Solar Energy Projects

How distributed solar power in developing countries displaces fossil fuel generation and generates Gold Standard carbon credits

PROJECT TYPE GUIDE | Gold Standard GS4GG / Verra VCS | SDG 7, 8, 13, 1

Standard	Gold Standard GS4GG / Verra VCS
SDG alignment	SDG 7, 8, 13, 1
Typical credit yield	0.3 – 0.8 tCO2e per household per year
Project life	10 – 20 years
Indicative price	GBP 6 – 12 per tCO2e (Gold Standard, 2024)

What is a Solar Energy Carbon Project?

In many developing countries, particularly in South Asia and sub-Saharan Africa, rural households rely on kerosene lamps, diesel generators and grid electricity from fossil-fuel-heavy grids for their energy needs. Solar energy projects — distributing solar home systems, lanterns or supporting solar mini-grids — displace this fossil fuel consumption and generate measurable greenhouse gas emission reductions.

Unlike the cookstove and water projects which focus on biomass, solar projects target fossil fuel displacement, which typically means lower volumes of credits per household but a cleaner, more straightforward emission reduction calculation with less uncertainty around the non-renewable fraction.

- Displaces kerosene lighting and diesel generation with clean solar power
- Verified under Gold Standard AMS-I.L (solar home systems) and related methodologies
- Strong energy access co-benefits — SDG 7 (Affordable and Clean Energy)
- Particularly impactful in grid-isolated communities
- Technology has fallen dramatically in price, improving project economics

Carbon Credit Methodology

Baseline Energy Sources

The baseline scenario identifies what energy source the solar system displaces. For lighting, this is typically kerosene (with a well-established emission factor of approximately 2.54 kgCO2e per litre). For power, this may be diesel generation or grid electricity, each with their own emission factors depending on the national or regional grid mix.

Displaced Source	Emission Factor	Notes
Kerosene (lighting)	2.54 kgCO2e/litre	IPCC default
Diesel generation	2.68 kgCO2e/litre	Plus equipment factor
Grid electricity (India)	0.82 kgCO2e/kWh	2023 CEA factor
Grid electricity (Kenya)	0.17 kgCO2e/kWh	High renewable penetration
Grid electricity (Nigeria)	0.43 kgCO2e/kWh	2023 estimate

Metered vs Deemed Savings

Larger grid-connected projects can use metered generation data to calculate precise emission reductions. For distributed solar home systems, deemed savings approaches — based on typical consumption profiles verified through surveys — are more practical and accepted under Gold Standard methodology.

Project Types

Solar Home Systems (SHS)

Solar home systems — typically 20 - 100W panels with battery storage — provide household lighting, phone charging and small appliance power. Distribution can be through subsidised sales, pay-as-you-go financing or rental models. PAYG models in particular have expanded access significantly, with companies like M-KOPA and d.light reaching millions of households.

Solar Mini-Grids

Mini-grid projects install centralised solar generation with battery storage and local distribution networks to serve entire villages. Higher capital cost but enables productive use of energy — powering small businesses, irrigation pumps and health clinics in addition to households.

Solar Lanterns

Simple solar lanterns replace kerosene lamps for basic lighting. The lowest cost entry point for solar access — lanterns can cost as little as USD 5 - 15 — but generate relatively few credits per unit compared to larger systems.

Project Economics

System Type	Credits/unit/yr	Revenue at GBP 9/t	Unit Cost
Solar lantern	0.05 - 0.1 tCO2e	GBP 0.45 - 0.90	USD 5 - 15
Solar home system (50W)	0.2 - 0.4 tCO2e	GBP 1.80 - 3.60	USD 80 - 200
Solar home system (200W)	0.5 - 0.8 tCO2e	GBP 4.50 - 7.20	USD 200 - 500

Mini-grid (per household)	0.4 - 0.7 tCO2e	GBP 3.60 - 6.30	USD 300 - 800

Carbon revenue alone rarely justifies solar project economics — projects are typically cross-subsidised by equipment sales, PAYG financing revenue or development grants, with carbon credits providing supplementary revenue.

At scale, aggregated solar programmes covering tens or hundreds of thousands of households can generate meaningful credit volumes. A programme covering 100,000 households with solar home systems might generate 40,000 - 70,000 tCO2e per year, yielding GBP 360,000 - 630,000 in carbon revenue at current prices.