Potential and challenges to off-grid solar energy development

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Presentation Outline

- Context: Off-grid RE systems for rural areas
- PV is predominant technology in off-grid projects
- Enhancing affordability of PV SHS
- International co-finance options
- Case study: SHS in Bangladesh

Context: Off-grid Renewable Energy systems

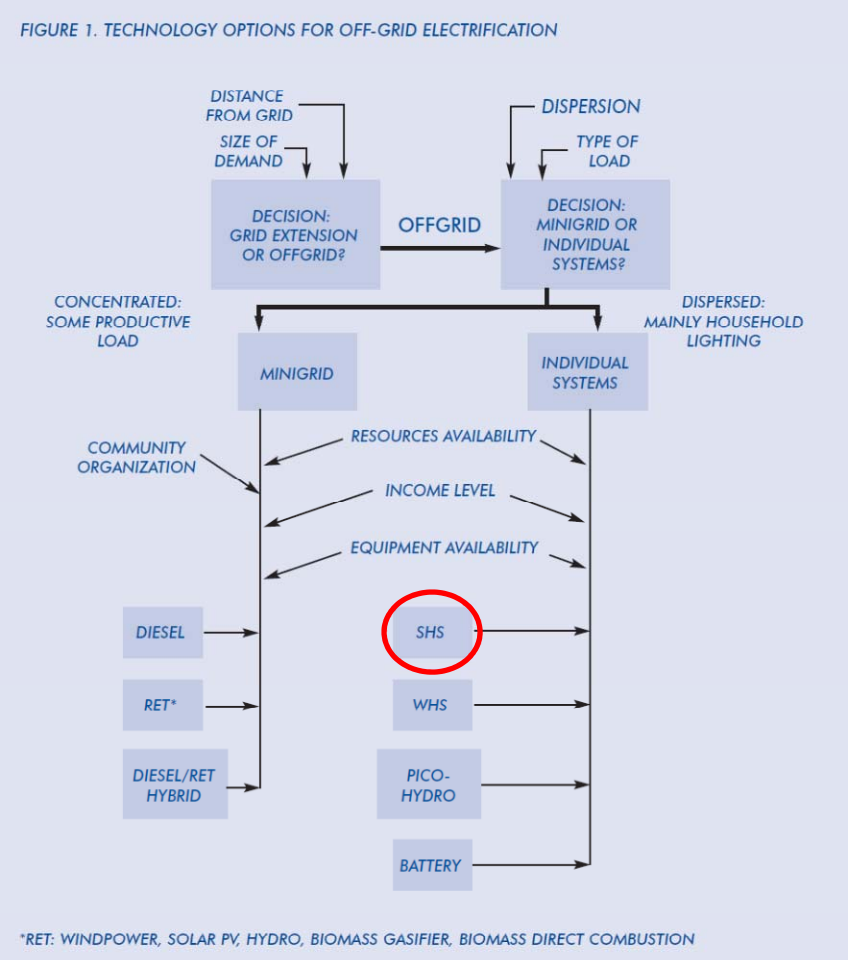
- More than 1.5 billion people, mainly in Sub-Saharan Africa and South Asia remain without access to electricity services today

- Off-grid RE-based technologies have emerged as a viable alternative to fossil-fuel based sources such as kerosene due to cost decrease and environmental considerations

- From a sample of 120 World Bank electrification projects, nearly 50% had off-grid components (IEG 2007)

PV is predominant technology used for individual households in off-grid projects

- Deciding how and when off-grid investments complement grid extensions is key
- PV is the only technology that can function virtually anywhere despite variations in the resource
- Solar Home Systems (SHS) generally consists of a 10-100 Wp solar PV panel, a battery, a controller, cabling and DC lamps.



Enhancing affordability of PV SHS through financing, technology and policy

- Subsidies or other financing mechanisms, e.g. microfinance institutions, can help off-grid consumers afford the high upfront costs

- Smaller, lower-power systems can enhance affordability for poorer and more dispersed populations

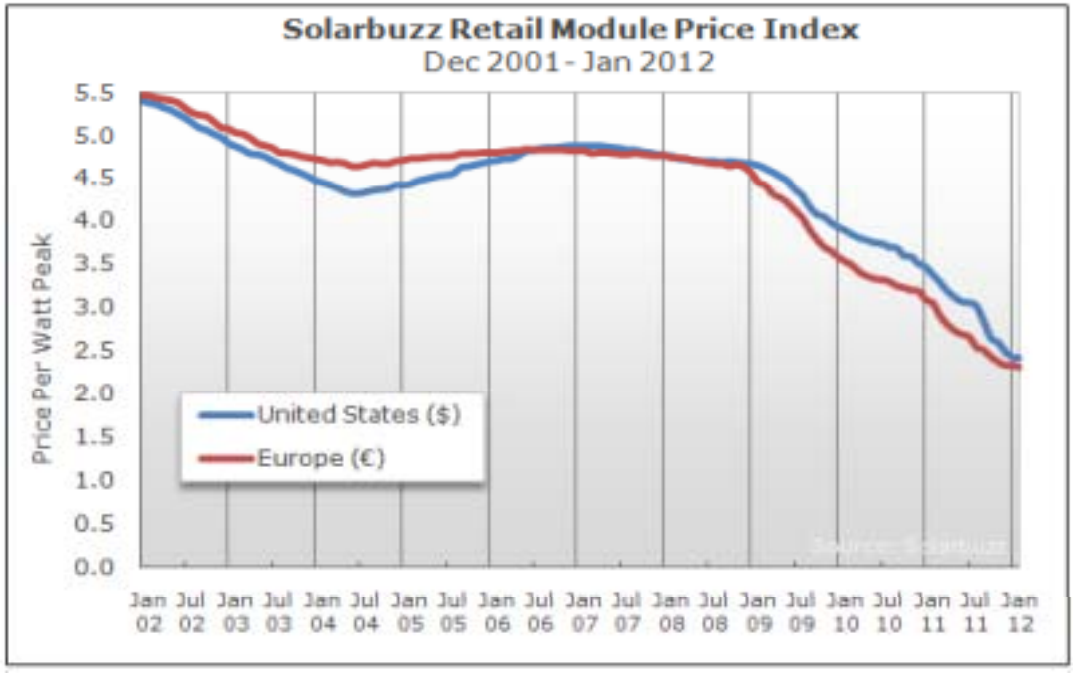
- Policy measures to reduce capital cost also improve affordability, e.g. exemption of solar PV import duties in Kenya and Tanzania

International co-finance assistance is available for off-grid projects

- GEF provides grants to RE technologies facing market barriers.
- GPOBA provides grants through output-based approaches
- ESMAP provides grants for studies and project preparation activities
- UNFCCC CDM enhances project financing through carbon credits

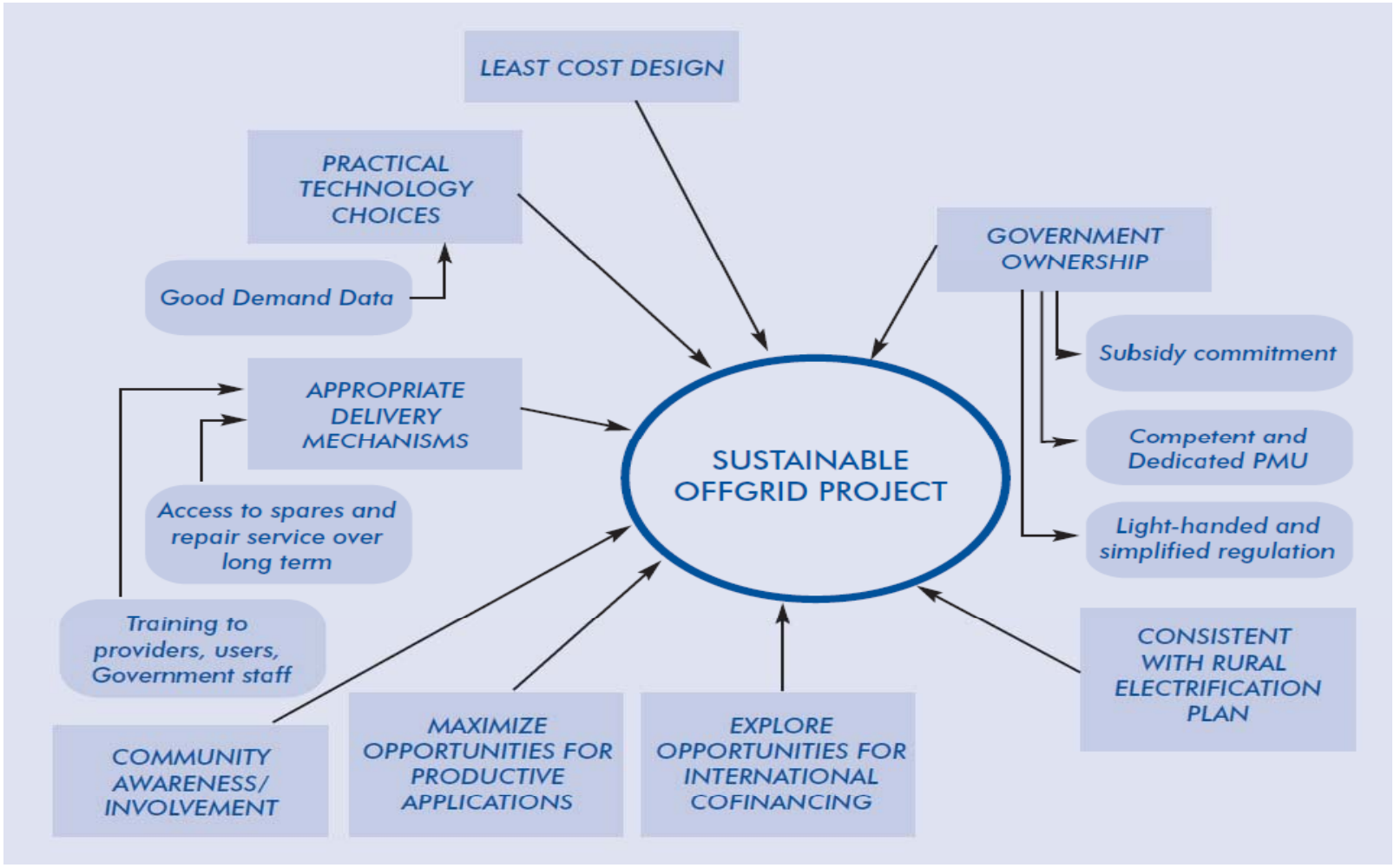
CIFs provide concessional financing

Off-grid market benefits from industry's declining costs



Price of PV module represents 35-40% of total solar system

Designing a sustainable off-grid project





CASE STUDY

Case study: Bangladesh SHS Program

- Off-grid component of the Rural Electrification and Renewable Energy Development (RERED) launched in 2002

- Created a viable model for providing access through Solar Home Systems (SHS)
  - Implemented by the Infrastructure Development Company Limited (IDCOL)
  - Started in January 2003 with IDA and GEF funds
  - Target of 50,000 systems by 2008 was achieved 3 years ahead of time
  - Over 1.1 million SHS (60 MW) installed so far with support from the World Bank (for 500,000) and other donors (ADB, kfW, GTZ, IDB, GPOBA)
  - One of the fastest growing RE programs in the world

Implementation model is the key to success

- **Ownership Model**
  - Partner Organizations (POs), i.e. NGOs, micro-finance institutions, install the systems under a micro-credit program.
    - Households pay down payment (10-15%) of the system cost net of grant. The rest is paid under micro-finance (3-5 years repayment at interest rate of 12-15% per year)
    - The micro-finance extended by the POs are refinanced by IDCOL (8-10 years at 6-8% interest rates) allowing POs to install more systems
- **Fee for Service Model**
  - Utility (REB) installed the systems and provided repair and maintenance. Consumers paid a monthly rent

The Ownership Model

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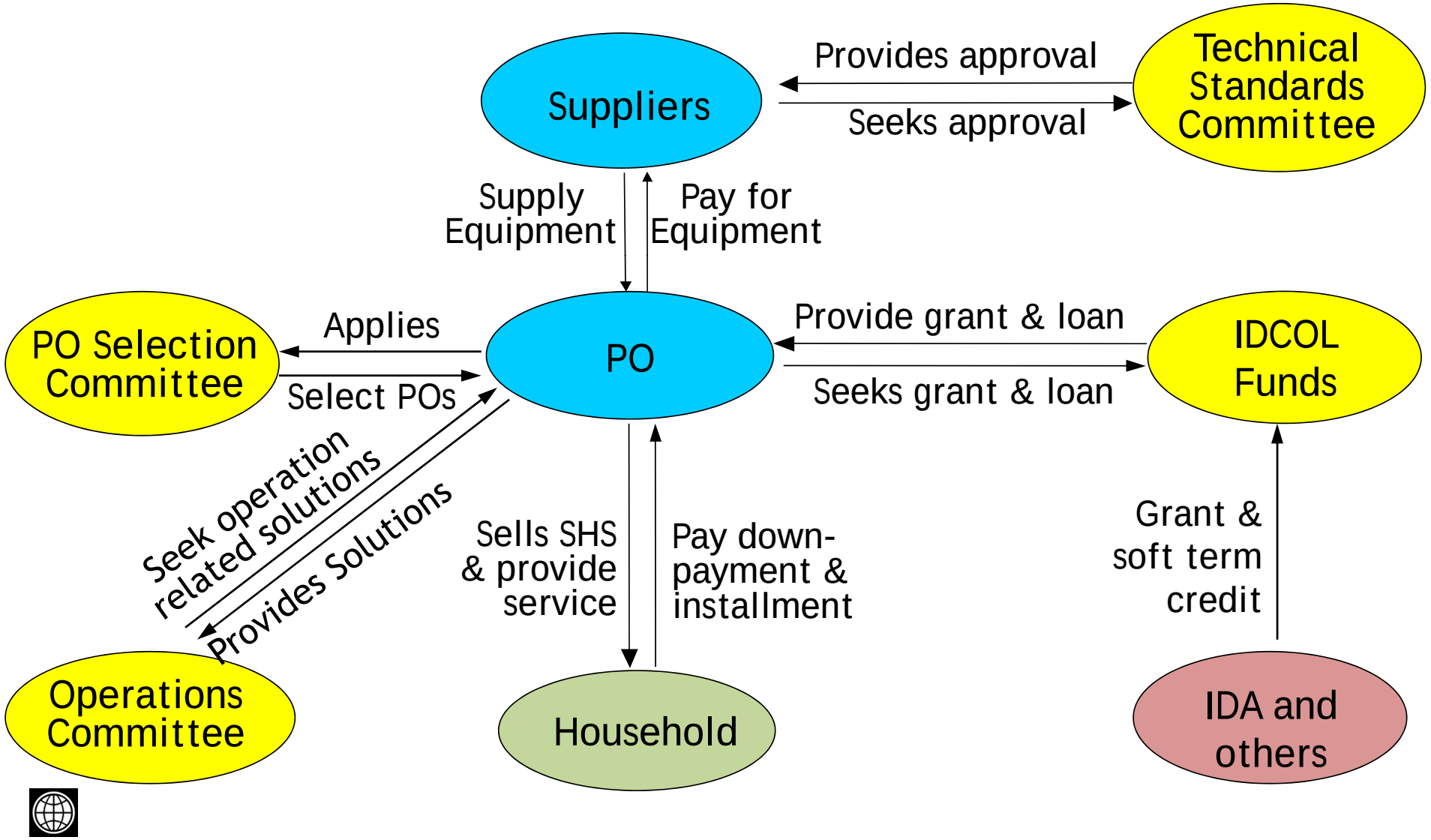

Financing Scheme

Cash Sale

Only Grant A (buy-down grant) is provided to the PO

Credit Sale

SHS cost	USD 380
System buy-down Grant A: USD 25	USD 25
Remaining Cost	**USD 355**
Household Down payment (15%)	USD 53.25
Credit to customer (Tk)	**USD 301.75**
IDCOL refinance (80%)	USD 241.40
PO Contribution (20% of loan amount)	USD 60.35
Institutional Development Grant B : USD 3	USD 3

Financing terms of loans from PO to household	
Loan (Tk)	USD 301.75
Loan duration	3 years
Total Interest charge (12% p.a. flat)	USD 108.63
Total household payment	USD 410.38
Monthly household installment	**USD 11.40**

Phased Reduction of Grants

- The goal is the commercialization of SHS

Item	Amount of Grant Available per SHS		
	Total	Buy-down grant	Institutional Development Grant
First 20,000 SHS	$90	$70	$20
Next 20,000 SHS	$70	$55	$15
Next 35,000 SHS	$50	$40	$10
Next 88,160 SHS	€38	€30	€8
Next 35,000 SHS	€36	€30	€6
Next 235,000 SHS	€34	€30	€4
Next 100,000 SHS	€28	€25	€3
Currently	€22	€20	€2

Development Impact

- Financed over 1.1 million SHS
- Beneficiaries: 4.87 million, 3% of population
- Savings: ~80,000 tons of kerosene worth US$ 60 million/year
- Job creation: 15,000 direct and 30,000 indirect
- CO_2 reduction: ~225,000 tons of CO_2 per year
- Created new industries: solar PV batteries, charge controllers.

Success Factors

- Geographic concentration of rural population - Economies of Scale
- Existing network of NGOs - Public acceptance of NGO services
- Supervision and Monitoring by IDCOL

THANK YOU!

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100 kW Solar PV Mini-grid at Sandwip Island, RERED project, Bangladesh