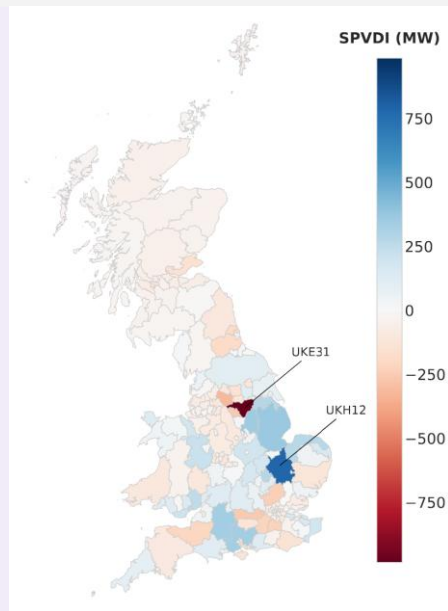
~1 GW_{lag}

Government capacity is 1 GW less than PV Live

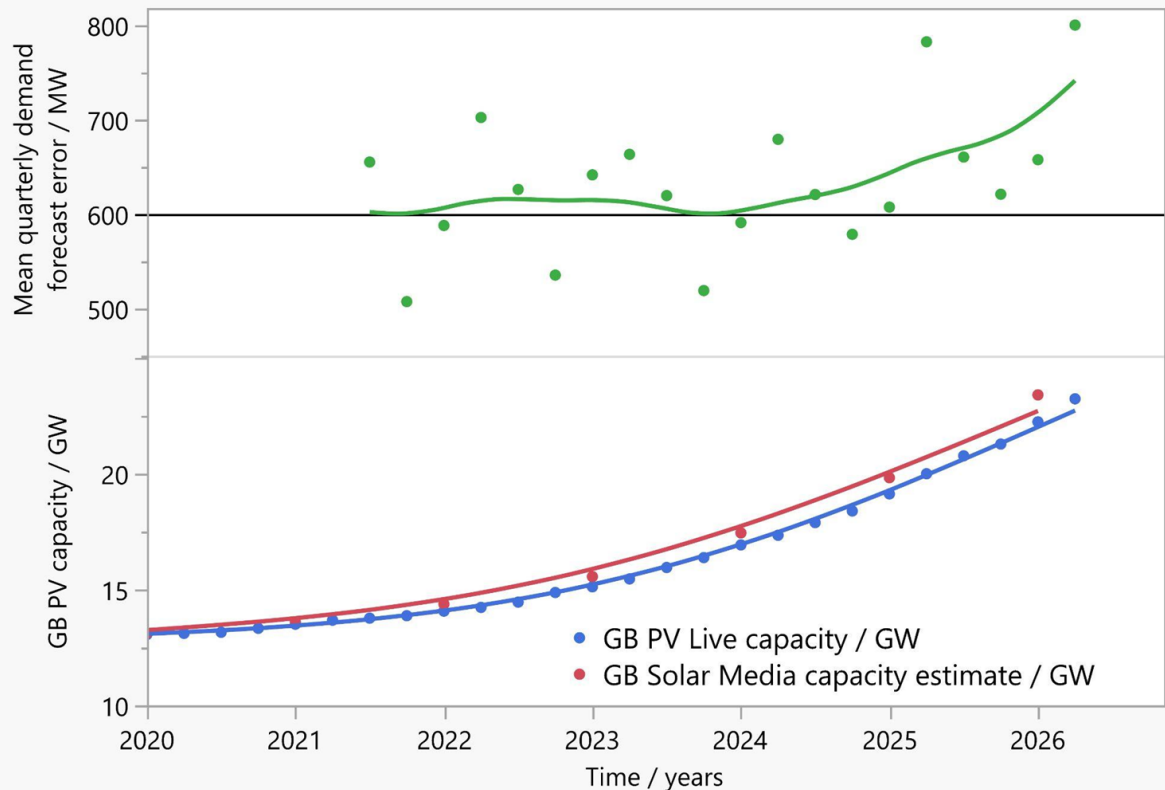
ML modelling to identify missing capacity

Land use, economic and socio-demographic features. XG Boost model. Alghanem (2025).

Capacity errors are not spatially uniform. Low density urban areas are likely to miss most capacity: eg warehouses



Linking PV capacity and demand forecast error



Numerical Weather Prediction error and then PV capacity errors are key factors in demand forecast error.

NWP has bias and stochastic components.

PV capacity is a bias error. It is complicated by being in the outturn and the forecast so partly corrected in the error calculation.

Conclusion

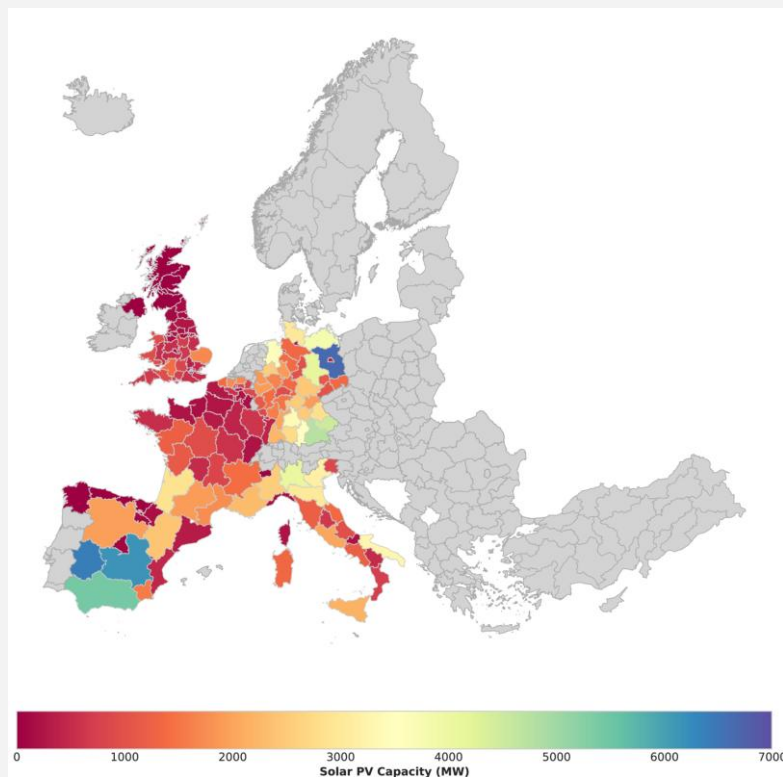
We've shown the intricacies of GB capacity tracking.

We estimate that lag and missing systems mean quarterly government stats are currently ~2 GW low.

Above 17 GW (after 2024) the PV forecast error from capacity and NWP has a material impact on demand forecast error; increasing from 600 MW to >700 MW.

How does GB compare with some other countries?
Maybe GB is just bad at this data?

“Claude! - please compare Germany, France, Belgium, Spain, Italy and of course the Netherlands”



PV capacity coverage at NUTS2 level in Europe. Grey indicates missing data. Alghanem and Buckley. 14



Solar PV capacity tracking across Europe

Key data-quality challenge and the most official access point, by country

Compiled and analysed
by [claude.ai](#) Opus 4.8

Country	Key tracking challenge	Most official data access point
Germany	Register is near-complete (registration is mandatory), but late registrations revise recent months upward.	Marktstammdatenregister (MaStR) marktstammdatenregister.de
France	National total exists only by combining RTE + Enedis; large-plant (>12 MW) data is integrated with a lag.	RTE – Panorama de l'électricité renouvelable rte-france.com
Italy	Data is provisional and revised continuously until the annual report; real deployment often under-recorded.	Terna – Driving Energy portal dati.terna.it
Spain	Self-consumption (rooftop) historically undercounted – a persistent gap between REE and UNEF figures.	Red Eléctrica (REE) sistemaelectrico-ree.es
United Kingdom	Heavily revised; a backlog of previously unrecorded unaccredited plants can overstate annual additions.	DESNZ – Solar PV deployment gov.uk
Belgium	No native national count — three regional registers (Flanders, Wallonia, Brussels) stitched together by Elia.	Elia – grid data elia.be
Netherlands	Built from a supplier survey + register rather than a live grid feed, so figures are provisional / modelled.	CBS StatLine opendata.cbs.nl

For harmonised cross-country comparison: use the ENTSO-E Transparency Platform (transparency.entsoe.eu), which standardises installed-capacity definitions across all these operators — though it excludes some behind-the-meter capacity.

Key References

O.T. Huxley, J. Taylor, A. Everard, J. Briggs, K. Tilley, J. Harwood, A. Buckley, The uncertainties involved in measuring national solar photovoltaic electricity generation, *Renewable and Sustainable Energy Reviews*, Volume 156, 2022, 112000, <https://doi.org/10.1016/j.rser.2021.112000>

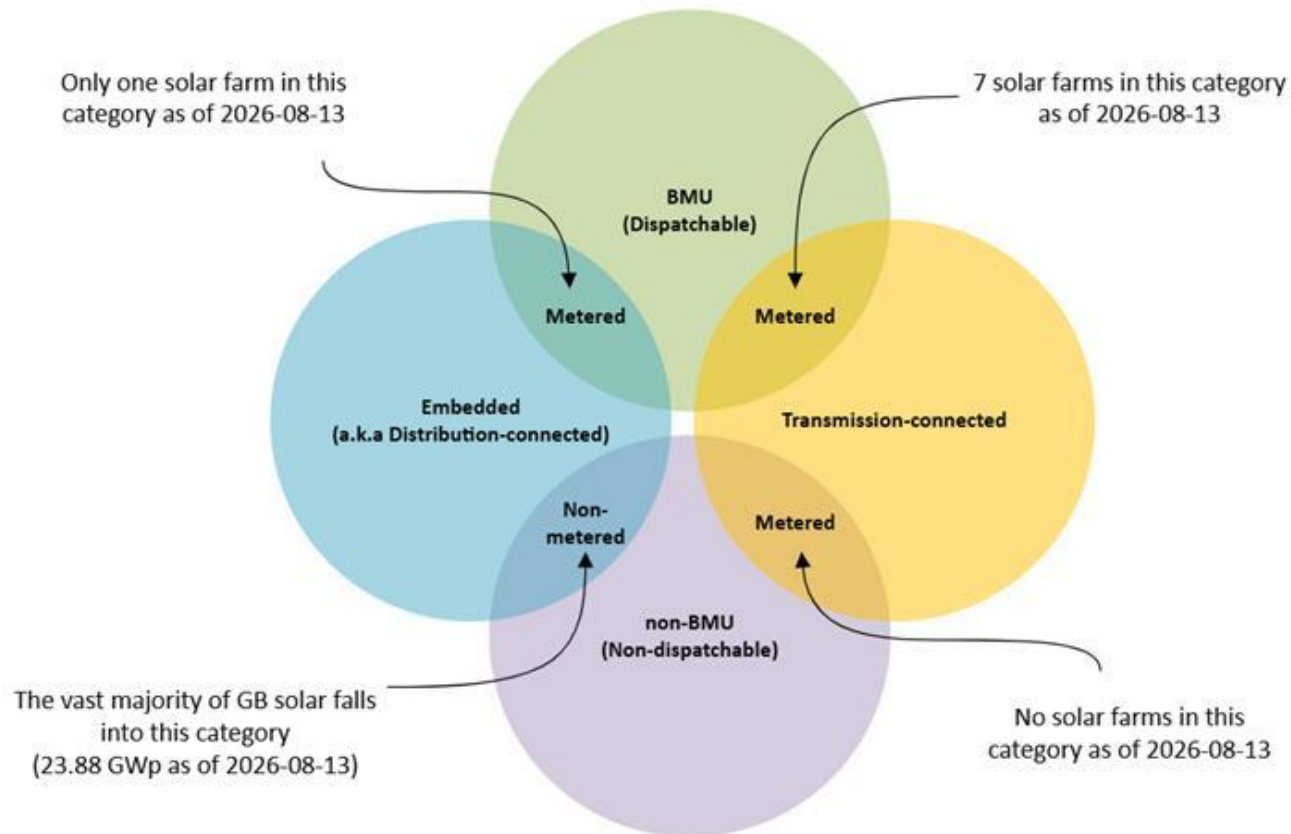
Hussah Alghanem, Alastair Buckley. Modelling regional solar photovoltaic capacity in Europe: A data-driven approach for disaggregation, benchmarking, and forecasting, *Energy Reports*, Volume 14, 2025, Pages 1283-1302, <https://doi.org/10.1016/j.egyr.2025.07.010>.

Hussah Alghanem. Modelling the Spatial Distribution of Installed Solar Photovoltaic Capacity. PhD thesis. 2025

Solar Power Portal "[UK Solar expected to grow 50 % YoY in 2026](#)"

"[Review of Solar PV Capacity Publications](#)" 31/3/2022. UK Department for Energy Security and Net Zero.

Stowell, D., Kelly, J., Tanner, D. *et al.* A harmonised, high-coverage, open dataset of solar photovoltaic installations in the UK. *Sci Data* **7**, 394 (2020). <https://doi.org/10.1038/s41597-020-00739-0>



NOTE: When we say "metered" in the above diagram, we mean "metering data is available to NESO"



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