BANGLADESH'S ENERGY TRANSITION

From Off-Grid to On-Grid

Solar Home Systems to Rooftop Solar

How a nation that electrified 20 million people off-grid is now building its renewable future on the grid

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The Journey at a Glance

◀ OFF-GRID ERA: Solar Home Systems

ON-GRID ERA: Rooftop Solar ▶

2003

SHS Programme Launched

IDCOL begins rural off-grid electrification

2013

SHS Peak 853,000/year

World's largest off-grid solar programme

2014–18

Grid Expansion Accelerates

National grid reaches rural Bangladesh

2018

SHS Collapses to 3,455/year

Off-grid model loses relevance

2023–25

Rooftop Solar Surges

1,531 installed in 2025 alone

This is not two separate stories — it is one transition.

As Bangladesh's national grid extended into rural areas, the off-grid model that brought electricity to 20 million people became obsolete — almost overnight, and without a planned transition. Now, a new on-grid solar chapter is emerging, but it follows very different rules, serves different users, and faces its own risks.

2003–2013

The Off-Grid Era: SHS Built Rural Electrification

Electricity Where the Grid Could Not Reach

Launched in the early 2000s, Solar Home Systems (SHS) brought electricity to **over 20 million people** in rural and remote areas where grid extension was not yet economically viable.

The Infrastructure Development Company Limited (IDCOL), a state-owned non-bank financing institution, led the programme — mobilising concessional funds from the World Bank, ADB, EU, and JICA, and channelling them through roughly 30 NGO/microfinance partner organisations (POs).

Households received electricity through an instalment-based model: a 75:25 loan-to-grant ratio, with full ownership transferring after repayment.

20M+

People electrified

75:25

Loan-to-grant financing ratio

~30

IDCOL Partner Organisations (NGOs/MFIs)

The Financing Flow

Government / Donors → IDCOL → Partner Orgs (NGOs/MFIs) → Households

SHS Installation Trend, 2003–2018

The Peak — and the Collapse

Figure 1: Annual Installation Trend of SHS

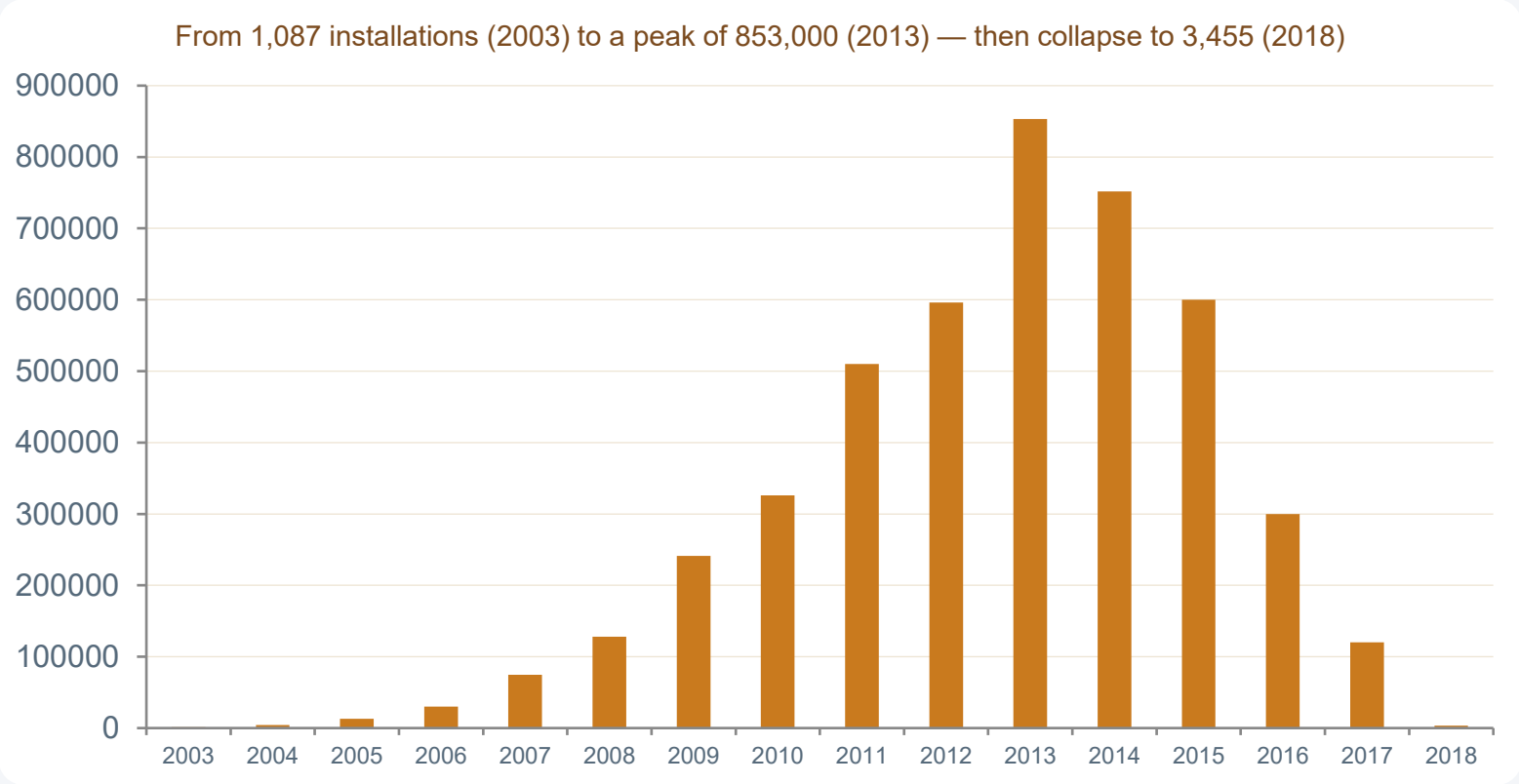


Table 1: Institutional Concentration

Agency	Share
IDCOL	74.4%
MoDMR	25.1%
BREB, NESCO, GIZ, RDCD	0.5%

From 853K to 3,455

a 99.6% drop in annual installations within just 5 years (2013–2018)

This collapse did not mean demand for electricity disappeared — it meant the off-grid model was overtaken by a more attractive alternative: the national grid.

Why Off-Grid Gave Way to On-Grid

Grid Expansion Outpaced Planning

The unplanned expansion of national grid electricity over the past decade reached rural areas faster than any transition plan for existing SHS households was designed.

SHS Couldn't Meet Growing Demand

SHS provided small-capacity power — enough for lighting and charging, but as households' energy needs grew, the systems could not keep up, pushing users toward grid power.

The Retention Crisis: What Happened to the 6 Million Systems Already Installed?

~47%

According to the **CPD SHS Survey 2025**, nearly half of all installed solar home systems are now **non-functional.** No structured transition pathway was ever designed to help households retrofit, upgrade, or hybridise their systems as grid electricity arrived — leaving millions of stranded solar assets across the country.

The On-Grid Solar Portfolio at a Glance

Total Rooftop Solar Installations

4,551

Net metering installations

60.4%

in Dhaka division

Total Rooftop Solar Capacity

213.3 MW

Net metering capacity

45.4%

on CAPEX ownership model

Solar Irrigation Grid Integration

309

SIPs connected to grid

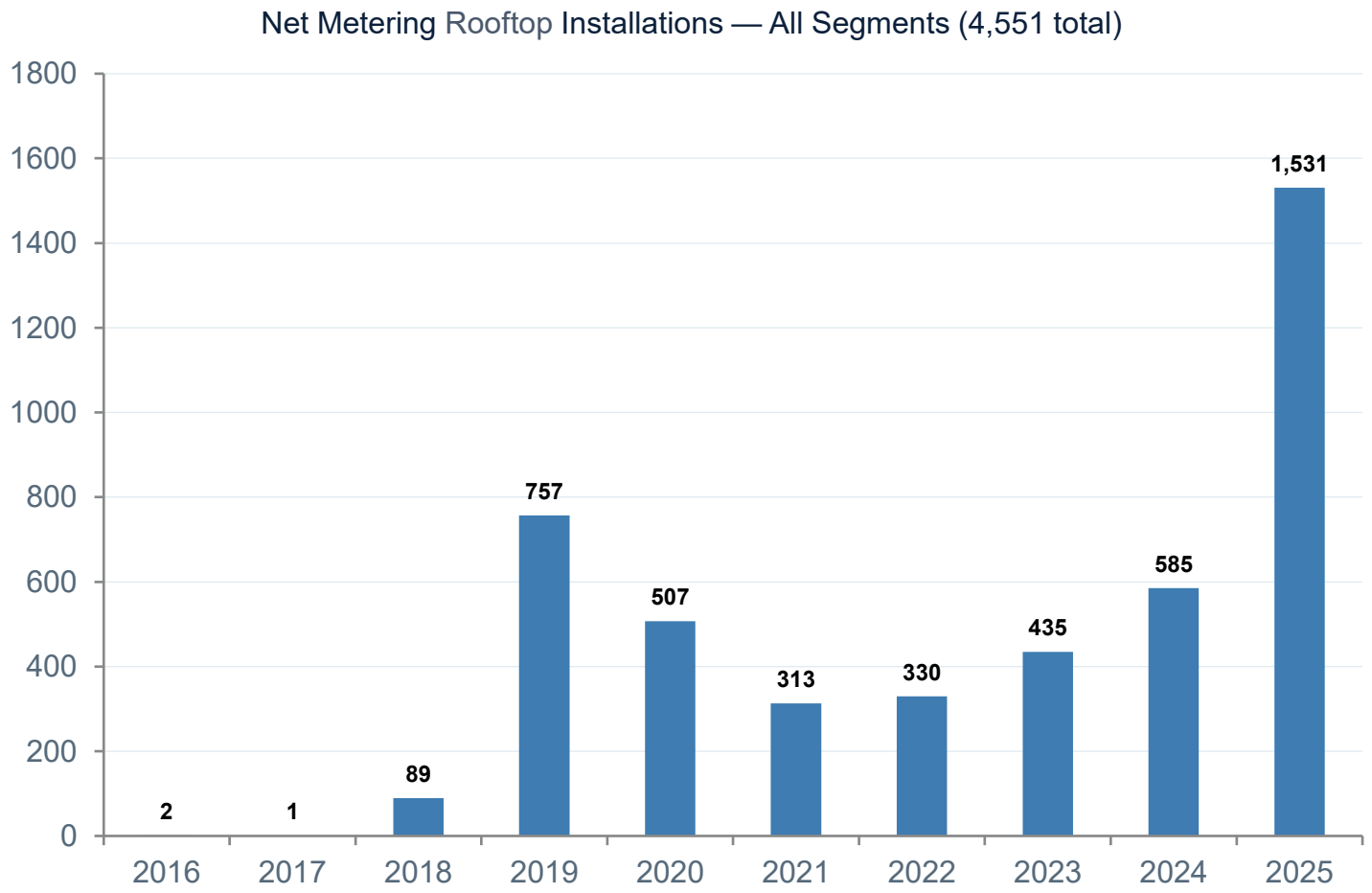
8.77%

of all SIPs (3,523 total)

Together, these three pillars represent Bangladesh's most promising — and most underexploited — pathway to scaling distributed renewable energy without repeating the retention failures of the off-grid era.

Rooftop Solar— Current State

Figure 2 : Annual Installation Trend of Net Metered Rooftop Solar



98.1% of all net metering systems completed & running

63.6% financed through own/self investment

10% sanctioned-load rule drives residential compliance installs

Rooftop Solar— Current State

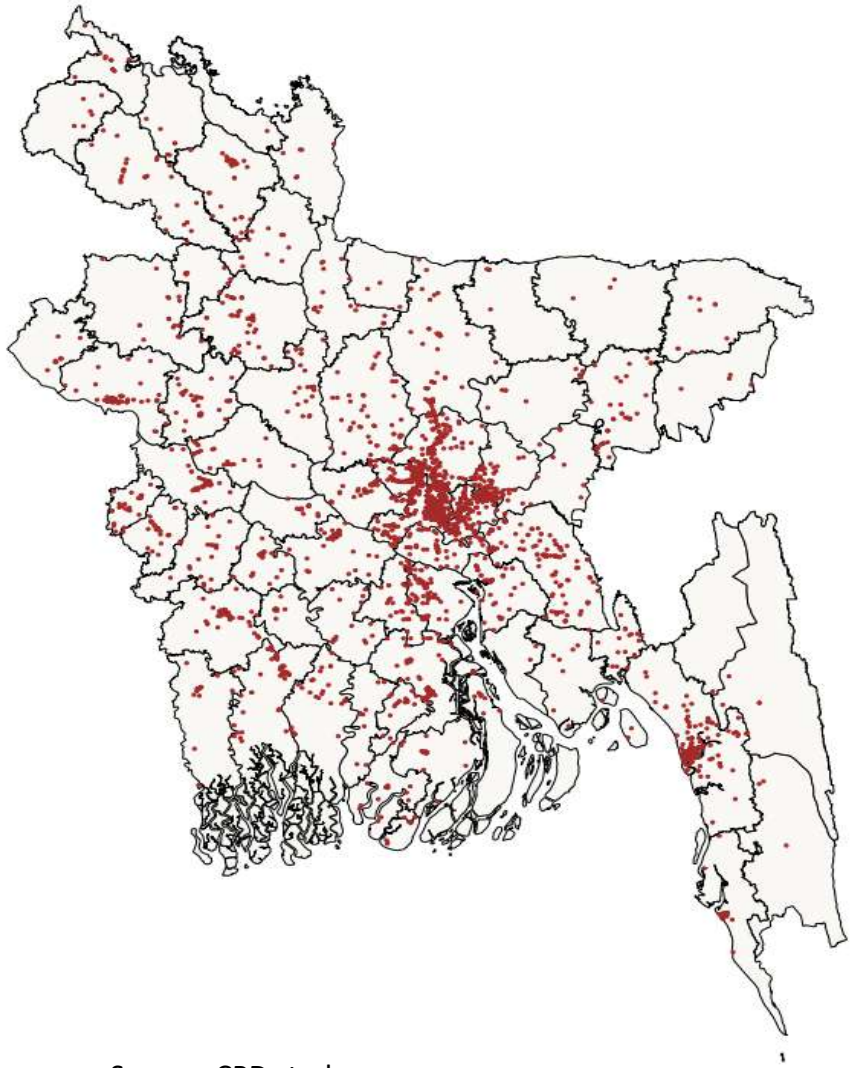
Table 2: Geographic Concentration

Division	Share
Dhaka	60.4%
Chattogram	16.1%
Khulna	8.8%
All others	14.7%

Table 3: Leading Implementing Utilities

Utility	Share
BREB	40.2%
DESCO	23.9%
BPDB	12.0%
WZPDCL / DPDC / NESCO	23.9%

Figure 3: Geographical Distribution of Net Metered Rooftop Solar



Source: CPD study

Rooftop Solar in Industry — Current State

Industrial Rooftop Across Sectors

RMG | Textile | Glass | Pharmaceuticals | Paper & Particle Board | Sanitary & Ceramics | Cold Storage

Poultry | Automobile | Leather | Agro Processing | Plastics | Chemicals

Total Installation

828

systems installed

Total Capacity

≈77.5 MWp

combined capacity

CURRENT STATE

Agriculture — Solar Irrigation & Grid Integration

Solar Irrigation Pumps

3,100+

>90%	<10%
Off-grid	On-grid

Figure 5: Distribution of SIPs across Divisions

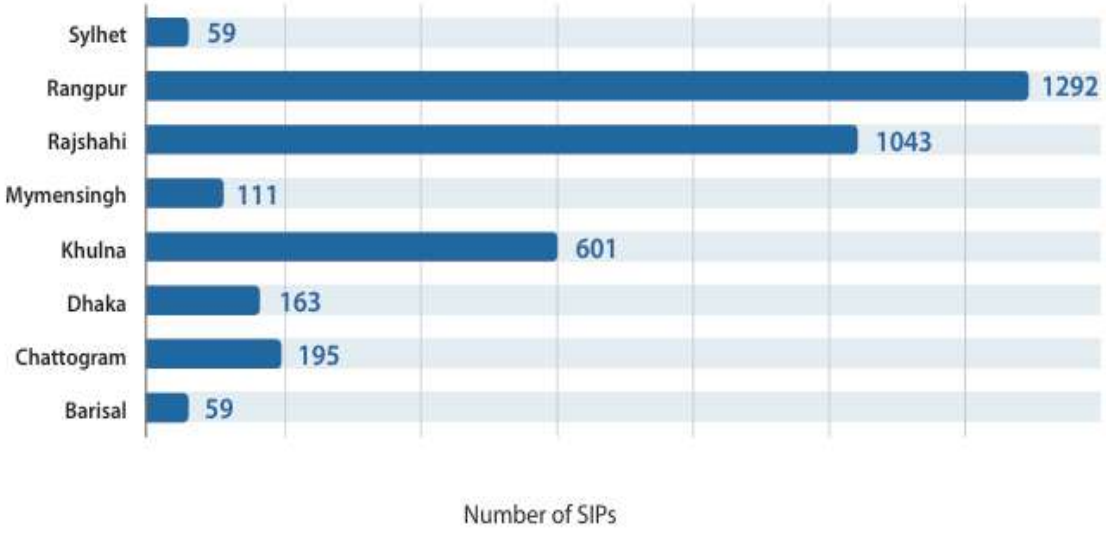
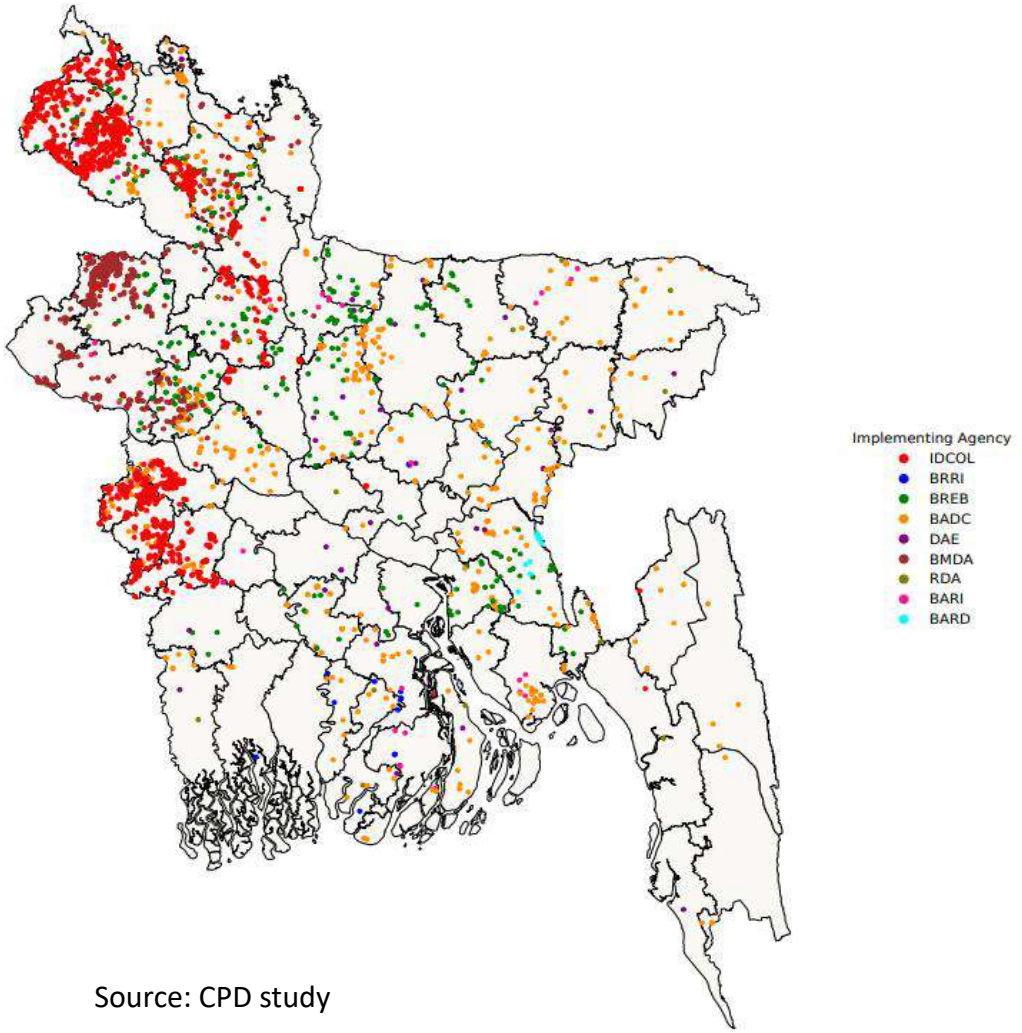


Figure 4: Geographical Distribution of SIPs by Implementing Agency



Source: CPD study

Agriculture — Solar Irrigation & Grid Integration

Table 4: Three Co-Existing Implementation Models

Model	Ownership	Grid Connection
IDCOL (fee-for-service)	Sponsor-owned	Off-grid
BREB (ownership model)	Farmer-owned	On-grid
BMDA/BADC/DAE (community)	Community-owned, govt-funded	Off-grid

Table 5: Geographic Concentration (North-West)

Division	SIPs
Rangpur	1,292
Rajshahi	1,043
Khulna	601
All other divisions	587

Table 6: Financing Organization

Financier	Share
IDCOL	46.0%
Government of Bangladesh	44.6%
ADB (via BREB)	8.6%

Only the BREB model gives farmers ownership AND grid connection — yet BREB implements just 8.6% of all SIPs. The two dominant actors (IDCOL, BMDA/BADC/DAE) remain off-grid.

Challenges of Rooftop Solar

Residential

- **Financing Gap** — No microcredit-equivalent for rooftop solar; banks avoid small, long-tenor loans, and Bangladesh Bank's refinance window pays after installation, not before.
- **High Tax Burden** — Cumulative duties of 27.5–33.6% on panels and inverters (FY25-26) inflate upfront costs despite strong lifecycle economics.
- **Regulatory Bottlenecks** — System-size caps, sanctioned-load rules and slow, inconsistent net-metering approvals discourage smaller residential users.
- **Institutional Fragmentation** — SREDA's role is advisory only; multiple utilities and BERC have limited enforcement capacity, causing delays.

Industrial

- **Collateral Rigidity** — Banks demand 100% asset-backed security; solar assets and PPAs aren't recognised as bankable collateral. Third-party developers can't pledge the project itself, blocking the lower-cost OPEX model from scaling.
- **Green Refinance Underused** — Bangladesh Bank's refinance and Green Transformation Fund disbursement in RE is very low, uncertain and often suffers by heavy documentation.
- **SME Access Gap** — Smaller industries lack capital and technical capacity — uptake remains skewed to large firms.

Challenges of Solar Irrigation

- **Heavy Grant Dependency** — Financing ranges from 50% grant (IDCOL) to 100% grant (BMDA/BADC) — little standalone commercial viability.
- **Payback Reality Gap** — Actual recovery of 15–20 years vs official 8-year estimates; revenue confined to a single Boro season.
- **Ownership Misalignment** — Fee-for-service, ownership and community models create inconsistent usage and maintenance incentives.
- **Diesel Subsidy Bias** — Diesel irrigation stays subsidised while SIP licensing is comparatively more restrictive.
- **Limited Grid Integration** — Outside the BREB model, no net metering exists — surplus capacity sits idle off-season.
- **Geographic & Behavioural Limits** — Viable mainly in 3-crop zones; night-irrigation habits conflict with daytime solar generation.

Challenges of Adoption and Retention

- **Demand Exists, Financing Doesn't Follow** — Households and firms show strong willingness to adopt, but commercial bank access is limited and green-financing windows involve heavy documentation and long approvals.
- **An Installation-Centric System** — Institutional success is measured by installations completed and loans recovered — not by continued use; adoption is treated as a one-time event.
- **Asymmetric, One-Way Feedback** — Information flows downward from institutions to users; declining utilisation or shifting user needs rarely feed back into programme redesign.
- **Policy-Induced Cost Disincentives** — High tax incidence on panels and inverters raises upfront costs, while diesel irrigation stays subsidised and more loosely regulated than solar.
- **Stranded & Non-Functional Assets** — Nearly half of surveyed Solar Home Systems are non-functional today, mainly due to battery failure and weak after-sales service.
- **One-Size-Fits-All Programme Design** — National programmes assume homogeneous users, overlooking regional, economic and behavioural differences that shape adoption and retention.

Recommendations

Residential

- **Reform Net Metering** — Simplify residential eligibility, fast-track approvals and launch a unified digital application platform across utilities.
- **Dedicated Financing Windows** — Green facilities with partial credit guarantees, on-bill and pay-as-you-save financing for households.
- **Rationalise Duties & Taxation** — Move essential PV components to a concessional or zero-duty category to reduce upfront costs.
- **Strengthen Institutional Coordination** — Clarify mandates across SREDA, utilities and BERC to reduce approval delays.
- **Lifecycle Management & SHS Integration** — Mandate maintenance standards and repower legacy Solar Home Systems into hybrid, grid-tied installations.

Industrial

- **Build a RESCO Collateral Framework** — Recognise PPAs and project assets as bankable security to unlock OPEX-model lending.
- **Streamline Green Refinancing** — Simplify documentation and move to single-tier disbursement for Bangladesh Bank schemes.
- **Bank Capacity Building** — Standardised DRE credit-appraisal tools and training so commercial lenders can price solar risk accurately.

Recommendations

Solar Irrigation

- **Shared Ownership Models** — Shift Solar Irrigation Pumps toward farmer cost-sharing to strengthen usage and maintenance incentives.
- **Expand Net Metering for SIPs** — Allow nationwide surplus-power sale from irrigation pumps to improve financial viability.
- **Reform Diesel Subsidies** — Phase out diesel-irrigation subsidies and align SIP licensing procedures with diesel-pump processes.
- **Integrate Water-Saving Technology** — Bundle SIPs with drip and sprinkler irrigation to raise efficiency and returns.
- **Bundle With Agricultural Finance** — Package SIP loans with equipment finance such as power tillers and harvesters.
- **Align Awareness Campaigns With Solar Hours** — Re-orient irrigation-timing campaigns toward daytime, solar-generation hours.

Adoption and Retention

- **National DRE Coordination Body** — A SREDA-led committee to harmonise programme design and track retention — not just installations — across all DRE.
- **Institutionalise Feedback Loops** — Regular user surveys, grievance mechanisms and field audits that actively feed into programme redesign.
- **Shift to Retention-Centric Design** — Redesign incentives so meso-level institutions are rewarded for continued use, not just disbursement.

Recommendations

Adoption and Retention

- **Build Local Maintenance Capacity** — Train local technicians and establish performance-based service contracts to reduce stranded assets.
- **Expand Centralised DRE Data Systems** — Real-time monitoring of installed capacity, functionality and retention across all technologies.

Thanks!